2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments	2021 IRC – Chapter 1 – Scope and Administration	2021 Houston IRC Amendments	Code Change Summary
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		**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~~ hereinafter 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-____.[1]	No change to Houston amendment
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.	**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* not more than three stories above *grade plane* in height. **Exceptions:** The following shall be permitted to be constructed in accordance with this code where provided with ~~a residential fire~~ an automatic system complying with Section P2904: 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*. Fire suppression required by Section 419.5 of the *International Building Code* where constructed under the *International Residential Code for Oneand 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 the *International Residential Code for One- and Two-family Dwellings* where equipped with a fire sprinkler system in accordance with Section P2904.~~ 3. A care facility with five or fewer persons receiving custodial care within a dwelling unit. 4. A care facility with five or fewer persons receiving medical care within a dwelling unit.	**R101.2 Scope.** The provisions of 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:** ~~The following shall be permitted to be constructed in accordance with this code where provided with an automatic system complying with Section P2904:~~ 1. Live/work units located in *townhouses* and complying with the requirements of Section 508.5 of the ~~*International*~~ *Building Code*. 2. Owner-occupied *lodging houses* with five or fewer guestrooms. 3. A care facility with five or fewer persons receiving custodial care within a *dwelling unit*. 4. A care facility with five or fewer persons receiving medical care within a *dwelling unit*. 5. A care facility for five or fewer persons receiving care that are within a single-family dwelling.	Minor wordsmithing and changes to scope to include care facilities. No change to Houston amendment.

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

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	5. A care facility for five or fewer persons receiving care that are within a single-family dwelling.		
R102.1 General. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall prevail. 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. 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.		**SECTION R102** **APPLICABILITY** **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 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 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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.	No change to Houston amendment.
R102.8 Special piping and storage systems. See Chapter 57 of the 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.	No change to Houston amendment.
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.		**R102.9 Electrical Code.** Part VIII-Electrical (Chapters 34-43) of the 2021 *Residential Code* is not adopted. All electrical work and licensing shall comply with the *Electrical Code*.	No change to Houston amendment.

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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.		**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*.	No change to Houston amendment.
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*.	No change to Houston amendment.
	R101.3 ~~Intent~~ Purpose. The purpose of this code is to establish minimum requirements to ~~safeguard the public~~ provide a reasonable level of safety, health and general welfare through affordability, structural strength, means of egress ~~facilities~~, stability, sanitation, light and ventilation, energy conservation and safety to life and property from fire and other hazards ~~attributed to the built environment,~~ and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.		Minor wordsmithing changes.
	R102.7.1 Additions, alterations or repairs. *Additions*, *alterations* or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with the requirements of this code, unless otherwise stated. *Additions*, *alterations,* repairs and relocations shall not cause an existing structure to become ~~unsafe or adversely affect the performance of the building~~ less compliant with the provisions of this code than the existing building or structure was prior to the *addition*, *alteration* or *repair*. An existing building together with its *additions* shall comply with the height limits of this code. Where the *alteration* causes the use or occupancy to be changed to one not within the scope of this		Updates to base code language for existing buildings.

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	code, the provisions of the *International Existing Building Code* shall apply.		
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*.		**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*.	No change to Houston amendment.
	SECTION R104 **DUTIES AND POWERS OF THE BUILDING OFFICIAL** **R104.1 General.** The *building official* is hereby authorized and directed to enforce the provisions of this code. The *building official* shall have the authority to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures shall be in ~~conformance~~ compliance with the intent and purpose of this code. Such policies and procedures shall not have the effect of waiving requirements specifically provided for in this code.		Minor wordsmithing changes.
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.		**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.	No change to Houston amendment.

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~~**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.~~		~~**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.~~	No change to Houston amendment.
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~~.		**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 the Building Code Enforcement Division ~~the department of building safety.~~	No change to Houston amendment.
{EDITORIAL NOTE: DELETE SECTION R104.10.1 IN ITS ENTIRETY.}		[**EDITORIAL NOTE:** DELETE SECTION R104.10.1 IN ITS ENTIRETY.]	No change to Houston amendment.
	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*~~. The *building official* shall have the authority to approve ~~A~~an alternative material, design or method of construction ~~shall be *approved* whereupon~~ application of the owner or the owner's authorized agent. ~~t~~The *building official* shall first find~~s~~ 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, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Compliance with the specific performance-based provisions of the International Codes 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 respond in writing, stating the reasons why the alternative was not *approved*.		Minor wordsmithing to match language of IBC.
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.*	No change to Houston amendment.

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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*, provided that the floor area does not exceed ~~200~~ 120 square feet (~~18.58~~ 11.15 m²).
2. Fences not over ~~7~~ 8 feet (~~2134~~ 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, cabinet~~s,~~ and counter–top~~s~~ 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 m²);
   - 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 m²); or
   - 6.4. Roof covering that does not exceed an aggregate of 100 square feet (9.29 m²).
7. ~~Prefabricated *swimming pools* that are less than 24 inches (610 mm) deep.~~
8. Minor single-family residential accessory ~~S~~swings and other residential playground equipment less than 12-feet in height.
9. 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.
10. Decks not exceeding 200 square feet (18.58 m²) in area, that are not more than 30 inches (762 mm) above *grade* at any point, are not attached to a

R105.2 Work exempt from permit.
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*. *Permits* shall not be required for the following:

Building:

1. ~~One~~ Other than *storm shelters*, one *-story* detached *accessory structures,* provided that the floor area does 2 not exceed 200 square feet (18.58 m).
2. Fences not over 7 feet (2134 mm) high.
3. Retaining walls that are not over 4 feet (1219 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.
6. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
7. Prefabricated swimming pools that are less than 24 inches (610 mm) deep.
8. Swings and other playground equipment.
9. Window awnings supported by an exterior wall that do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.
10. Decks not exceeding 200 square feet (18.58 m²) 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 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.

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. Other than *storm* shelters, one-*story* detached *accessory structures*, provided that the floor area does not exceed ~~200~~ 120 square feet (~~18.58~~ 11.15 m²).
2. Fences not over ~~7~~ 8 feet (~~2134~~ 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 not covered under the provisions of the *Infrastructure Design Manual*; i.e. *interior flatwork* not exceeding 65% of the total impervious area.
6. Minor repair and maintenance of existing structures that include:
   - 6.1. Painting, tarping, wallpapering, tiling, carpeting, cabinet~~s,~~ and counter–top~~s~~ 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 m²);
   - 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 m²); or
   - 6.4. Roof covering that does not exceed an aggregate of 100 square feet (9.29 m²).
7. ~~Prefabricated *swimming pools* that are less than 24 inches (610 mm) deep.~~
8. Swings and other playground equipment.
9. 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.
10. Decks not exceeding 200 square feet (18.58 m²) 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.

Update wording to be in line with base code, no major change to Houston amendment.

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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.
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.

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.
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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.

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.
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.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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R105.2.1 Emergency replacements or *repairs*. Where emergency *equipment* replacements ~~and~~ or emergency repairs ~~for~~ 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.		**R105.2.1 Emergency replacements or *repairs*.** Where emergency *equipment* replacements ~~and~~ or emergency repairs ~~for~~ for which a permit is required must be performed in an emergency situation, the *permit* application shall be submitted to the building official ~~within~~ not later than the next ~~working~~ business day to the *building official* after initiation of the replacement or repair.	No change to Houston amendment.
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.		**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, 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 of 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.	No change to Houston amendment.
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 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*		**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 Building Code Enforcement Division ~~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 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*.	No change to Houston amendment.

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{EDITORIAL NOTE: **DELETE SECTION R105.3.1.1 IN ITS ENTIRETY AND RESERVE.}**		[**EDITORIAL NOTE:** DELETE SECTION R105.3.1.1 IN ITS ENTIRETY AND RESERVE.]	No change to Houston amendment.
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 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 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.~~	No change to Houston amendment.
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*.~~		**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*.~~	No change to Houston amendment.
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.	**R105.5 Expiration.** Every *permit* issued shall become invalid unless the work authorized by such *permit* is commenced within 180 days after its issuance~~, or the work authorized by such *permit* is suspended or abandoned for a period of after the time the work is~~ commenced~~ment of work if more than~~ 180 days ~~pass between inspections.~~ 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.	**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 after commencement of work if more than 180 days pass between inspections. 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 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.	Update wording to be in line with base code, no major change to Houston amendment.

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		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.	
R105.5.1 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.		**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.	No change to Houston amendment.
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.*		**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.*	No change to Houston amendment.
	SECTION R106 **CONSTRUCTION DOCUMENTS** **R106.1 Submittal documents.** Submittal documents consisting of *construction documents*, and other data shall be submitted in two or more sets, or in a digital format where allowed by the *building official*, with each application for a *permit.* The *construction documents* shall be prepared by a *registered design professional* where required by the statutes of the *jurisdiction* in which the project is to be constructed. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*. **Exception:** The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a *registered design professional* if it is found that the nature of the work applied for is such that reviewing of *construction documents* is not necessary to obtain compliance with this code.		Updated language to accommodate digital submittals of construction documents.
{EDITORIAL NOTE: DELETE SECTION R106.1.4 IN ITS ENTIRETY.}		[**EDITORIAL NOTE:** DELETE SECTION R106.1.4 IN ITS ENTIRETY.]	No change to Houston amendment.
	R106.1.5 Information on storm shelters. *Construction documents* for *storm shelters* shall include the information required in **ICC 500**.		New requirements for storm shelters.
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*.		**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 R108.3 and the ~~schedule as established by the applicable governing authority~~ *city fee schedule*.	No change to Houston amendment.

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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.

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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 R108.3.1, Tables R108.3.1(1) and R108.3.1(2), 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 R108.3.1, Tables R108.3.1(1) and R108.3.1(2), 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.

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<td>No change to Houston amendment.</td>
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R108.3.1 Buildings. Building permit fees, payable in the amounts set forth in the *city fee schedule*, shall be required under this code for new buildings, additions, *alterations*, remodels, conversions, and *repairs*.

For one- and two-family *dwellings*, the building permit fee shall be comprised of two components, the base charge, which shall be determined according to type of construction and size, as shown in Table R108.3.1(1), and the incremental charge, which shall be determined according to type of construction and size, as shown in Table R108.3.1(2).

</td>
<td>New Houston amendment to the IRC brought over from the Houston IBC amendments for residential permit fee calculations. No change to enforcement or process.</td>
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TABLE R108.3.1(1)
RESIDENTIAL BUILDING PERMIT CONSTRUCTION TYPE AND TIER

ype of struction	Tier	Square footage greater than	Square footage l than or equal t
IA	1	0	44.92
IA	2	44.92	962.53
IA	3	962.53	1,283.37
IA	4	1,283.37	1,925.05
IA	5	1,925.05	3,208.42
IA	6	3,208.42	6,416.84
IA	7	6,416.84	32,084.19
IA	8	32,084.19	320,841.89
IA	9	320,841.89	No maximum
IB	1	0	46.17

</td>
<td>New Houston amendment to the IRC brought over from the Houston IBC amendments for residential permit fee calculations. No change to enforcement or process.</td>
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	IB	2	46.17	989.38	
	IB	3	989.38	1,319.17	
	IB	4	1,319.17	1,978.76	
	IB	5	1,978.76	3,297.94	
	IB	6	3,297.94	6,595.87	
	IB	7	6,595.87	32,979.35	
	IB	8	32,979.35	329,793.55	
	IB	9	329,793.55	No maximum	
	IIA	1	0	47.35	
	IIA	2	47.35	1,014.68	
	IIA	3	1,014.68	1,352.91	
	IIA	4	1,352.91	2,029.36	
	IIA	5	2,029.36	3,382.26	
	IIA	6	3,382.26	6,764.53	
	IIA	7	6,764.53	33,822.63	
	IIA	8	33,822.63	338,226.34	
	IIA	9	338,226.34	No maximum	
	IIB	1	0	48.58	
	IIB	2	48.58	1,041.02	
	IIB	3	1,041.02	1,388.02	
	IIB	4	1,388.02	2,082.03	
	IIB	5	2,082.03	3,470.05	
	IIB	6	3,470.05	6,940.11	
	IIB	7	6,940.11	34,700.53	
	IIB	8	34,700.53	347,005.34	
	IIB	9	347,005.34	No maximum	
	IIIA	1	0	50.38	
	IIIA	2	50.38	1,079.60	
	IIIA	3	1,079.60	1,439.47	
	IIIA	4	1,439.47	2,159.21	
	IIIA	5	2,159.21	3,598.68	
	IIIA	6	3,598.68	7,197.35	
	IIIA	7	7,197.35	35,986.76	
	IIIA	8	35,986.76	359,867.57	
	IIIA	9	359,867.57	No maximum	
	IIIB	1	0	51.75	
	IIIB	2	51.75	1,108.89	
	IIIB	3	1,108.89	1,478.52	
	IIIB	4	1,478.52	2,217.79	
	IIIB	5	2,217.79	3,696.31	
	IIIB	6	3,696.31	7,392.62	

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	IIIB	7	7,392.62	36,963.11	
	IIIB	8	36,963.11	369,631.11	
	IIIB	9	369,631.11	No maximum	
	IV	1	0	49.39	
	IV	2	49.39	1,058.43	
	IV	3	1,058.43	1,411.23	
	IV	4	1,411.23	2,116.85	
	IV	5	2,116.85	3,528.08	
	IV	6	3,528.08	7,056.17	
	IV	7	7,056.17	35,280.84	
	IV	8	35,280.84	352,808.35	
	IV	9	352,808.35	No maximum	
	VA	1	0	53.83	
	VA	2	53.83	1,153.49	
	VA	3	1,153.49	1,537.99	
	VA	4	1,537.99	2,306.98	
	VA	5	2,306.98	3,844.97	
	VA	6	3,844.97	7,689.94	
	VA	7	7,689.94	38,449.71	
	VA	8	38,449.71	384,497.08	
	VA	9	384,497.08	No maximum	
	VB	1	0	57.16	
	VB	2	57.16	1,224.89	
	VB	3	1,224.89	1,633.19	
	VB	4	1,633.19	2,449.78	
	VB	5	2,449.78	4,082.97	
	VB	6	4,082.97	8,165.93	
	VB	7	8,165.93	40,829.66	
	VB	8	40,829.66	408,296.59	
	VB	9	408,296.59	No maximum	

TABLE R108.3.1(2)
SQUARE FOOTAGE INCREMENT BY TYPE OF CONSTRUCTION

Type of Construction	Square footage increment, each incurring additional charge
IA	6.42
IB	6.60
IIA	6.76
IIB	6.94
IIIA	7.20
IIIB	7.39

New Houston amendment to the IRC brought over from the Houston IBC amendments for residential permit fee calculations. No change to enforcement or process.

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		IV 7.06 VA 7.69 VB 8.17 For all buildings not included in Tables R108.3.1(1) and R108.3.1(2), the building permit fee shall be based on the valuation, as described in Section 109.3 and the *city fee schedule*. **Notes:** 1. New one- and two-family *dwellings* and townhouses 1,800 square feet or less shall receive a 50 percent discount on permit fees. 2. A historic building that has been designated by the *jurisdiction* as a landmark or that is located within a historic district designated by the *jurisdiction*, or for which designation as a landmark or part of a historic district is pending, shall receive a 50 percent discount on permit fees provided that a certificate of appropriateness approved by the Houston Archaeological and Historical Commission pursuant to Chapter 33 of the *City Code* is submitted with the construction documents.	
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. 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.		**R108.5 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. 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.	No change to Houston amendment.
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.	No change to Houston amendment.
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.		**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*.	No change to Houston amendment.

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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.		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*.	
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.		**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.	No change to Houston amendment.
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~~ 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*.	**SECTION R110** **CERTIFICATE OF OCCUPANCY** **R110.1 Use and change of occupancy.** A building or structure shall not be used or occupied in whole or in part, and a *change* ~~in the existing use or~~ *of occupancy* or change of use of a building or structure or portion thereof shall not 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.	**SECTION R110** **CERTIFICATE OF ~~OCCUPANCY~~ COMPLIANCE** **R110.1 Use and ~~Change of~~ occupancy.** ~~A~~ Group R3 *One- and Two-family Dwellings* and *Townhouses* and associated residential accessory buildings or structures shall not be used or occupied in whole or in part, and a *change of occupancy* ~~or change of use of~~ in 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~~certificates of compliance ~~occupancy~~ is not required for work exempt from permits under Section R105.2. 2. ~~Accessory buildings or structures.~~ A certificate of compliance 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*.	Update wording to be in line with base code, no major change to Houston amendment.
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*.			Removed Houston amendment.
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.	**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~~, the *building official* shall issue a certificate of occupancy containing the following: 1. The ~~building~~ *permit* number. 2. The address of the structure. 3. The name and address of the *owner* or the owner's authorized agent.	**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~~ Building Code Enforcement, the *building official* shall issue a certificate of compliance ~~occupancy~~ containing the following: 1. The *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.	Update wording to be in line with base code, no major change to Houston amendment.

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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. The type of construction as defined by Chapter 6 of the *Building Code*.	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 forcompliance 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~~ Where an automatic sprinkler system is provided and whether the sprinkler system is required. 9. Any special stipulations and conditions of the building *permit*.	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. Where 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. 11. The type of construction as defined by Chapter 6 of the *Building Code*.	
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.		**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.	No change to Houston amendment.
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*.	**R110.5 Revocation.** The *building official* ~~shall, in writing,~~ is authorized to suspend or revoke a certificate of 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~~ the provisions of this code or other ordinance of the *jurisdiction*.	**R110.5 Revocation.** The *building official* is authorized to 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 the provisions of this code or other ordinance of the *jurisdiction*. 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*.	Update wording to be in line with base code, no major change to Houston amendment.
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*.		**R110.6 Certificate of compliance availability.** If a certificate of compliance has been issued, then, 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*.	No change to Houston amendment.
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*.~~		**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*.~~	No change to Houston amendment.

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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.		**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.	No change to Houston amendment.
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*.~~	No change to Houston amendment.
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 the *Texas Penal Code*, and, instead, they shall constitute defenses to prosecution within the meaning of Section 2.03 of the *Texas Penal Code*.		**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 the *Texas Penal Code*, and, instead, they shall constitute defenses to prosecution within the meaning of Section 2.03 of the *Texas Penal Code*.	No change to Houston amendment.
	SECTION R114 **STOP WORK ORDER** **R114.1 ~~Notice to owner or the owner's authorized agent~~ Authority.** ~~Upon notice from~~ Where the *building official* finds any work regulated by this code being performed in a manner ~~that work on any building or structure is being executed~~ contrary to the provisions of this code or in ~~an~~ a dangerous or unsafe ~~and dangerous~~ manner, the *building official* is authorized to issue a stop work order~~, such work shall be immediately stopped. The stop work order shall be in writing and shall be given to the owner of the property involved, or to the owner's authorized agent or to the person performing the work and shall state the conditions under which work will be permitted to resume~~.		Base code language has been updated to clarify stop work order provisions and enforcement.

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	R114.2 Issuance. The stop work order shall be in writing and shall be given to the *owner* of the property, the owner's authorized agent or the *person* performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work is authorized to resume.		Base code language has been updated to clarify stop work order provisions and enforcement.
	R114.3 Emergencies. Where an emergency exists, the building official shall not be required to give a written notice prior to stopping the work.		Base code language has been updated to clarify stop work order provisions and enforcement.
	~~**R114.2**~~ **R114.4** ~~**Unlawful continuance**~~ **Failure to comply.** Any *person* who shall continue any work ~~in or about the structure~~ after having been served with a stop work order, except such work as that *person* is directed to perform to remove a violation or unsafe condition, shall be subject to fines established by the authority having jurisdiction ~~penalties as prescribed by law~~.		Base code language has been updated to clarify stop work order provisions and enforcement.
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 any one- or two-family residence or townhouse and associated accessory structures.		**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 any one- or two-family residence or townhouse and associated accessory structures.	No change to Houston amendment.
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		**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.	No change to Houston amendment.

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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. 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		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. 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	

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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; 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		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; 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.	

entities within the third degree of consanguinity or within the second degree of affinity.			
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.		**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.	No change to Houston amendment.
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*.		**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*.	No change to Houston amendment.

2015 Houston IRC Amendments	2021 IRC – Chapter 2 Definitions	2021 Houston IRC Amendments	Code Change Summary
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 in those other volumes, as applicable to the construction and proposed scope of work hereunder ~~in other code publications of the International Code Council~~.		**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 in those other volumes, as applicable to the construction and proposed scope of work hereunder ~~in other code publications of the International Code Council.~~	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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SECTION 202 DEFINITIONS		**SECTION R202 DEFINITIONS** **[EDITORIAL NOTE:** ALL PORTIONS OF SECTION R202 NOT SHOWN REMAIN AS SET FORTH IN THE 2021 IRC.]	No change to Houston amendment.
	[RE] ABOVE-GRADE WALL. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RB] ACCESS (TO). That which enables a device, an appliance or equipment to be reached by ready access or by a means that first requires the removal or movement of a panel, door or similar obstruction.		New base code definition.
	~~**[RE] ACCESSIBLE.** For the definition applicable in **Chapter 11**, see **Section N1101.6**.~~		Base code definition removed.
	[RB] ADDITION. An extension or increase in floor area, number of stories or height of a building or structure. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
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.		**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.	No change to Houston amendment.
[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.		**[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 an 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*. For the definition applicable in Chapter 11, see Section N1101.6.	No change to Houston amendment.
	[RE] AIR BARRIER. ~~See Section N1101.6f~~For the definition applicable in Chapter 11, see Section N1101.6.		Minor changes to definition.
	[RB] AIR-IMPERMEABLE INSULATION. An insulation having an air permanence equal2 to or less than 0.02 L/s-m at 75 Pa pressure differential as tested in accordance with ASTM E-2178 or E-283. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.

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	[RB] ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a building, 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. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests~~,or~~ furnishing inspection services~~, where such agency~~or furnishing product certification, and has been *approved* by the building official~~. For the definition applicable in Chapter 11, see Section N1101.6.~~		Minor updates to definition for clarity.
	[MP] APPROVED SOURCE. An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.		New base code definition.
		APPROVED FABRICATOR. An established and qualified person, firm or corporation registered and certified with the *jurisdiction* and approved by the *building official* pursuant to Chapter 17 of this code to provide specific products and/or services that document compliance with the *Construction Code*.	New amendment definition to correlate special inspection requirements with the Houston IBC.
ATTIC, HABITABLE. A finished ~~or unfinished~~ area, not considered a *story*, complying with all of the following requirements: 1. The occupiable floor area is not less than 70 square feet (17m²), in accordance with Section R304. 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. **4.** The occupiable space is within a one- or two- family dwelling containing not more than two stories above grade plane in height.	**[RB] ATTIC, HABITABLE.** A finished or unfinished *habitable space* within an *attic*. ~~area, not considered a *story*, complying with all of the following requirements:~~ ~~**1.** The occupiable floor area is not less than 70 square feet (17 m2), in accordance with Section R304.~~ ~~**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.~~		Removed Houston amendment to go with base code.
AUTHORITY HAVING JURISDICTION. The director of Houston Public Works or the director's duly authorized representative.		**AUTHORITY HAVING JURISDICTION.** The City of Houston, Texas. The definition shall also include the director of Houston Public Works as the *jurisdiction's* duly authorized representative.	No change to Houston amendment.
	[RB~~B~~E] BASEMENT WALL. ~~The opaque portion of a wall that encloses one side of a *basement* and has an average below *grade* wall area that is 50 percent or more of the total opaque and nonopaque area of that enclosing side.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[MP] BALANCED VENTILATION. Any combination of concurrently operating mechanical exhaust and mechanical supply whereby the total mechanical exhaust airflow rate is within 10 percent of the total mechanical supply airflow rate.		New base code definition.

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	[MP] BALANCED VENTILATION SYSTEM. A ventilation system where the total supply airflow and total exhaust airflow are simultaneously within 10 percent of their averages. The balanced ventilation system airflow is the average of the supply and exhaust airflows.		New base code definition.
	[RB] BUILDING. ~~**Building shall mean**~~ aAny one- ~~and~~**or** two-family dwelling *or townhouse*, or portion thereof, including ~~*townhouses*~~, ~~**that is**~~ used~~**, or designed**~~ intended to be used for human habitation, for living, sleeping, cooking or eating purposes, or any combination thereof, ~~and~~**or** ~~shall include~~any *accessory structure*~~**s thereto**~~. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
BUILDING CODE. The *City of Houston Building Code*, as adopted and amended by this *jurisdiction.*		**BUILDING CODE.** The *City of Houston Building Code*, as adopted and amended by this *jurisdiction.*	No change to Houston amendment.
	[RB] BUILDING-INTEGRATED PHOTOVOLTAIC ROOF PANEL (BIPV Roof Panel). A *photovoltaic panel* that functions as a component of the building envelope.		New base code definition.
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.	**[RB] BUILDING OFFICIAL.** The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative. For the definition applicable in Chapter 11, see Section N1101.6.	**BUILDING OFFICIAL** The~~ officer or other designated authority charged with the administration and enforcement of this code or a duly authorized representative~~ 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. For the definition applicable in Chapter 11, see Section N1101.6.	Update wording to be in line with base code, no major change to Houston amendment.
	[RE] BUILDING SITE. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
BUILDING THERMAL ENVELOPE. The boundary formed by *basement walls, exterior walls,* floor, roof and any other building element that encloses *conditioned space*. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.	**[RE] BUILDING THERMAL ENVELOPE.** ~~The *basement walls*, *exterior walls*, floor, roof and any other building element that enclose *conditioned spaces*.~~For the definition applicable in Chapter 11, see Section N1101.6.	**BUILDING THERMAL ENVELOPE.** ~~For the definition applicable in Chapter 11, see Section N1101.6.~~ The boundary formed by *basement* walls, *exterior* walls, floor, roof and any other building element that encloses *conditioned space*. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.	No change to Houston amendment.
	[RB] CARBON MONOXIDE ALARM. A single- or multiple-station alarm intended to detect carbon monoxide gas and alert occupants by a distinct audible signal. It incorporates a sensor, control components and an alarm notification appliance in a single unit.		No Houston amendment.

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	[RB] CARBON MONOXIDE DETECTOR. A device with an integral sensor to detect carbon monoxide gas and transmit an alarm signal to a connected alarm control unit.		New base code definition.
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.		**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.	No change to Houston amendment.
	[RB] CHANGE OF OCCUPANCY. A change in the use of a building or portion of a building that involves a change in the application of the requirements of this code.		New base code definition.
	[MP] CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
CITY CODE. The *Code of Ordinances, City of Houston, Texas.*		**CITY CODE.** The *Code of Ordinances, City of Houston, Texas.*	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
	[MP] CLEANOUT. An access ~~**accessible**~~ opening in the drainage system ~~used~~ utilized for the removal of ~~possible obstruction and located to allow for access~~. obstructions. Types of cleanouts include a removable plug or cap, and a removable fixture or fixture trap.		Minor updates to definition for clarity.
	[RE] CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
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 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*	No change to Houston amendment.

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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*.		*Code*, ordinances, and other laws and policies as specifically delegated by the *building official, fire chief,* and the *authority having jurisdiction*.	
	[RB] COLLAPSIBLE SOILS. Soils that exhibit volumetric reduction in response to partial or full wetting under load.		New base code definition.
	~~**[CE] COMMERCIAL, BUILDING.** See Section N1101.6.~~		Base code definition removed.
	[RB] COMPRESSIBLE SOILS. Soils that exhibit volumetric reduction in response to the application of load even in the absence of wetting or drying.		New base code definition.
	~~**[RE] CONDITIONED AREA.** That area within a building provided with heating or cooling systems or *appliances* capable of maintaining, through design or heat loss or gain, 68°F (20°C) during the heating season or 80°F (27°C) during the cooling season, or has a fixed opening directly adjacent to a conditioned area.~~		Base code definition removed.
	[RE] CONDITIONED FLOOR AREA. ~~The horizontal projection of the floors associated with the *conditioned space*.~~For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] CONDITIONED SPACE. ~~An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or that is indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate thru openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings or where they contain uninsulated ducts, piping or other sources of heating or cooling.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] CONTINUOUS AIR BARRIER. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RE] CONTINUOUS INSULATION (ci). For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
CONSTRUCTION CODE. Has the meaning ascribed in Section 1-2 of the *City Code*.		**CONSTRUCTION CODE.** Has the meaning ascribed in Section 1-2 of the *City Code*.	No change to Houston amendment.

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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*.			Removed Houston amendment.
	[RB] CRIPPLE WALL CLEAR HEIGHT. The vertical height of a *cripple wall* from the top of the foundation to the underside of floor framing above.		New base code definition.
	[RB] CRAWL SPACE. An underfloor space that is not a basement.		New base code definition.
	[RE] CRAWL SPACE WALL. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RE] CURTAIN WALL. ~~See Section N1101.6 f~~For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates for clarity.
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.		**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.	No change to Houston amendment.
	[RE] DEMAND RECIRCULATION WATER SYSTEM. See Section N1101.6 ~~F~~for the definition applicable in Chapter 11, see Section N1101.6.		Minor updates for clarity.
	[RE] DUCT. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[MP] DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling *equipment* and *appliances*. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates for clarity.

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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.		**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.	No change to Houston amendment.
	[RB] DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
ELECTRICAL CODE. The *City of Houston Electrical Code*, as adopted and amended by this *jurisdiction*.		**ELECTRICAL CODE.** The *City of Houston Electrical Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
	[RB] EMERGENCY ESCAPE AND RESCUE OPENING. An operable exterior window, door or similar device that provides for a means of escape and access for rescue in the event of an emergency. (See also ~~" Grade floor opening."~~ "***Grade floor emergency escape and rescue opening***.")		Minor updates to definition for clarity.
	[RE] ENERGY ANALYSIS. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
ENERGY CONSERVATION CODE. The *City of Houston Residential Energy Conservation 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*.	No change to Houston amendment.
	[RE] ENERGY COST. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RB] ENERGY STORAGE SYSTEMS (ESS). One device or multiple devices, assembled together, capable of storing electrical energy to be supplied at a future time.		New base code definition.
	[RE] ERI REFERENCE DESIGN. ~~A version of the rated design that meets the minimum requirements of the 2006 *International Energy Conservation Code*.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
EXISTING BUILDING CODE. The *City of Houston Existing Building Code* as adopted and amended by this *jurisdiction*.		**EXISTING BUILDING CODE.** The *City of Houston Existing Building Code* as adopted and amended by this *jurisdiction*.	No change to Houston amendment.

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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*.			Removed Houston amendment.
	[RB] EXPANSIVE SOILS. Soils that exhibit volumetric increase or decrease (swelling or shrinking) in response to partial or full wetting or drying under load.		New base code definition.
	[RE~~B~~] EXTERIOR WALL. ~~An above-*grade* wall that defines the exterior boundaries of a building. Includes between-floor spandrels, peripheral edges of floors, roof and *basement* knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and *basement walls* with an average below-*grade* wall area that is less than 50 percent of the total opaque and nonopaque area of that enclosing side.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] FENESTRATION. ~~Skylights, roof windows, vertical windows (whether fixed or moveable); opaque doors; glazed doors; glass block; and combination opaque and glazed doors. For definition applicable in Chapter 11, see Section N1101.6.~~ Products classified as either vertical fenestration or skylights and sloped glazing, installed in such a manner as to preserve the weather-resistant barrier of the wall or roof in which they are installed. Fenestration includes products with glass or other transparent or transluscent materials. For the definition applicable in Chapter 11, see Section N1101.6. **Skylights.** For the definition applicable in Chapter 11, see Section N1101.6. **Vertical fenestration.** For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] FENESTRATION, VERTICAL. Windows that are fixed or movable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors installed in a wall at less than 15 degrees from vertical. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RE] FENESTRATION PRODUCT, SITE-BUILT. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RB] FIRE-RETARDANT-TREATED WOOD. ~~Pressure-treated lumber and plywood that~~ Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface burning characteristics and resist propagation of fire. **Other means during manufacture.** A process where the wood raw material is treated with a fire-retardant formulation while undergoing creation as a finished product.		Minor updates to definition for clarity.

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	Pressure process. A process for treating wood using an initial vacuum followed by the introduction of pressure above atmospheric.		
	[RB] FIRE SEPARATION DISTANCE. The distance measured from the building face to one of the following: 1. To the closest interior *lot line*. 2. To the centerline of a street, an alley or public way. 3. To an imaginary line between two buildings on the *lot*. 4. The distance shall be measured at a right angle from the face of the wall.		New base code definition.
FIRE CODE. The *City of Houston Fire Code*, as adopted and amended by this *jurisdiction*.		**FIRE CODE.** The *City of Houston Fire Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
FIRE CODE OFFICIAL. The fire marshal or a duly authorized representative charged with the administration and enforcement of the *Fire Code*.		**FIRE CODE OFFICIAL.** The fire marshal or a duly authorized representative charged with the administration and enforcement of the *Fire Code*.	No change to Houston amendment.
	[MP] FIXTURE FITTING. **Supply fitting.** A fitting that controls the volume or directional flow or both of water and that is either attached to or access~~ible~~**d** from a fixture or is used with an open or atmospheric discharge. **Waste fitting.** A combination of components that conveys the sanitary waste from the outlet of a fixture to the connection of the sanitary drainage system.		Minor updates for clarity.
	[RB] FUEL CELL POWER SYSTEM, STATIONARY. A stationary energy generation system that converts the chemical energy of a fuel and oxidant to electric energy (DC or AC electricity) by an electrochemical process. **Field-fabricated fuel cell power system.** A *stationary fuel cell power system* that is assembled at the job site and is not a preengineered or prepackaged factory-assembled fuel cell power system. **Preengineered fuel cell power system.** A *stationary fuel cell power system* consisting of components and modules that are produced in a factory, and shipped to the job site for assembly. **Prepackaged fuel cell power system.** A *stationary fuel cell power system* that is factory assembled as a single, complete unit and shipped as a complete unit for installation at the job site.		New base code definition.

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	[MP] FULL-OPEN VALVE. A water control or shutoff component in the water supply system piping that, where adjusted for maximum flow, the flow path through the component's closure member is not a restriction in the component's through-flow area.		New base code definition.
	[RB] GLASS MAT GYPSUM PANEL. A gypsum panel consisting of a noncombustible core primarily of gypsum, surfaced with glass mat partially or completely embedded in the core.		New base code definition.
	[RB] ~~**GRADE FLOOR OPENING.**~~**GRADE FLOOR EMERGENCY ESCAPE AND RESCUE OPENING.** ~~A window or other~~An emergency escape and rescue opening located such that the ~~sill height~~ bottom of the clear opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening. (See also "***Emergency escape and rescue opening***.")		Minor updates to definition for clarity.
	[MP] GRADE, PIPING. See "Slope."		New base code definition.
GRAY WATER. Untreated waste water that has not come into contact with toilet waste. *Gray water* includes ~~Waste~~ waste water discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.		**GRAYWATER.** Untreated waste water that has not come into contact with toilet waste. *Gray water* includes ~~Waste~~ waste water discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.	No change to Houston amendment.
	[RB] GYPSUM SHEATHING. Gypsum panel products specifically manufactured with enhanced water resistance for use as a substrate for exterior surface materials.		New base code definition.
	[RB] GYPSUM WALLBOARD. A gypsum board used primarily as interior surfacing for building structures.		New base code definition.
	~~**[RE] HEATING DEGREE DAYS (HDD).** The sum, on an annual basis, of the difference between 65°F (18°C) and the mean temperature for each day as determined from "NOAA Annual Degree Days to Selected Bases Derived from the 1960-1990 Normals" or other weather data sources acceptable to the code official.~~ **[RE] HEATED SLAB.** For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] ~~**HIGH-EFFICACY LAMPS.**~~ **HIGH-EFFICACY LIGHT SOURCES.** ~~**See Section N1101.6**~~ ~~F~~for the definition applicable in Chapter 11**, see Section N1101.6.**		Minor updates to definition for clarity.

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	[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.~~ A building or structure that is one or more of the following: 1. Listed, or certified as eligible for listing, by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places in the National Register of Historic Places. 2. Designated as historic under an applicable state or local law. 3. Certified as a contributing resource within a National Register-listed, or a state-designated or locally designated historic district. For the definition applicable in Chapter 11, see Section N1101.6.		Updates to definition for clarity.
	[MP] HOT WATER. Water at a temperature greater than 120ºF (49ºC) ~~or equal to 110°F (43°C)~~.		Updates to hot water temperature limit.
	[RB] IMPACT PROTECTIVE SYSTEM. Construction that has been shown by testing to withstand the impact of test missiles and that is applied, attached, or locked over exterior glazing.		New base code definition.
	[RE] INFILTRATION. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RB] 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. For the definition applicable in Chapter 11, see Section N1101.6.		Updates to definition for clarity.
	[RE~~B~~] INSULATING SHEATHING. ~~An insulating board~~ A rigid panel or board insulation material having a thermal resistance of not less than R-2 of the core material with properties suitable for use on walls, floors, roofs or foundations. For the definition applicable in Chapter 11, see Section N1101.6.		Updates to definition for clarity.
	[RB] INTERMODAL SHIPPING CONTAINER. A six-sided steel unit originally constructed as a general cargo container used for the transport of goods and materials.		New base code definition.
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*.		**INFRASTRUCTURE DESIGN MANUAL.** The design manual with latest revision at the time of permit application that sets forth the standards for infrastructure design and construction as approved by the Office of the City Engineer in Houston Public Works.	No change to Houston amendment.

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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*.		**INTERIOR FLATWORK.** Any flat system of construction, such as a concrete slab, sidewalks, patios, and asphalt drives constructed inside of the property line.	No change to Houston amendment.
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 BUILDING CODE.** The *City of Houston Building Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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 ENERGY CONSERVATION CODE.** The *City* of Houston Residential Energy Conservation Code, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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 EXISTING BUILDING CODE.** The *City of Houston Existing Building Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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 FIRE CODE.** The *City of Houston Fire Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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 FUEL GAS CODE.** The *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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 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*.	No change to Houston amendment.
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 RESIDENTIAL CODE.** The *City of Houston Residential Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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*.		**INTERNATIONAL SWIMMING POOL AND SPA CODE.** The *City of Houston Swimming Pool and Spa Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
	[RB] JURISDICTION. The governmental unit that has adopted this code ~~under due legislative authority~~.		Minor update to definition.

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	[RB] LABELED. *Equipment*, materials or products to which have been affixed a *label*, seal, symbol or other identifying *mark* of a nationally recognized testing laboratory, ~~inspection~~approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of ~~the~~such *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. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] LIGHT-FRAME CONSTRUCTION. ~~A type of c~~Construction ~~with~~whose vertical and horizontal structural elements that are primarily formed by a system of repetitive wood or cold-formed steel framing members.		Minor updates to definition for clarity.
	[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. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] LIVE/WORK UNIT. A *dwelling unit* or sleeping unit in which a significant portion of the space includes a nonresidential use that is operated by the tenant.		New base code definition.
	[MP] LOCKING-TYPE TAMPER-RESISTANT CAP. A cap designed to be unlocked by a specially designed tool or key to prevent removal of the cap by means of hand-loosening or by commonly available tools.		New base code definition.
	[RB] LOT. A measured portion or parcel of land considered as a unit having fixed boundaries.		Minor updates to definition for clarity.
	[RB] LOT LINE. ~~A line dividing one *lot* from another, or from a street or any public place~~ The line that bounds a plot of ground described as a lot in the title to the property.		Minor updates to definition for clarity.
	[RE] LOW-VOLTAGE LIGHTING. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.

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	[RE] MANUAL. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	~~**[RE] MASS WALL.** Masonry or concrete walls having a mass greater than or equal to 30 pounds per square foot (146 kg/m^2), solid wood walls having a mass greater than or equal to 20 pounds per square foot (98 kg/m^2), and any other walls having a heat capacity greater than or equal to 6 Btu/ft^2·°F [123 J/(m^2·K)].~~		Base code definition removed.
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*.		**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*.	No change to Houston amendment.
MECHANICAL CODE. The *City of Houston Mechanical Code*, as adopted and amended by this *jurisdiction*.		**MECHANICAL CODE.** The *City of Houston Mechanical Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
	[RB] NONCOMBUSTIBLE MATERIAL. ~~Materials that pass the test procedure for defining noncombustibility of elementary materials set forth in~~A material that passes **ASTM E136**.		Minor updates to definition for clarity.
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.		**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.	No change to Houston amendment.
	[RE] OPAQUE DOOR. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
PATIO COVER. A structure with open or glazed walls that is used for recreational, outdoor living purposes associated with a dwelling unit.			Removed Houston amendment.
	[RB] PERMIT. An official document or certificate issued by the ~~authority having jurisdiction~~*building official* that authorizes performance of a specified activity.		Minor updates to definition for clarity.

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PLUMBING CODE. The *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*.		**PLUMBING CODE.** The *City of Houston Plumbing Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
	[MP] PRESS-CONNECT JOINT. A permanent mechanical joint incorporating an elastomeric seal or an elastomeric seal and corrosion-resistant grip or bite ring. The joint is made with a pressing tool and jaw or ring approved by the fitting manufacturer.		New base code definition.
	[RE] PROPOSED DESIGN. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
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).		**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).	No change to Houston amendment.
	[MP] PUSH-FIT FITTING. A mechanical fitting that joins pipes or tubes and achieves a seal by mating the pipe or tube into the fitting.		New base code definition.
	~~**[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 ($h \cdot ft^2 \cdot °F/Btu$).~~		Base code definition removed.
	[RE] RATED DESIGN. ~~A description of the proposed *building*, used to determine the energy rating index.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	~~**[RE] READILY ACCESSIBLE.** For the definition applicable in **Chapter 11**, see **Section N1101.6**.~~		Base code definition removed.
	[RB] READY ACCESS (TO). That which enables a device, *appliance* or *equipment* to be directly reached, without requiring the removal or movement of any panel, door or similar obstruction.		New base code definition.
	~~**[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.~~		Base code definition removed.

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[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.	**[RB] REPAIR.** The reconstruction, replacement or renewal of any part of an existing building for the purpose of its maintenance or to correct damage. For the definition applicable in Chapter 11, see Section N1101.6.	**RB] REPAIR.** The reconstruction, replacement or renewal of any part of an existing building for the purpose of its maintenance or to correct damage using like for like materials. ~~For the definition applicable in Chapter 11, see Section N1101.6.~~	Update wording to be in line with base code, no major change to Houston amendment.
	[RB] REROOFING. The process of recovering or replacing an existing roof covering. See "Roof recover." For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] RESIDENTIAL BUILDING. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
RESIDENTIAL CODE. The *City of Houston Residential Code*, as adopted and amended by this *jurisdiction*.		**RESIDENTIAL CODE.** The *City of Houston Residential Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
	[MP] RISER (PLUMBING). A water pipe that extends vertically one full *story* or more to convey water to branches or to a group of fixtures.		New base code definition.
	[RB] RISER (STAIR). The vertical component of a step or stair. ~~**1.** The vertical component of a step or stair.~~ ~~**2.** A water pipe that extends vertically one full *story* or more to convey water to branches or to a group of fixtures.~~		Minor updates to definition for clarity.
	[RB] ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly ~~includes the roof deck, vapor retarder, substrate or thermal barrier, insulation, vapor retarder, and roof covering.~~ ~~*underlayment* and *roof covering*, and can also include a~~ can include an underlayment, thermal barrier, ignition barrier, insulation or a vapor retarder. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] ROOF COATING. A fluid-applied, adhered coating used for roof maintenance or *roof repair*, or as a component of a *roof covering* system or *roof assembly*.		New base code definition.

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	[RB] ROOF RECOVER. The process of installing an additional *roof covering* over ~~a prepared~~ an existing roof covering without removing the existing roof covering. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate and installing a new *roof covering*. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] R-VALUE (THERMAL RESISTANCE). For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RE] SERVICE WATER HEATING. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
SIGN CODE. The *Houston Sign Code*, which is Chapter 46 of the *Building Code* but is published as a separate document.		**SIGN CODE.** The *Houston Sign Code*, which is Chapter 46 of the *Building Code* but is published as a separate document.	No change to Houston amendment.
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*.		**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*.	No change to Houston amendment.
	[RE] SKYLIGHT. ~~See Section N1101.6 for definition applicable in Chapter 11.~~For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RB] SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. ~~Glazing materials in skylights, includingu~~Unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls are included in this definition. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.

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	[RB] SLEEPING UNIT. A single unit that provides rooms or spaces for one or more persons, includes permanent provisions for sleeping and can include provisions for living, eating and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a *dwelling unit* are not sleeping units.		New base code definition.
	[RB] SOLAR ENERGY SYSTEM. A system that converts solar radiation to usable energy, including *photovoltaic panel systems* and *solar thermal systems*.		New base code definition.
	[RE] SOLAR HEAT GAIN COEFFICIENT (SHGC). ~~The solar heat gain through a fenestration or glazing assembly relative to the incident solar radiation (Btu/h · ft² · °F)~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[MP] SOLAR THERMAL COLLECTOR. Components in a *solar thermal system* that collect and convert solar radiation to thermal energy.		New base code definition.
	[MP] SOLAR THERMAL SYSTEM. A system that converts solar radiation to thermal energy for use in heating or cooling.		New base code definition.
		SPECIAL INSPECTOR. A qualified person employed or retained by an *approved agency* registered and certified with the *jurisdiction* and *approved* by the *building official* as having the competence necessary to inspect a particular type of construction requiring *special inspection*.	New Houston amendment to correlate to Houston IBC amendments.
	[RE] STANDARD REFERENCE DESIGN. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[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 attached to a building, porch or deck~~.		Minor updates to definition for clarity.
	[RB] STORM SHELTER. A building, structure or portion thereof, constructed in accordance with **ICC 500** and designated for use during a severe wind storm event, such as a hurricane or tornado.		New base code definition.
	[RB] STRUCTURAL COMPOSITE LUMBER. [Redline Note: Examples of Structural Composite Lumber have been reorganized-No technical changes] Structural members manufactured using wood elements bonded together with exterior adhesives.		Minor updates to definition for clarity.

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Examples of structural composite lumber are:

~~Laminated veneer lumber (LVL). A composite of wood veneer elements with wood fibers primarily oriented along the length of the member, where the veneer element thicknesses are 0.25 inches (6.4 mm) or less.~~

Laminated strand lumber (LSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths are not less than 150 times the least dimension of the wood strand elements.

~~Parallel strand lumber (PSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.25 inch (6.4 mm) or less and their average lengths are not less than 300 times the least dimension of the wood strand elements.~~

Laminated veneer lumber (LVL). A composite of wood veneer elements with wood fibers primarily oriented along the length of the member, where the veneer element thicknesses are 0.25 inch (6.4 mm) or less.

~~Laminated strand lumber (LSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths are not less than 150 times the least dimension of the wood strand elements.~~

Oriented strand lumber (OSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths are not less than 75 times and less than 150 times the least dimension of the wood strand elements.

~~Oriented strand lumber (OSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.10 inch (2.54 mm) or less and their average lengths are not less than 75 times and less than 150 times the least dimension of the wood strand elements.~~

Parallel strand lumber (PSL). A composite of wood strand elements with wood fibers primarily oriented along the length of the member, where the least dimension of the wood strand elements is 0.25 inch (6.4 mm) or less and their average lengths

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	are not less than 300 times the least dimension of the wood strand elements.		
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 predamage 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.		**SUBSTANTIAL DAMAGE.** A condition where one or all 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. 3. The capacity of any structural component carrying snow load, or any group of such components, that supports more than 30 percent of the roof area if similar construction has been reduced more than 20 percent from its pre-damage condition, and the remaining capacity with respect to dead, live, and snow loads is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location.	Added exception to Houston amendment.
	[RB] SUNROOM. 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. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
SWIMMING POOL AND SPA CODE. The *City of Houston Swimming Pool and Spa Code*, as adopted and amended by this *jurisdiction*.		**SWIMMING POOL AND SPA CODE.** The *City of Houston Swimming Pool and Spa Code*, as adopted and amended by this *jurisdiction*.	No change to Houston amendment.
	[RBE] THERMAL ISOLATION. ~~Physical and space conditioning separation from *conditioned space(s)* consisting of existing or new walls, doors or windows. The *conditioned space(s)* shall be controlled as separate zones for heating and cooling or conditioned by separate *equipment*.~~ For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
	[RE] THERMAL RESISTANCE, R-VALUE. ~~The inverse of the time rate of heat flow through a body 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 ($h \cdot ft^2 \cdot °F/Btu$) ($m^2 \cdot K/W$).~~ See "*R*-value."		Minor updates to definition for clarity.

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	[RE] THERMAL TRANSMITTANCE, U-FACTOR. ~~The coefficient 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 unit temperature difference between the warm side and cold side air films (Btu/h · ft^2 · °F) W/(m^2 · K).~~ See "*U*-factor."		Minor updates to definition for clarity.
	~~**[RB] THIRD-PARTY TESTED.** Procedure by which an approved testing laboratory provides documentation that a product material or system conforms to specified requirements.~~		Base code definition removed.
TOWNHOUSE. A multi-family residential structure constructed in a group of three or more attached single-family *dwelling units* ~~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*.	**[RB] TOWNHOUSE.** A *building* that contains three or more attached *townhouse units*. ~~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 not less than two sides.~~	**[RB] TOWNHOUSE.** A building that contains three or more attached *townhouse units*, also considered a multi-family residential structure.	Update wording to be in line with base code, no major change to Houston amendment.
	[RB] TOWNHOUSE UNIT. A single-family *dwelling unit* in a *townhouse* that extends from foundation to roof and that has a *yard* or *public way* on not less than two sides.	**[RB] TOWNHOUSE UNIT.** A single-family *dwelling unit* in a *townhouse* that extends from foundation to roof and that has 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*.	New base code definition, Houston amendment incorporated.
	[RE] *U*-FACTOR~~,~~ (THERMAL TRANSMITTANCE). ~~See Section N1101.6 f~~For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.
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.		**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.	No change to Houston amendment.
	[RB] VAPOR DIFFUSION PORT. ~~A passageway for conveying~~ An assembly constructed or installed within a *roof assembly* at an opening in the *roof deck* to convey water vapor from an unvented *attic* to the outside atmosphere.		New base code definition.
	[RB] VAPOR PERMEABLE. The property of having a moisture vapor permeance rating of 5 perms (2.9 × 10^{-10} kg/Pa × s × m^2) or greater, where tested in accordance with ~~the desiccant method using~~ Procedure A or Procedure B of **ASTM E96**. A vapor permeable material permits the passage of moisture vapor.		Minor updates to definition for clarity.
	[RB] VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space. For the definition applicable in Chapter 11, see Section N1101.6.		Minor updates to definition for clarity.

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	[RE] VENTILATION AIR. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.
	[RB] WINDBORNE DEBRIS REGION. Areas within *hurricane-prone regions* located in accordance with one of the following: 1. Within 1 mile (1.61 km) of the coastal mean high-water line where the ultimate design wind speed, V_{ult}, is 130 mph (58 m/s) or greater. 2. In areas where an Exposure D condition exists upwind at the waterlne and the ultimate design wind speed, V_{ult}, is 140 mph (63 m/s) or greater; or Hawaii. **[RB] WINDER.** A tread with nonparallel edges.		Minor updates to definition for clarity.
	[RE] ZONE. For the definition applicable in Chapter 11, see Section N1101.6.		New base code definition.

2015 Houston IRC Amendments	2021 IRC – Chapter 3 – Building Planning	2021 Houston IRC Amendments	Code Change Summary
	R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1, the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the *International Building Code*. 1. ~~AF&PA~~**AWC** *Wood Frame Construction Manual* (WFCM). 2. AISI *Standard for Cold-Formed Steel Framing-Prescriptive Method for One- and Two-Family Dwellings* (AISI S230). ICC *Standard on the Design and Construction of Log Structures* (ICC 400).		Minor update, no major change.
	R301.1.4 Intermodal shipping containers. Intermodal shipping containers that are repurposed for use as buildings or structures shall be designed in accordance with the structural provisions in Section 3115 of the *International Building Code*.		New section for intermodal container construction.
	R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established by the local *jurisdiction* and set forth in Table R301.2.		Minor update, no major change.

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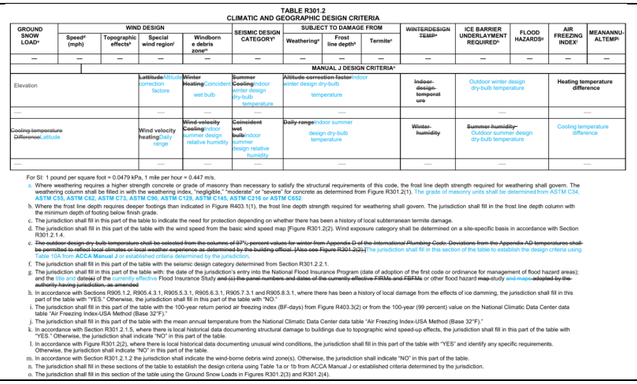

TABLE R301.2
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD[a]	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]	Special wind region[l]	Windborne debris zone[m]		Weathering[a]	Frost line depth[b]	Termite[c]					
—	—	—	—	—	—	—	—	—	—	—	—	—	—

MANUAL J DESIGN CRITERIA[n]							
Elevation	Latitude/Altitude correction factor	Winter Heating Coincident wet bulb	Summer Cooling Indoor winter design dry-bulb temperature	Altitude correction factor Indoor winter design dry-bulb temperature	Indoor design temperature	Outdoor winter design dry-bulb temperature	Heating temperature difference
—	—	—	—	—	—	—	—
Cooling temperature Difference/ Latitude	Wind velocity heating/Daily range	Wind velocity Cooling/Indoor summer design relative humidity	Coincident wet bulb Indoor summer design relative humidity	Daily range Indoor summer design dry-bulb temperature	Winter humidity	Summer humidity Outdoor summer design dry-bulb temperature	Cooling temperature difference
—	—	—	—	—	—	—	—

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

a. Where weathering requires a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code, the frost line depth strength required for weathering shall govern. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(1). The grade of masonry units shall be determined from ASTM C34, ASTM C55, ASTM C62, ASTM C73, ASTM C90, ASTM C129, ASTM C145, ASTM C216 or ASTM C652.

b. Where the frost line depth requires deeper footings than indicated in Figure R403.1(1), the frost line depth strength required for weathering shall govern. 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(2)]. 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 AD temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official. (Also see Figure R301.2(5).)~~ The jurisdiction shall fill in this section of the table to establish the design criteria using Table 1OA from **ACCA Manual J** or established criteria determined by the jurisdiction.

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: 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); and the ~~title and~~ date(s) of the currently effective Flood Insurance Study ~~and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs~~ or other flood hazard map study and maps ~~adopted by the authority having jurisdiction, as amended~~.

h. In accordance with Sections R905.1.2, 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)."

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)."

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.

l. In accordance with Figure R301.2(2), 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 the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

n. The jurisdiction shall fill in these sections of the table to establish the design criteria using Table 1a or 1b from ACCA Manual J or established criteria determined by the jurisdiction.

o. The jurisdiction shall fill in this section of the table using the Ground Snow Loads in Figures R301.2(3) and R301.2(4).

Updates to climate and geographical 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]	MEAN ANNUAL TEMP[j]
	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 Footnote n	NO	NO	Zone 1 or 2[n]	A	Negligible	6 inches	Very heavy	28	NO	Reference Ch. 19 of City Code	<1500	68.2

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.**}**

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.

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

No change to Houston amendment.

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]	Special wind region[l]	Wind-borne debris zone[m]		Weathering[a]	Frost line depth[b]	Termite[c]					
0	See Footnote n	NO	NO	Zone 1 or 2[n]	A	Negligible	6 inches	Very heavy	28	NO	Reference Ch. 19 of City Code	<1500	68.2

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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://asce7hazardtool.online. Buildings shall be considered Risk Category II. A copy of the windspeed printout from the website shall be attached to the plans for verification.

GROUND SNOW LOAD°	WIND DESIGN				SEISMIC DESIGN CATEGORYf	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMPe	ICE BARRIER UNDERLAYMENT REQUIREDh	FLOOD HAZARD Sg	AIR FREEZING INDEXi	MEAN ANNUAL TEMPj
	Speed (mph)	Topographic effectsk	Special wind regionl	Wind-borne debris zonem		Weatheringa	Frost line depthb	Termitec					
—	—	—	—	—	—	—	—	—	—	—	—	—	—

MANUAL J DESIGN CRITERIA[n]							
Elevation	Latitude	Winter heating	Summer cooling	Altitude correction factor	Indoor design tenpratur e	Design temperatu re cooling	Heating temperatu re difference
—	—	—	—	—	—	—	—
Cooling temperatu re difference	Wind velocity heating	Wind velocity cooling	Coincident wet bulb	Daily range	Winter humidity	Summer humidity	—
—	—	—	—	—	—	—	—

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

a. ~~Weathering may require~~ **Where weathering requires** a higher strength concrete or *grade* of masonry than necessary to satisfy the structural requirements of this ~~code~~ **code, the frost line depth strength required for weathering shall govern.** The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(~~3~~4). 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~~ **C34, C55, C62, C73, C90, C129, C145, C216** or ~~C 652~~. **C652.**

b. **Where** ~~1~~The frost line depth ~~may~~ require**s** deeper footings than indicated in Figure R403.1(1), **the frost line depth strength required for weathering shall govern.** The *jurisdiction* shall fill in the frost line depth column with the minimum depth of footing below finish *grade*.

	R301.2.1 Wind design criteria. Buildings and portions thereof shall be constructed in accordance with the wind provisions of this code using the ultimate design wind speed in **Table R301.2** as determined from **Figure R301.2(2)**. The structural provisions of this code for wind loads are not permitted where wind design is required as specified in **Section R301.2.1.1**. Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where not otherwise specified, the wind loads listed in **Table R301.2.1(1)** adjusted		Minor updates to certain roof wind design criteria.

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	for height and exposure using **Table R301.2.1(2)** shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with **Section R905.2.4**. *Metal roof shingles* shall be designed for wind speeds in accordance with **Section R905.4.4**. A continuous load path shall be provided to transmit the applicable uplift forces in **Section R802.11** from the *roof assembly* to the foundation. Where ultimate design wind speeds in **Figure R301.2(2)** are less than the lowest wind speed indicated in the prescriptive provisions of this code, the lowest wind speed indicated in the prescriptive provisions of this 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.	**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 R301.2.1.1**, or where the ultimate design wind speed, V_{ult}, in **Figure R301.2(2)** equals or exceeds 140 miles per hour (225 kph) in a special wind region. **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 R301.2.1.1** or where the ultimate design wind speed, V_{ult}, in **Figure R301.2(2)** equals or exceeds 140 miles per hour (225 kph) in a special wind region, the design of buildings for wind loads shall be in accordance with one or more of the following methods: 1. AWC *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. The elements of design not addressed by the methods in Items 1 through 5 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	**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 R301.2.1.1, or where the ultimate design wind speed, V_{ult}, in Figure R301.2(2) equals or exceeds 140 miles per hour (225 kph) in a special wind region. **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 R301.2.1.1 or where the ultimate design wind speed, V_{ult}, in Figure R301.2(2) equals or exceeds 140 miles per hour (225 kph) in a special wind region, the design of buildings for wind loads shall be in accordance with one or more of the following methods: 1. AWC *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.	Update wording to be in line with base code, no major change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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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.	exposure category requirements as specified in **ASCE 7** and the International Building Code shall be used.	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.	
	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 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~~ on 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~~ 1 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 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. 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. 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). This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the unobstructed area. Exposure D extends downwind from the edge of the unobstructed area a distance of 600 feet (183 m) or 20 times the height of the building or structure, whichever is greater.		Minor wordsmithing changes.

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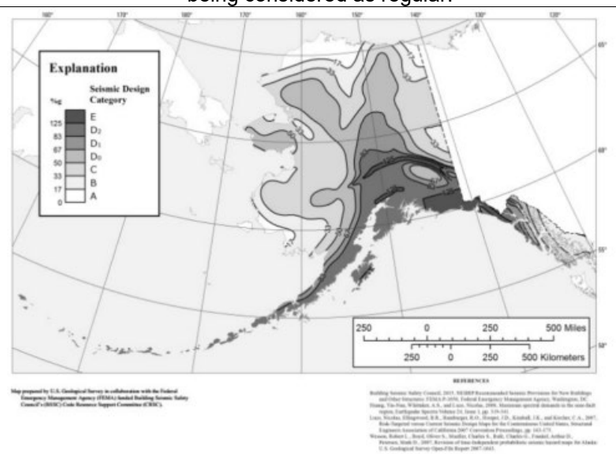
	R301.2.2 Seismic provisions. Buildings in Seismic Design Categories C, D0, D1, and D2 shall be constructed in accordance with the requirements of this section and other seismic requirements of this code. The seismic provisions of this code shall apply as follows: 1. *Townhouses* in Seismic Design Categories C, D0, D1 and D2. 2. Detached one- and two-family *dwellings* in Seismic Design Categories, D0, D1 and D2. Buildings in Seismic Design Category E shall be designed to resist seismic loads in accordance with the *International Building Code,* except where the seismic design category is reclassified to a lower seismic design category in accordance with Section R301.2.2.1. Components of buildings not required to be designed to resist seismic loads shall be constructed in accordance with the provisions of this code.		Updated seismic provisions.
	R301.2.2.1 Determination of seismic design category. Buildings shall be assigned a seismic design category in accordance with **Figures R301.2.2.1(1)** through **R301.2.2.1(6)**.		Base code renumbering.
	R301.2.2.1.1 Alternate determination of seismic design category. The seismic design categories and corresponding short-period design spectral response accelerations, *S* **,**shown in Figure R301.2(2) are based on soil Site *DS* Class D, used as an assumed default, as defined in Section 1613.3.2 of the *International Building Code*. If soil conditions are ~~other than~~ determined by the building official to be Site Class A, B, or D, the seismic design category and short-period design spectral response accelerations, *Sds*, for a site ~~can~~ shall be allowed to be determined in accordance with Figure R301.2(3), or Section 1613.3~~2~~2 of the *International Building Code*. The value of *S* determined in accordance with Section 1613.3~~2~~2 of the *International Building Code* is permitted to be used to set the seismic design category in accordance with Table R301.2.2.1.1, and to interpolate between values in Tables R602.10.3(3), R603.9.2(1) and other seismic design requirements of this code.		Minor updates to seismic requirements.
	R301.2.2.1.2 Alternative determination of Seismic Design Category E. Buildings located in Seismic Design Category E in accordance with Figure R301.2(2), or Figure R301.2(3) where applicable, are permitted to be reclassified as being in Seismic Design Category D2 provided that one of the following is done: 1. A more detailed evaluation of the seismic design category is made in accordance with the provisions and maps of the *International Building Code*. Buildings located in Seismic Design		Minor updates to seismic requirements.

	Category E in accordance with Table R301.2.2.1.1, but located in Seismic Design Category D in accordance with the *International Building Code*, shall be permitted to be designed using the Seismic Design Category D2 requirements of this code. 2. Buildings located in Seismic Design Category E that conform to the following additional restrictions are permitted to be constructed in accordance with the provisions for Seismic Design Category D2 of this code: 2.1. All exterior shear wall lines or *braced wall panels* are in one plane vertically from the foundation to the uppermost *story*. 2.2. Floors shall not cantilever past the *exterior walls*. 2.3. The building is within the requirements of Section R301.2.2.2.~~5~~**6** for being considered as regular.		
	 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1(1)** through **301.2.2.1(6)** are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the *International Building Code*. ~~**FIGURE R301.2(2)**~~**FIGURE R301.2.2.1(1)** **SEISMIC DESIGN CATEGORIES—ALASKA**[a]		Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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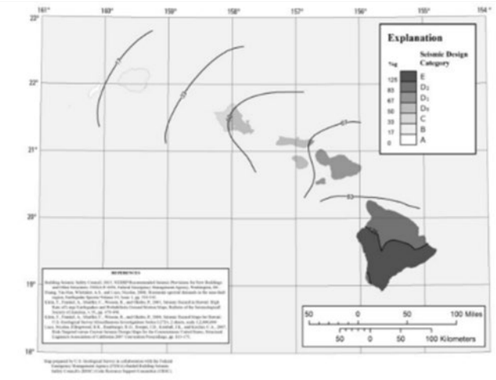
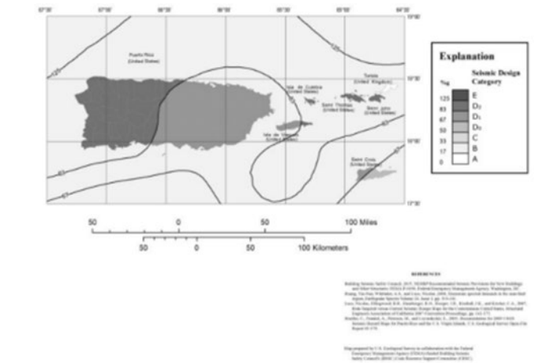
	 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1(1)** through **301.2.2.1(6)** are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the *International Building Code*. **FIGURE R301.2.2.1(2)** **SEISMIC DESIGN CATEGORIES—HAWAII[a]**		Minor updates to seismic requirements.
	 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1(1)** through **301.2.2.1(6)** are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the *International Building Code*. **FIGURE R301.2.2.1(3)** **SEISMIC DESIGN CATEGORIES—PUERTO RICO[a]**		Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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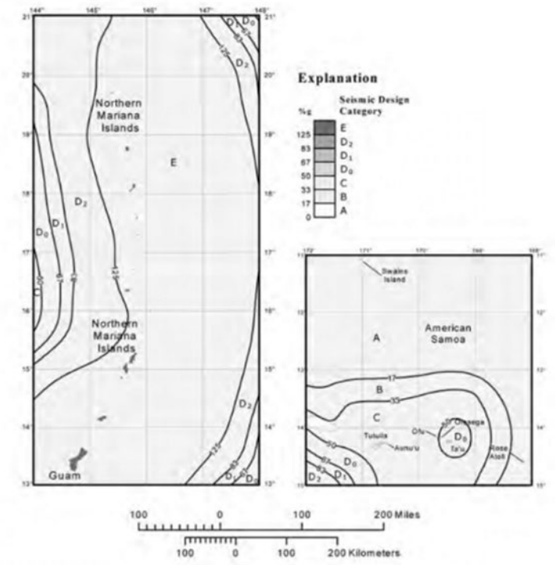

a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1(1)** through **301.2.2.1(6)** are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the *International Building Code*.

FIGURE R301.2.2.1(4)
SEISMIC DESIGN CATEGORIES—NORTHERN MARIANA ISLANDS AND

Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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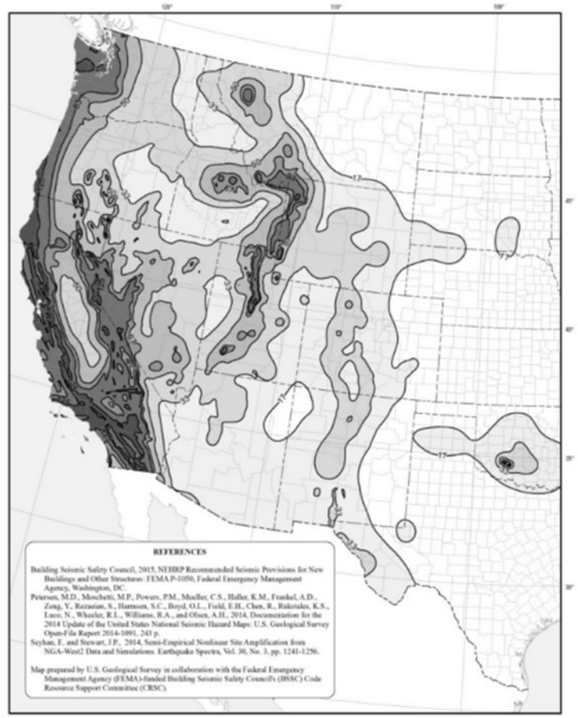
	AMERICAN SAMOA[a]  a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1(1)** through **301.2.2.1(6)** are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the *International Building Code*. **FIGURE R301.2.2.1(5)** **SEISMIC DESIGN CATEGORIES—UNITED STATES[a]**		Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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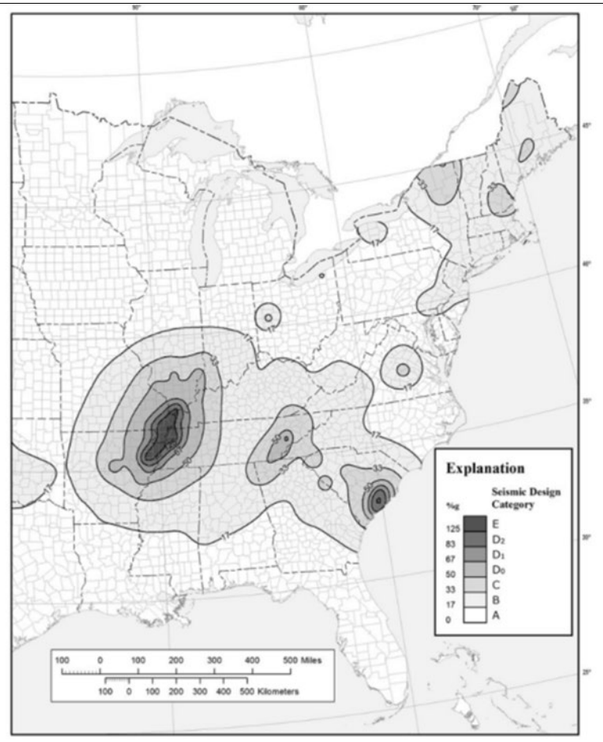
<td> 

a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in Figures R301.2.2.1(1) through 301.2.2.1(6), are based on soil Site Class D, used as an assumed default, as defined in Section 1613.2.2 of the International Building Code.
FIGURE R301.2.2.1(6)
SEISMIC DESIGN CATEGORIES—UNITED STATES[a]</td>
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<td>Minor updates to seismic requirements.</td>
</tr>
<tr>
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<td>R301.2.2.1.1 Alternate determination of seismic design category. ~~Theseismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in Figure R301.2(2), are based on soil SiteClass D, used as an assumed default, as defined in Section 1613.2.2 of the International Building Code.~~ If soil conditions are determined by the building official to be Site Class A, B, or D, the seismic design category and short-period design spectral response accelerations, S_{DS}, for a site shall be allowed to be determined in accordance with Figures R301.2.2.1.1(1) throughR301.2.2.1.1(6), or Section 1613.2 of the International Building Code. The value of S_{DS} determined in accordance with Section 1613.2 of the International Building Code is permitted to be used to set the seismic design category in accordance with Table R301.2.2.1.1, and to interpolate between values</td>
<td></td>
<td>Minor updates to seismic requirements and wordsmithing.</td>
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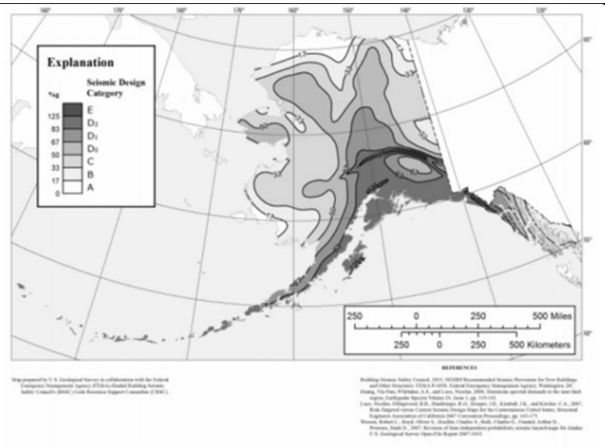
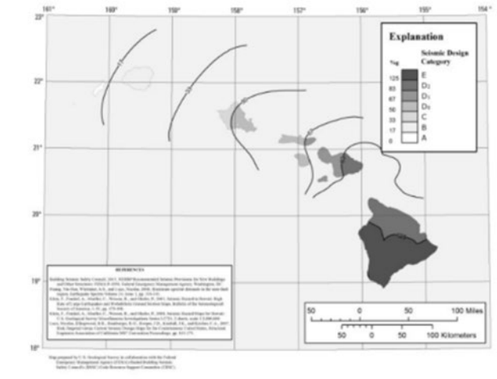
	in **Tables R602.10.3(3)** and **R603.9.2(1)** and other seismic design requirements of this code.		
	 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D. ~~**FIGURE R301.2(3)**~~**FIGURE R301.2.2.1.1(1)** **ALTERNATE SEISMIC DESIGN CATEGORIES~~—ALASKA~~[a]**		Minor updates to seismic requirements.
	 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D. **FIGURE R301.2.2.1.1(2)** **ALTERNATE SEISMIC DESIGN CATEGORIES—HAWAII[a]**		Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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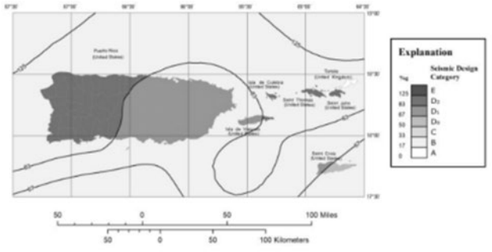

a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D.

FIGURE R301.2.2.1.1(3)
ALTERNATE SEISMIC DESIGN CATEGORIES—PUERTO RICO[a]

Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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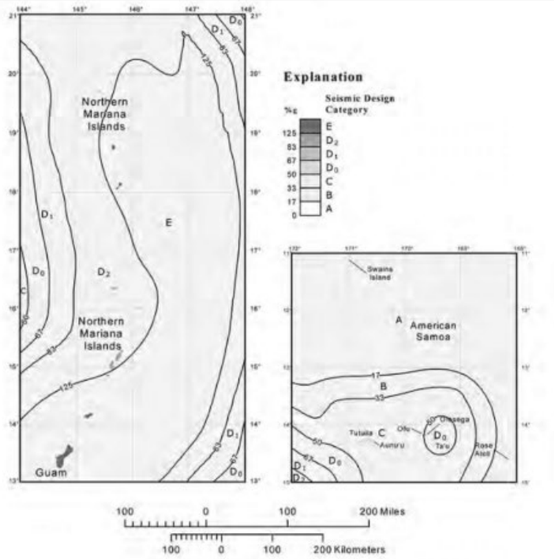

a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D.

FIGURE R301.2.2.1.1(4)
ALTERNATE SEISMIC DESIGN CATEGORIES—NORTHERN MARIANA ISLANDS AND AMERICAN SAMOA[a]

Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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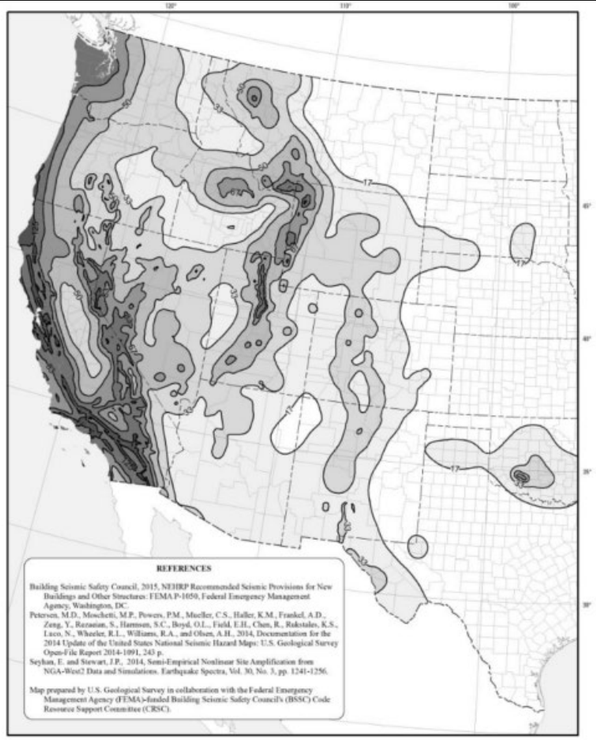

a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D.

FIGURE R301.2.2.1.1(5)
ALTERNATE SEISMIC DESIGN CATEGORIES—UNITED STATES[a]

Minor updates to seismic requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	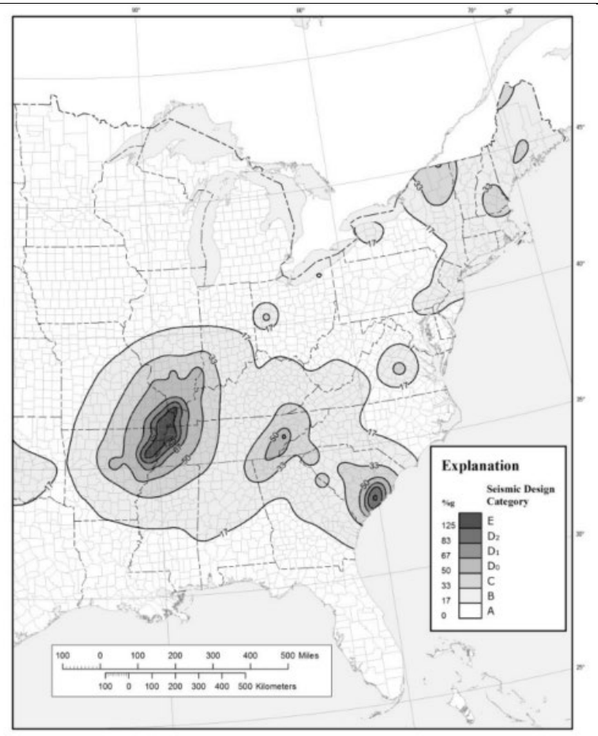 a. The seismic design categories and corresponding short-period design spectral response accelerations, S_{DS}, shown in **Figures R301.2.2.1.1(1)** through **301.2.2.1.1(6)** are permitted to be used where soil conditions are determined by the building official to be Site Class A, B or D. **FIGURE R301.2.2.1.1(6)** **ALTERNATE SEISMIC DESIGN CATEGORIES—UNITED STATES[a]**		Minor updates to seismic requirements.
	~~**R301.2.2.2 Seismic Design Category C.** Structures assigned to Seismic Design Category C shall conform to the requirements of this section.~~		Base code section removed.
	~~R301.2.2.2.1~~ **R301.2.2.2 Weights of materials.**		Base code renumbering.
	~~**R301.2.2.2.2**~~ **R301.2.2.3 Stone and masonry veneer.**		Base code renumbering.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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	~~**R301.2.2.2.3**~~ **R301.2.2.4 Masonry construction.** Masonry construction in Seismic Design Categories D0 and D1 shall comply with the requirements of Section R606.12.1. Masonry construction in Seismic Design Category D_2 shall comply with the requirements of Section R606.12.4.		Base code renumbering and updates to seismic requirements.
	R301.2.2.5 Concrete construction. Buildings with exterior above-grade concrete walls shall comply with PCA 100 or shall be designed in accordance with ACI 318. ~~**R301.2.2.2.4 Concrete construction.**~~ **Exception:** Detached one- and two-family *dwellings* in Seismic Design Category C with exterior above-*grade* concrete walls ~~shall~~ are allowed to comply with the requirements of Section R608~~, PCA 100 or shall be designed in accordance with ACI 318. Townhouses with above-grade exterior concrete walls shall comply with the requirements of PCA 100 or shall be designed in accordance with ACI 318~~.		Updates to seismic requirements.
	~~**R301.2.2.2.5**~~ **R301.2.2.6 Irregular buildings.** The seismic provisions of this code shall not be used for ~~irregular~~ structures or portions thereof, located in Seismic Design Categories C, D0, D1 and D2 ~~considered to be irregular~~ in accordance with this section. A building or portion of a building shall be considered to be irregular where one or more of the conditions defined in Items 1 through ~~7~~8 occur. Irregular structures, or irregular portions of structures shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system. Where the forces associated with the irregularity are resisted by a structural system designed in accordance with accepted engineering practice, ~~design of~~ the remainder of the building shall be permitted to be designed using the provisions of this code. ~~A building or portion of a building shall be considered to be irregular where one or more of the following conditions occur:~~ 1. ~~Where~~Shear wall or braced wall offsets out of plane. Conditions where exterior shear wall lines or *braced wall panels* are not in one plane vertically from the foundation to the uppermost *story* in which they are required. Exception: For wood light-frame construction, floors with cantilevers or setbacks not exceeding four times the nominal depth of the wood floor joists are permitted to support *braced wall panels* that are out of plane with *braced wall panels* below provided ~~that:~~ that all of the following are satisfied: 1. Floor joists are nominal 2 inches by 10 inches (51 mm by 254 mm) or larger and spaced not more than 16 inches (406 mm) on center. 2. The ratio of the back span to the cantilever is not less than 2 to 1.		Base code renumbering and updates to seismic requirements.

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3. Floor joists at ends of *braced wall panels* are doubled.
4. For wood-frame construction, a continuous rim joist is connected to ends of cantilever joists. ~~When~~ Where spliced, the rim joists shall be spliced using a galvanized metal tie not less than 0.058 inch (1.5 mm) (16 gage) and 1 1/2 inches (38 mm) wide fastened with six 16d nails on each side of the splice; or a block of the same size as the rim joist and of sufficient length to fit securely between the joist space at which the splice occurs, fastened with eight 16d nails on each side of the splice~~; and~~.
5. Gravity loads carried at the end of cantilevered joists are limited to uniform wall and roof loads and the reactions from headers having a span of 8 feet (2438 mm) or less.

2. ~~Where~~Lateral support of roofs and floors. Conditions where a section of floor or roof is not laterally supported by shear walls or *braced wall lines* on all edges.

Exception: Portions of floors that do not support shear ~~walls or~~ walls, *braced wall panels* above, or roofs~~,~~ shall be permitted to extend not more than 6 feet (1829 mm) beyond a shear wall or *braced wall line*.

3. ~~Where~~ Shear wall or braced wall offsets in plane. Conditions where the end of a *braced wall panel* occurs over an opening in the wall below and ~~ends at a horizontal distance greater~~ extends more than 1 foot (305 mm) ~~from~~ horizontally past the edge of the opening. This provision is applicable to shear walls and *braced wall panels* offset in plane and to *braced wall panels* offset out of plane ~~as permitted by~~ in accordance with the exception to Item 1.

Exception: For wood light-frame wall construction, one end of a *braced wall panel* shall be permitted to extend more than 1 foot (305 mm) over an opening not more than 8 feet (2438 mm) in width in the wall below provided that the opening includes a header in accordance with all of the following:

1. The building width, loading condition and framing member species limitations of Table R602.7(1) shall ~~apply; and~~ apply.
2. ~~Not less than one 2 × 12 or two 2 × 10 for an opening not more than 4 feet (1219 mm) wide; or~~The header is composed of:

~~3.~~2.1. Not less than ~~two~~ one 2 × 12 or ~~three~~ two 2 × 10 for an opening not more than ~~6~~ 4 feet ~~(1829~~ (1219 mm) ~~in width; or~~ wide.

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~~4.~~2.2. Not less than ~~three~~ two 2 × 12 or ~~four~~ three 2 × 10 for an opening not more than ~~8~~ 6 feet (~~2438~~ (1829 mm) in ~~width; and~~ width.

~~5. The entire length of the braced wall panel does not occur over~~ 2.3. Not less than three 2 × 12 or four 2 × 10 for an opening not more than 8 feet (2438 mm) in ~~the wall below.~~ width.

~~4. Where~~ 3. The entire length of the braced wall panel does not occur over an opening in ~~a floor or roof exceeds the lesser of 12 feet (3658 mm) or 50 percent of~~ the ~~least floor or roof dimension.~~ wall below.

~~5. Where portions of~~ 4. Floor and roof opening. Conditions where an opening in a floor ~~level are vertically offset.~~ or roof exceeds the lesser of 12 feet (3658 mm) or 50 percent of the least floor or roof dimension.

5. Floor level offset. Conditions where portions of a floor level are vertically offset.

Exceptions:

1. Framing supported directly by continuous foundations at the perimeter of the building.
2. For wood light-frame construction, floors shall be permitted to be vertically offset ~~when~~ where the floor framing is lapped or tied together as required by Section R502.6.1.

6. Perpendicular shear wall and wall bracing. Conditions ~~W~~where shear walls and *braced wall* lines do not occur in two perpendicular directions.

7. Wall bracing in stories containing masonry or concrete construction. Conditions ~~W~~where stories above *grade plane* partially or completely braced by wood wall framing in accordance with Section R602 or cold-formed steel wall framing in accordance with Section R603 include masonry or concrete construction. Where this irregularity applies, the entire *story* shall be designed in accordance with accepted engineering practice. Exception: Fireplaces, chimneys and masonry veneer ~~as permitted~~ by in accordance with this code.

8. Hillside *light-frame construction*. Conditions in which all of the following apply:

8.1. The grade slope exceeds 1 unit vertical in 5 units horizontal where averaged across the full length of any side of the dwelling.

8.2. The tallest cripple wall clear height exceeds 7 feet (2134 mm), or where a post and beam system occurs at the dwelling perimeter, the post and beam system tallest post clear height exceeds 7 feet (2134 mm).

8.3. Of the total plan area below the lowest framed floor, whether open or enclosed, less than

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	50 percent is living space having interior wall finishes conforming to Section R702. Where Item 8 is applicable, design in accordance with accepted engineering practice shall be provided for the floor immediately above the cripple walls or post and beam system and all structural elements and connections from this diaphragm down to and including connections to the foundation and design of the foundation to transfer lateral loads from the framing above. Exception: Light-frame construction in which the lowest framed floor is supported directly on concrete or masonry walls over the full length of all sides except the downhill side of the dwelling need not be considered an irregular dwelling under Item 8.		
	~~**R301.2.2.3 Seismic Design Categories D , D** and D . Structures assigned to Seismic Design Categories D , D and D shall conform to the requirements for Seismic Design Category C and the additional requirements of this section.~~		Base code section removed.
	~~**R301.2.2.3.1**~~ **R301.2.2.7 Height limitations.** Wood-framed buildings shall be limited to three *stories* above *grade plane* or the limits given in **Table R602.10.3(3)**. Wood-framed buildings in Seismic Design Category D_2 exceeding two *stories* shall be designed for wind and seismic loads in accordance with accepted engineering practice. Coldformed steel-framed buildings shall be limited to less than or equal to three *stories* above *grade plane* in accordance with **AISI S230**. *Mezzanines* as defined in **Section R202** that comply with **Section R325** shall not be considered as *stories*. *Structural insulated panel* buildings shall be limited to two *stories* above *grade plane*.		Base code renumbering and updates to seismic requirements.
	~~**R301.2.2.3.3 Masonry construction.** Masonry construction in Seismic Design Categories D and D shall comply with the requirements of Section R606.12.1. Masonry construction in Seismic Design Category D shall comply with the requirements of Section 606.12.4.~~		Base code section removed.
	~~**R301.2.2.3.4 Concrete construction.** Buildings with exterior above-grade concrete walls shall comply with PCA 100 or shall be designed in accordance with ACI 318.~~		Base code section removed.
	~~R301.2.2.3.5~~ **R301.2.2.8 Cold-formed steel framing in Seismic Design Categories D0 D1 and D2.**		Base code renumbering.

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	~~R301.2.2.3.6~~ **R301.2.2.9 Masonry chimneys.** ~~Masonry~~ In Seismic Design Categories D0, D1 and D2, masonry chimneys shall be reinforced and anchored to the building in accordance with Sections R1003.3 and R1003.4.		Base code renumbering and updates to seismic requirements.
	~~R301.2.2.3.7~~ **R301.2.2.10 Anchorage of water heaters.** ~~Water~~ **In Seismic Design Categories D0, D1 and D2,** and in *townhouses* in Seismic Design Category C, water heaters and thermal storage units shall be anchored against movement and overturning in accordance with **Section M1307.2** or **P2801.8**.		Base code renumbering and updates to seismic requirements.
	~~**R301.2.2.4 Seismic Design Category E.** Buildings in Seismic Design Category E shall be designed to resist seismic loads in accordance with the International Building Code, except where the seismic design category is reclassified to a lower seismic design category in accordance with Section R301.2.2.1. Components of buildings not required to be designed to resist seismic loads shall be constructed in accordance with the provisions of this code.~~		Base code section removed.
	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~~ repair 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.		Minor wordsmithing change.
	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 (3531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5). **Exception:** A *story height* not exceeding 13 feet 7 inches (4140 mm) is permitted provided that the maximum wall stud clear height does not exceed 12 feet (3658 mm), the wall studs are in accordance with Exception 2 or 3 of Section R602.3.1 or an engineered design is provided for the wall framing members, and wall bracing for the building is in accordance with **Section R602.10**. Studs shall be laterally supported at the top and bottom plate in accordance with **Section R602.3**. 2. For cold-formed steel wall framing, the *story height* shall be not more than 11 feet 7 inches (3531 mm) and the unsupported bearing wall stud height shall be not more than 10 feet (3048 mm).		New exception and minor changes to story height wind and seismic requirements.

	3. For masonry walls, the *story height* shall be not more than 13 feet 7 inches (4140 mm) and the bearing wall clear height shall be not ~~greater~~ more than 12 feet (3658 mm). **Exception:** An additional 8 feet (2438 mm) of bearing wall clear height is permitted for gable end walls. 4. For insulating concrete form walls, the maximum story height shall not exceed 11 feet 7 inches (3531 mm) and the maximum unsupported wall height per *story* as permitted by Section R608 tables shall not exceed 10 feet (3048 mm). 5. For structural insulated panel (SIP) walls, the story height shall be not ~~greater~~ more than 11 feet 7 inches (3531 mm) and the bearing wall height per *story* as permitted by Section R610 tables shall not exceed 10 feet (3048 mm). For walls other than wood-framed walls, individual ~~Individual~~ walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 ~~provisions~~, provided the *story heights* of this section are not exceeded. An engineered design shall be provided for the wall or wall framing members 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*.		

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TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	UNIFORM ~~LIVE~~ LOAD (psf)	CONCENTRATED LOAD (lb)
Uninhabitable attics without storage[b]	10	—
Uninhabitable attics with limited storage[b, g]	20	—
Habitable attics and attics served with fixed stairs	30	—
Balconies (exterior) and decks[e]	40	—
Fire escapes	40	—
Guards ~~and handrails~~[d]	~~200~~[h] —	200[h, i]
Guard in-fill components[f]	~~50~~[h] —	50[h]
Handrail[d]	200[h]	—
Passenger vehicle garages[a]	50[a]	2,000[h]
Areas ~~Rooms~~ other than sleeping areas ~~rooms~~	40	—
Sleeping areas ~~rooms~~	30	—
Stairs	40[c]	300[c]

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2, 1 pound = 4.45 N.

a. Elevated garage floors shall be capable of supporting the uniformly distributed live load or a 2,000-pound ~~load applied over a 20-square-inch area~~concentrated load applied on an area of $4^1/_2$ inches by $4^1/_2$ inches, whichever produces the greater stresses.
b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
c. Individual stair treads shall be ~~designed for~~capable of supporting the uniformly distributed live load or a 300-pound concentrated load ~~acting over~~applied on an area of ~~4 square~~2 inches by 2 inches, whichever produces the greater stresses.
d. A single concentrated load applied in any direction at any point along the top. For a guard not required to serve as a handrail, the load need not be applied to the top element of the guard in a direction parallel to such element.
e. See **Section R507.1** for decks attached to exterior walls.
f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with

New updates to live load table.

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	any other live load requirement. g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met: 1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches. 2. The slopes of the joists or truss bottom chords are not greater than 2~~inches~~ units vertical in 12 units horizontal. 3. Required insulation depth is less than the joist or truss bottom chord member depth. The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot. h. Glazing used in handrail assemblies and guards shall be designed with a ~~safety~~load adjustment factor of 4. The ~~safety~~load adjustment factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load. i. Where the top of a guard system is not required to serve as a handrail, the single concentrated load shall be applied at any point along the top, in the vertical downward direction and in the horizontal direction away from the walking surface. Where the top of a guard is also serving as the handrail, a single concentrated load shall be applied in any direction at any point along the top. Concentrated loads shall not be applied concurrently.		
	R301.6 Roof load. The roof shall be designed for the *live load* indicated in **Table R301.6** or the ground snow load indicated in **Table R301.2**, whichever is greater.		Minor change for clarity.

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<table>
<tr>
<td></td>
<td>
TABLE R301.7
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS[b, c]
<table>
<tr><th>STRUCTURAL MEMBER</th><th>ALLOWABLE DEFLECTION</th></tr>
<tr><td>Rafters having slopes greater than 3:12 with finished ceiling not attached to rafters</td><td>L/180</td></tr>
<tr><td>Interior walls and partitions</td><td>H/180</td></tr>
<tr><td>Floors</td><td>L/360</td></tr>
<tr><td>Ceilings with brittle finishes (including plaster and stucco)</td><td>L/360</td></tr>
<tr><td>Ceilings with flexible finishes (including gypsum board)</td><td>L/240</td></tr>
<tr><td>All other structural members</td><td>L/240</td></tr>
<tr><td>Exterior walls—wind loads[a] with plaster or stucco finish</td><td>H/360</td></tr>
<tr><td>Exterior walls—wind loads[a] with other brittle finishes</td><td>H/240</td></tr>
<tr><td>Exterior walls—wind loads[a] with flexible finishes</td><td>H/120[d]</td></tr>
<tr><td>Lintels supporting masonry veneer walls[e]</td><td>L/600</td></tr>
</table>
Note: L = span length, H = span height.
a. For the purpose of the determining deflection limits herein, the wind load shall be permitted to be taken as 0.7 times the component and cladding (ASD) loads obtained from Table R301.2.1(1).
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 R703.8.2. The dead load of supported materials shall be included when calculating the deflection of these members.
</td>
<td></td>
<td>Minor update to table.</td>
</tr>
<tr>
<td>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 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.</td>
<td>SECTION R302
FIRE-RESISTANT CONSTRUCTION
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).
Exceptions:
1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.
2. Walls of ~~dwellings~~ individual dwelling units and their 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.</td>
<td></td>
<td>Minor wordsmithing changes for clarity.

Removed previous Houston amendment.</td>
</tr>
</table>

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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
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 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.

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.
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.

TABLE R302.6
DWELLING GARAGE SEPARATION[a]

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~~ E119 or ~~UL 263~~ UL263 or Section 703.3 of the *International Building Code* with exposure from both sides	~~< 5~~ 0 feet
	Not fire-resistance rated	0 hours	▯ 5 feet
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood[a, b]	▯ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	▯ 5 feet
Openings in walls	Not allowed	N/A	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.
~~N/A~~ NA = Not Applicable.
a. ~~Roof eave~~ The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
b. ~~Roof eave~~ The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the ~~eave provided that~~ rake overhang where gable vent openings are not installed.

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~~ E119, ~~or UL 263~~ UL263 or Section 703.3 of the *International Building Code* with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	[a] 3 feet
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood [b, c]	[a] 2 feet
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	N/A	< 3 feet
	Unlimited	0 hours	[a] 3 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	[a] 3 feet

For SI: 1 foot = 304.8 mm. ~~N/A~~ NA = 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~~ not fire-resistance rated and for fire-resistance-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.~~ line.
b. The ~~roof eave~~ fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking 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~~ rake overhang where gable vent openings are not installed.

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 E119, UL 263 or Section 703.3 of the *International Building Code* with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood[a, b]	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 Foot = 304.8 mm.
N/A = Not Applicable
a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where provided that gable vent openings are not installed.
c. Opening requirements do not apply to noncombustible carports that are open on two sides.

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 E119, UL 263 or Section 703.2.2 of the *International Building Code* with exposure from the outside	0 feet
	Not fire-resistance rated	0 hours	3 feet[a]
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood[b, c]	2 feet[a]
	Not fire-resistance rated	0 hours	3 feet
Openings in walls	Not allowed	NA	< 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.
N/A = Not Applicable
d. 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 exterior walls not fire-resistance rated and for fire-resistance-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.
e. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
f. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
g. Opening requirements do not apply to noncombustible carports that are open on two sides.

Update to be in line with base code, no major change to Houston amendment.

Update to be in line with base code, no major change to Houston amendment.

Previous Houston amendment removed.

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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.

R302.2 Townhouses. ~~Common walls~~ **Walls** separating townhouses units shall be ~~assigned a fire-resistance rating~~ constructed in accordance with Section R302.2 and shall comply with **Sections 302.2.3** through **302.2.5**. ~~Item 1 or 2. The common wall shared by two townhouses~~ R302.2.2. ~~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.~~

~~**1.** Where a fire sprinkler system in accordance with Section P2904 is provided, 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.~~

~~**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.~~

Minor updates to townhouse separation section, requirements moved to subsections below.

R302.2.1 Double walls. Each townhouse *unit* shall be separated from other *townhouse units* by two 1-hour fire-resistance-rated wall assemblies tested in accordance with ASTM E119, UL 263 or Section 703.3 of the *International Building Code*.

Updates to townhouse unit separation requirements.

R302.2.2 Common walls. Common walls separating ~~*townhouses*~~ *townhouse units* shall be assigned a fire-resistance rating in accordance with Item 1 or 2 and shall be rated for fire exposure from both sides. Common walls shall extend to and be tight against the exterior sheathing of the exterior walls, or the inside face of exterior walls without stud cavities, and the underside of the roof sheathing. The common wall shared by two ~~*townhouses*~~ *townhouse units* shall be constructed without plumbing or mechanical equipment, ducts or vents, other than water-filled fire sprinkler piping 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.

1. Where ~~a fire~~ an automatic sprinkler system in

Updates to townhouse unit separation requirements.

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	accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E119, UL 263 or Section 703.3 of the *International Building Code*. **2.** Where ~~a fire~~ an automatic 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 E119, UL 263 or Section 703.3 of the *International Building Code*. **Exception:** Common walls are permitted to extend to and be tight against the inside of the exterior walls if the cavity between the end of the common wall and the exterior sheathing is filled with a minimum of two 2-inch nominal thickness wood studs.		
	R302.2.1~~2~~3 Continuity. The fire-resistance-rated wall or assembly separating ~~*townhouses*~~ townhouse units shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed *accessory structures*.		Base code renumbering and minor wordsmithing change.
	R302.2.2~~4~~ Parapets for townhouses. Parapets constructed in accordance with Section R302.2.~~3~~**5** shall be constructed for *townhouses* as an extension of exterior walls separating *townhouse units* or common walls in accordance with the following: 1. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches (762 mm) above the roof surfaces. 2. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches (762 mm) above the lower roof, the parapet shall extend not less than 30 inches (762 mm) above the lower roof surface. **Exception:** A parapet is not required in the preceding two cases where the roof covering complies with a minimum Class C rating as tested in accordance with ASTM ~~E 108~~E108 or UL 790 and the roof decking or sheathing is of noncombustible materials or ~~approved~~ fire-retardant-treated wood for a distance of 4 feet (1219 mm) on each side of the wall or walls, or one layer of 5/8 -inch (15.9 mm) Type X gypsum board is installed directly beneath the roof decking or sheathing, supported by not less than nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a distance of not less than 4 feet (1219 mm) on each side of the wall or walls and any openings or penetrations in the roof are not within 4 feet (1219 mm) of the common walls. Fire-retardant-treated wood shall meet the requirements of Sections R802.1.5 and R803.2.1.2. 3. A parapet is not required where roof surfaces adjacent to the wall or walls are at different elevations and		Base code renumbering and minor wordsmithing change.

	the higher roof is more than 30 inches (762 mm) above the lower roof. The common wall construction from the lower roof to the underside of the higher roof deck shall have not less than a 1-hour fire-resistance rating. The wall shall be rated for exposure from both sides.		
	R302.2.3~~5~~5 Parapet construction.		Base code renumbering.
	R302.2.4~~6~~6 Structural independence.		Base code renumbering.
	R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and floor assemblies having not less than a 1-hour fire-resistance rating where tested in accordance with ASTM ~~E 119 or~~E119, UL ~~263.~~263 or Section 703.3 of the *International Building Code*. Such separation shall be provided regardless of whether a *lot line* exists between the two *dwelling units* or not. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing. **Exceptions:** 1. A fire-resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with ~~NFPA 13~~Section P2904. 2. Wall assemblies need not extend through *attic* spaces where the ceiling is protected by not less than 5/8 -inch (15.9 mm) Type X gypsum board, an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings* and the structural framing supporting the ceiling is protected by not less than 1/2 -inch (12.7 mm) gypsum board or equivalent.		Minor changes to separation requirements.
	R302.4.2 Membrane penetrations. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced. **Exceptions:** 1. Membrane penetrations of not more than 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m2) in area provided that the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m2) in any 100 square feet (9.29 m2) of wall area. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm). Such boxes on opposite sides of the wall shall be separated by one of the following:		New ceiling membrane penetration exception.

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	1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities. 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation. 1.3. By solid fireblocking in accordance with Section R302.11. 1.4. By protecting both boxes with *listed* putty pads. 1.5. By other *listed* materials and methods. 2. Membrane penetrations by *listed* electrical boxes of any materials provided that the boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the *listing*. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm) unless *listed* otherwise. Such boxes on opposite sides of the wall shall be separated by one of the following: 2.1. By the horizontal distance specified in the *listing* of the electrical boxes. 2.2. By solid fireblocking in accordance with Section R302.11. 2.3. By protecting both boxes with *listed* putty pads. 2.4. By other *listed* materials and methods. 3. The annular space created by the penetration of a fire sprinkler provided that it is covered by a metal escutcheon plate. 4. Ceiling membrane penetrations by listed luminaires or by luminaires protected with listed materials that have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.		
	R302.4.1 Through penetrations. Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with **Section R302.4.1.1** or **R302.4.1.2**. ~~**Exception**~~ **Exceptions:** 1. Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space shall be protected as follows: 1.1. ~~1.~~ In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fireresistance rating, provided that both of the following are complied with: 1.1.1 ~~1.1.~~ The nominal diameter of the penetrating item is not more than 6 inches (152 mm).		Minor updates to section, no major change.

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	1.1.2.~~1.2.~~The area of the opening through the wall does not exceed 144 square inches (92 900 mm^2). 1.2 ~~2.~~ The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to **ASTM E119** or **UL 263** time temperature fire conditions under a positive pressure differential of not less than 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated. 2. The annular space created by the penetration of water-filled fire sprinkler piping, provided that the annular space is filled using a material complying with Item 1.2 of Exception 1.		
	R302.4.2 Membrane penetrations. Membrane penetrations shall comply with **Section R302.4.1**. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced. **Exceptions:** 1. Membrane penetrations of not more than 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m^2) in area provided that the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m^2) in any 100 square feet (9.29 m^2) of wall area. The annular space between the wall membrane and the box shall not exceed $^1/_8$ inch (3.1 mm). Such boxes on opposite sides of the wall shall be separated by one of the following: 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities. 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation. 1.3. By solid fireblocking in accordance with **Section R302.11**. 1.4. By protecting both boxes with *listed* putty pads. 1.5. By other *listed* materials and methods. 2. Membrane penetrations by *listed* electrical boxes of any materials provided that the boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the *listing*. The annular space between the wall membrane and the box shall not exceed 1		Minor wordsmithing changes.

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	/8 inch (3.1 mm) unless *listed* otherwise. Such boxes on opposite sides of the wall shall be separated by one of the following: 2.1. By the horizontal distance specified in the *listing* of the electrical boxes. 2.2. By solid fireblocking in accordance with **Section R302.11**. 2.3. By protecting both boxes with *listed* putty pads. 2.4. By other *listed* materials and methods. 3. The annular space created by the penetration of a fire sprinkler or waterfilled fire sprinkler piping, provided that ~~It~~ the annular space is covered by a metal escutcheon plate. 4. Ceiling membrane penetrations by *listed* luminaires or by luminaires protected with *listed* materials that have been tested for use in fireresistance-rated assemblies and are installed in accordance with the instructions included in the *listing*.		
	R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors~~.~~. Doors shall be self-latching and equipped with a self-closing or automatic-closing device.		Minor changes to self-latching / closing door requirements.
	R302.7 Under-stair protection. Enclosed ~~accessible~~ space under stairs that is accessed by a door or access panel shall have walls, under-stair surface and any soffits protected on the enclosed side with 1/2-inch (12.7 mm) gypsum board.		Minor wordsmithing change.
	R302.8.1 Interior finish. Foam plastics used as interior finishes shall comply with Section R316.5.10.		New requirements for interior finish.
	R302.9.5 High density polyethylene (HDPE) and polypropylene (PP). Where high density polyethylene or polypropylene is used as an interior finish material, it shall be tested in accordance with **NFPA 286** and comply with the criteria in **Section R302.9.4**.		New requirements for interior finish material.
	R302.10.1 Insulation. ~~Insulation materials, including facings, such as vapor retarders and vapor-permeable membranes~~ Insulating materials installed within floor-ceiling assemblies, roof-ceiling assemblies, wall assemblies, crawl spaces and *attics* shall ~~have~~ comply with the requirements of this section. They shall exhibit a flame spread index not to exceed 25 ~~with an accompanying~~ and a smoke-developed index not to exceed 450 where tested in accordance with ASTM ~~E 84~~ E84 or UL 723. Insulating materials, where tested in accordance with the requirements of this section, shall include facings, where used,		Updates to insulation requirements.

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	such as vapor retarders, vapor permeable membranes and similar coverings. **Exceptions:** 1. Where such materials are installed in concealed spaces, the flame spread index and smoke-developed index limitations do not apply to the facings, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or wall finish. 2. Cellulose fiber loose-fill insulation, that is not spray applied~~, complying~~ and that complies with the requirements of Section R302.10.3~~,~~ shall not be required to meet the ~~smoke-developed~~ flame spread index ~~of not more than 450 and~~ requirements but shall be required to meet a smoke-developed index of not more than 450 where tested in accordance with CAN/ULC S102.2. 3. Foam plastic insulation shall comply with Section R316.		
	R302.10.4 Exposed attic insulation. Exposed insulation materials installed on *attic* floors shall have a critical radiant flux of not less than 0.12 watt per square centimeter.		Minor wordsmithing change.
	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 (16mm) wood structural panel membrane, or equivalent on the underside of the floor framing member. 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 for the installation of fuel-fired or electric-powered heating appliances. 3. Portions of floor assemblies shall be permitted to be unprotected where complying with the following: 3.1. The aggregate area of the unprotected portions does not exceed 80 square feet (7.4 m2) per story. 3.2. Fireblocking 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.		Minor wordsmithing changes.

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	SECTION R303 **LIGHT, VENTILATION AND HEATING** **R303.1 Habitable rooms.** Habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural *ventilation* shall be through windows, skylights, doors, louvers or other *approved* openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The openable area to the outdoors shall be not less than 4 percent of the floor area being ventilated. **Exceptions:** 1. ~~The~~ For habitable rooms other than kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical *ventilation* system or a mechanical ventilation system capable of producing 0.35 air changes per hour in the habitable rooms is installed in accordance with Section M1505. 2. For kitchens, the glazed areas need not be openable where the opening is not required by Section R310 and a local exhaust system is installed in accordance with Section M1505. ~~2.~~3. The glazed areas need not be installed in rooms where Exception 1 is satisfied and artificial light is provided that is capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level. ~~3.~~4. Use of *sunroom* and patio covers, as defined in **Section R202**, shall be permitted for natural *ventilation* if in excess of 40 percent of the exterior *sunroom* walls are open, or are enclosed only by insect screening.		New and updated requirements for habitable room ventilation.
	R303.2 Adjoining rooms. For the purpose of determining light and *ventilation* requirements, ~~any room~~ rooms shall be considered to be a portion of an adjoining room where not less than one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room and not less than 25 square feet (2.3 m2). **Exception:** Openings required for light or *ventilation* shall be permitted to open into a sunroom with thermal isolation or a patio cover, provided that there is an openable area between the adjoining room and the sunroom or patio cover of not less than one-tenth of the floor area of the interior room and not less than 20 square feet (2 m2). The minimum openable area to the outdoors shall be based ~~up~~on the total floor area being ventilated.		Minor wordsmithing changes.
	R303.3 Bathrooms. Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m2), one-half of which ~~must~~ shall be openable. **Exception:** The glazed areas shall not be required where artificial light and a local exhaust system are provided. The minimum local exhaust rates shall be determined in accordance with Section M150~~7~~5. Exhaust air from the space shall be exhausted directly to the outdoors.		No Houston amendment.

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R303.4 Mechanical ventilation. Where the air infiltration rate of a *dwelling unit* is ~~5~~ 3 air changes per hour or less when 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.	**R303.4 Mechanical ventilation.** ~~Where the air infiltration rate of a *dwelling unit* is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the *dwelling unit* shall be provided with wholehouse mechanical *ventilation* in accordance with Section M1505.4.~~ Buildings and dwelling units complying with **Section N1102.4.1** shall be provided with mechanical ventilation in accordance with **Section M1505**, or with other approved means of ventilation.		Updated mechanical ventilation requirements. Removed Houston amendment.
	SECTION R305 **CEILING HEIGHT** **R305.1 Minimum height.** *Habitable space*, hallways and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm). Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm). **Exceptions:** 1. For rooms with sloped ceilings, the required floor area of the room shall have aceiling height of not less than 5 feet (1524 mm) and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet (2134 mm). 2. The ceiling height above bathroom and toilet room fixtures shall be such that thefixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches (2032 mm) above an area of 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. 4. Beams and girders spaced apart not less than 36 inches (914 mm) in clear finished width shall project not more than 78 inches (1981 mm) from the finished floor.		New exception provided for habitable space ceiling height.
	SECTION R308 **GLAZING** **R308.1 Identification.** Except as indicated in Section R308.1.1 each pane of glazing installed in hazardous locations as defined in Section R308.4 shall be provided with a manufacturer's designation specifying who applied the designation, designating ~~–~~the type of glass and the safety glazing standard with which it complies, ~~which~~ and that is visible in the final installation. The designation shall be acid etched, sandblasted, ceramic-fired, laser etched, embossed, or be of a type that once applied cannot be removed without being destroyed. A *label* shall be permitted in lieu of the manufacturer's designation.		Minor wordsmithing changes.
	R308.3.1 Impact test. Where required by other sections of the code, glazing shall be tested in accordance with CPSC 16 CFR 1201. Glazing shall comply with the test criteria for Category II unless otherwise indicated in Table R308.3.1(1).		Minor wordsmithing changes.

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	Exception: Glazing not in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers shall be permitted to be tested in accordance with ANSI Z97.1. Glazing shall comply with the test criteria for Class A unless otherwise indicated in Table R308.3.1(2).		
	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 (1524 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~~ less than 180 degrees (3.14 rad) **from** the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.		Minor wordsmithing changes.
	R308.4.3 Glazing in windows. Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered to be a hazardous location: 1. The exposed area of an individual pane is larger than 9 square feet (0.836 m2)**,** 2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor~~,~~**.** 3. The top edge of the glazing is more than 36 inches (914 mm) above the floor~~; and~~**.** 4. One or more walking surfaces are within 36 inches (914 mm), measured horizontally and in a straight line, of the glazing. **Exceptions:** 1. Decorative glazing. 2. Where glazing is adjacent to a walking surface and a horizontal rail is installed ~~on the accessible side(s) of the glazing~~ 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and have a cross-sectional height of not less than 1 1/2 inches (38 mm). 3. Outboard panes in insulating glass units and other multiple glazed panels where the bottom edge of the glass is 25 feet (7620 mm) or more above *grade*, a roof, walking surfaces or other horizontal [within 45 degrees (0.79 rad) of horizontal] surface adjacent to the glass exterior.		Minor wordsmithing changes.
	R308.4.4.1 Structural glass baluster panels. Guards with structural glass baluster panels shall be installed with an attached top rail or handrail. The top rail or handrail shall be supported by not less than three glass baluster panels, or shall be otherwise supported to remain in place should one glass baluster panel fail.		New glass baluster requirements.

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	Exception: An attached top rail or handrail is not required where the glass baluster panels are laminated glass with two or more glass plies of equal thickness and of the same glass type.		
	R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing or ~~facing~~ adjacent to hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered 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 (1524 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.		Minor wordsmithing changes.
	R308.4.6 Glazing adjacent to stairs and ramps. Glazing where the bottom exposed edge of the glazing is less than 36 inches (914 mm) above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered to be a hazardous location. **Exceptions:** 1. Where glazing is adjacent to a walking surface and a horizontal rail is installed ~~on the accessible side(s) of the glazing~~ at 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and have a cross-sectional height of not less than 1 1/2 inches (38 mm). 2. Glazing 36 inches (914 mm) or more measured horizontally from the walking surface.		Minor wordsmithing changes.
	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 (1524 mm) horizontal arc less than 180 degrees (3.14 rad) from the bottom tread nosing shall be considered to be a hazardous location. (See Figure R308.4.7.) Exception: ~~The~~Where 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*.		Minor wordsmithing changes.
	R308.6.2 Materials.~~The following types of glazing~~ Glazing materials shall be ~~permitted~~ limited to ~~be used:~~ the following: 1. Laminated glass with not less than a 0.015-inch (0.38 mm) polyvinyl butyral 2 interlayer for glass panes 16 square feet (1.5 m) or less in area located such that the highest point of the glass is not more than 12 feet (3658 mm) above a walking ~~surface or other accessible area;~~ **surface;** for higher or larger sizes, the interlayer thickness shall be not less than 0.030 inch (0.76 mm).		Minor wordsmithing changes.

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	2. Fully tempered glass. 3. Heat-strengthened glass. 4. Wired glass. 5. *Approved* rigid plastics.		
	R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a ~~retaining~~ broken glass retention screen meeting the requirements of **Section R308.6.7** shall be installed below the full area of the glass, except for fully tempered glass that meets ~~either~~ Condition 1 or 2 listed in **Section R308.6.5**.		Minor wordsmithing changes.
	R308.6.4 Screens with multiple glazing. Where the inboard pane is fully tempered, heat-strengthened or wired glass, a ~~retaining~~ broken glass retention screen meeting the requirements of **Section R308.6.7** shall be installed below the full area of the glass, except for ~~either~~ Condition 1 or 2 listed in **Section R308.6.5**. Other panes in the multiple glazing shall be of any type listed in **Section R308.6.2**.		Minor wordsmithing changes.
	R308.6.5 Screens not required. Screens shall not be required where laminated glass complying with Item 1 of **Section R308.6.2** is used as single glazing or the inboard pane in multiple glazing. Screens shall not be required where fully tempered glass is used as single glazing or the inboard pane in multiple glazing and either of the following conditions are met: 1. ~~Glass~~ The glass area is 16 square feet (1.49 m2) or ~~less. Highest~~ less; the highest point of glass is not more than 12 feet (3658 mm) above a walking ~~surface or other accessible area,~~ surface; the nominal glass thickness is not more than 3/16 inch (4.8 ~~mm),~~ mm); and (for multiple glazing only) the other pane or panes are fully tempered, laminated or wired glass. 2. ~~Glass~~The glass area is greater than 16 square feet (1.49 ~~m²). Glass~~ m2); the glass is sloped 30 degrees (0.52 rad) or less from ~~vertical,~~ vertical; and the highest point of glass is not more than 10 feet (3048 mm) above a walking ~~surface or other accessible area.~~surface.		Updates to screen requirements.
	R308.6.7 Screen characteristics. The screen and its fastenings shall: be capable of supporting twice the weight of the glazing, be firmly and substantially fastened to the framing members, be installed within 4 inches (102 mm) of the glass, and have a mesh opening of not ~~more~~ greater than 1 inch by 1 inch (25 mm by 25 mm).		Minor wordsmithing changes.
	R308.6.8 Curbs for skylights. Unit skylights installed in a roof with a pitch ~~flatter~~ of less than three units vertical in 12 units horizontal (25-percent slope) shall be mounted on a curb extending not less than 4 inches (102 mm) above the plane of the roof, unless otherwise specified in the manufacturer's installation instructions.		Minor wordsmithing changes.

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	R309.2 Carports. Carports shall be open on not less than two sides. Carport floor surfaces shall be of *approved* noncombustible material. Carports not open on two or more sides shall be considered to be a garage and shall comply with the provisions of this section for garages. ~~**Exception:** Asphalt surfaces shall be permitted at ground level in carports.~~ The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway. **Exception:** Asphalt surfaces shall be permitted at ground level in carports.		Exception relocated.
	R309.3 Flood hazard areas. ~~For buildings~~ Garages and carports located in flood hazard areas as established by **Table R301.2**~~, garage floors shall be one of the following:~~ shall be constructed in accordance with Section R322. ~~1. Elevated to or above the design flood elevation as determined in accordance with **Section R322**.~~ ~~2. Located below the design flood elevation provided that the floors are at or above *grade* on not less than one side, are used solely for parking, building access or storage, meet the requirements of **Section R322** and are otherwise constructed in accordance with this code.~~		Minor wordsmithing changes.
	R309.5 Fire sprinklers. Private garages shall be protected by fire sprinklers where the garage wall has been designed based on Table R302.1(2), ~~Footnote~~ Note a. Sprinklers in garages shall be connected to an automatic sprinkler system that complies with Section P2904. Garage sprinklers shall be residential sprinklers or quick-response sprinklers, designed to provide a density of 0.05 gpm/ft2 . Garage doors shall not be considered obstructions with respect to sprinkler placement.		Minor wordsmithing changes. Minor wordsmithing changes.
	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 having a minimum width of 36 inches (914 mm) that opens to a public way. **Exception:** **1.** Storm shelters and *basements* used only to house mechanical *equipment* not 2 exceeding a total floor area of 200 square feet (18.58 m). **2.** Where the dwelling *unit* or townhouse *unit* is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:	**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 having a minimum width of 36 inches (914 mm) that opens to a *public way*. 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. **EDITORIAL NOTE:** THE REMAINDER OF THIS SECTION REMAINS AS SET FORTH IN THE 2021 IRC.]	New emergency escape and rescue opening requirements in base code. New Houston amendment incorporated from previous amendment Section R311.1.1, no change to enforcement.

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	1.1. One means of egress complying with Section R311 and one emergency escape and rescue opening. **1.2.** Two means of egress complying with Section R311. **3.** A *yard* shall not be required to open directly into a *public way* where the *yard* opens to an unobstructed path from the *yard* to the *public way*. Such path shall have a width of not less than 36 inches (914 mm).		
	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 and fall prevention devices complying with ASTM F2090 shall be permitted for use ~~complying with ASTM F 2090 shall be permitted for use~~ on windows serving as a required emergency escape and rescue opening and shall be not more than 70 inches (178 cm) above the finished floor~~ shall comply with ASTM F2090~~.		Updates to emergency escape and rescue opening requirements.
	R310.2 Emergency escape and rescue openings. *Emergency escape and rescue openings* shall have minimum dimensions ~~as specified in this section~~ in accordance with Sections R310.2.1 through R310.2.4.		Updates to emergency escape and rescue opening requirements.
	R310.2.1 Minimum ~~opening area~~ size. Emergency escape and 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 of the 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:** The minimum net clear opening for *grade-floor emergency escape and rescue openings* shall be 5 square feet (0.465 m^2).		Updates to emergency escape and rescue opening requirements.
	R310.2.2 Minimum dimensions. The minimum net clear opening height dimension shall be 24 inches (610 mm). The minimum net clear opening width dimension shall be 20 inches (508 mm). The net clear opening dimensions shall be the result of normal operation of the opening.		New minimum dimension requirements.
	~~**R310.2.2**~~**R310.2.3** ~~**Window sill height**~~ **Maximum height from floor.** ~~Where a window is provided as the emergency~~ Emergency escape and rescue openings ~~opening, it~~ shall have ~~a sill height of not more than~~ the bottom of the clear opening not greater than 44 inches (1118 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~~.		Updates to emergency escape and rescue opening requirements.
	R310.2.4 Emergency escape and rescue openings under decks, ~~and~~ porches and cantilevers. Emergency escape and rescue openings shall be permitted to be ~~installed~~ under decks, ~~and~~ porches and cantilevers ~~provided that the location of the deck allows the emergency escape and rescue openings to~~ shall be fully ~~opened~~ openable and ~~provides~~ provide a path not		Updates to emergency escape and rescue opening requirements.

	less than 36 inches (914 mm) in height and 36 inches (914 mm) in width to a *yard* or court.		
	R310.2.5 Replacement windows. Replacement windows installed in buildings meeting the scope of this code shall be exempt from the maximum sill height requirements of ~~Sections R310.1~~ Section R310.2.2 and ~~Sections R310.2.1 and R310.2.2,~~ the requirements of Section R310.2.1, provided that the replacement window meets the following conditions: 1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window. 2. The replacement window is not part of a change of occupancy.		Updates to emergency escape and rescue opening requirements.
	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 sliding door ~~slider. Where the opening is below the adjacent grade, it shall be provided with an area well~~.		Updates to emergency escape and rescue opening requirements.
	~~**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**.~~		Base code section removed.
	~~**R310.3.2 Area wells.** Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.~~		Base code section removed.
	~~**R310.3.2.1 Ladder and steps.** Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with **Section R311.7**. 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 exterior stairwell.~~		Base code section removed.
	~~**R310.3.2.2 Drainage.** Area 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 area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United~~		Base code section removed.

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	~~Soil Classification System, Group I Soils, as detailed in **Table R405.1**.~~		
	R310.4 Area wells. An *emergency escape and rescue opening* where the bottom of the clear opening is below the adjacent grade shall be provided with an area well in accordance with Sections R310.4.1 through R310.4.4.		New area well requirements for emergency escape and rescue openings.
	~~**R310.2.3**~~ **R310.4.1** ~~**Window wells**~~ **Minimum size.** The horizontal area of the ~~window~~area 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~~size of the ~~window~~area well shall allow the *emergency escape and rescue opening* to be fully opened. **Exception:** The ladder or steps required by Section R310.4.2 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the ~~window~~area well.		New area well requirements for emergency escape and rescue openings.
	~~**R310.2.3.1**~~**R310.4.2 Ladder and steps.** ~~Window~~Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with ~~a~~an approved, permanently affixed ladder or steps. The ladder or steps ~~usable with~~shall not be obstructed by the emergency escape and rescue opening where the window or door is in the ~~fully~~ open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. ~~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.~~		New area well requirements for emergency escape and rescue openings.
	R310.4.2.1 Ladders. Ladders and 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 area well.		New area well requirements for emergency escape and rescue openings.
	R310.4.2.2 Steps. Steps shall have an inside width of not less than 12 inches (305 mm), a minimum tread depth of 5 inches (127 mm) and a maximum *riser* height of 18 inches (457 mm) for the full height of the area well.		New area well requirements for emergency escape and rescue openings.
	~~**R310.2.3.2**~~**R310.4.3 Drainage.** ~~Window~~Area 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~~area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.		New area well requirements for emergency escape and rescue openings.

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	~~R310.4~~**R310.4.4 Bars, grilles, covers and screens.** Where bars, grilles, covers, screens or similar devices are placed over *emergency escape and rescue openings*, ~~area wells~~ bulkhead enclosures or ~~window~~ area wells that serve such openings, the minimum net clear opening size shall comply with **Sections** R310.2 through R310.2.2 and R310.4.1. ~~R310.2.1 through R310.4.1, and such~~ Such devices shall be releasable or removable from the inside without the use of a key~~,~~ or tool~~, special knowledge~~ or force greater than that required for the normal operation of the escape and rescue opening.		New area well requirements for emergency escape and rescue openings.
	~~R310.2.5~~ **R310.5 Replacement windows for emergency escape and rescue openings.** Replacement windows installed in buildings meeting the scope of this code shall be exempt from ~~the maximum sill height requirements of Section R310.2.2 and the requirements of Section R310.2.1~~ Sections R310.2 and R310.4.4, provided that the replacement window meets the following conditions: 1. The replacement window is the manufacturer's largest standard size window that willfit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window. 2. The replacement window is not part of a change of occupancy.		Base code renumbering.
	~~R310.5~~**R310.6 Dwelling additions.** Where *dwelling additions* contain sleeping rooms, an *emergency escape and rescue opening* shall be provided in each new sleeping room. Where *dwelling additions* 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 *accessed* from the new *basement*. 3. An operable window complying with Section 310.7.1 shall be acceptable as an *emergency escape and rescue opening*.		Base code renumbering and new exception included.
	~~R310.6~~**R310.7 Alterations or repairs of existing basements.** ~~An *emergency escape and rescue opening* is not required where existing *basements* undergo *alterations* or repairs.~~ New sleeping rooms created in an existing *basement* shall be provided with *emergency escape and rescue openings* in accordance with **Section R310.1**. Other than new sleeping rooms, where existing basements undergo alterations or repairs, an *emergency escape and rescue opening* is not required. **Exception:** ~~New sleeping rooms created in an existing *basement* shall be provided with emergency escape and rescue openings in accordance with Section R310.1.~~ An operable window complying with **Section 310.7.1** shall be acceptable as an emergency escape and rescue opening.		Updated emergency escape and rescue openings requirements.

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	R310.7.1 Existing emergency escape and rescue openings. Where a *change of occupancy* would require an *emergency escape and rescue opening* in accordance with **Section 310.1**, operable windows serving as the *emergency escape and rescue opening* shall comply with the following: 1. An existing operable window shall provide a minimum net clear opening of 4 square feet (0.38 m^2) with a minimum net clear opening height of 22 inches (559 mm) and a minimum net clear opening width of 20 inches (508 mm). 2. A replacement window where such window complies with both of the following: 2.1. The replacement window meets the size requirements in Item 1. 2.2. The replacement window is the manufacturer's largest standard-size window that will fit within the existing frame or existing rough opening. The replacement window shall be permitted to be of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.		New emergency escape and rescue opening requirements.
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.			Previous Houston amendment removed, exception has been relocated to Section R310.1 as an amendment.
	R311.3 Floors and landings at exterior doors. There shall be a landing or floor on each side of each exterior door. The width of each landing shall be not less than the door served. ~~Every landing~~ Landings shall have a dimension of not less than 36 inches (914 mm) measured in the direction of travel. The slope at exterior landings shall not exceed 1/4 unit vertical in 12 units horizontal (2 percent). Exception: Exterior balconies less than 60 square feet (5.6 m2) and only access~~ible~~ed from a door are permitted to have a landing that is less than 36 inches (914 mm) measured in the direction of travel.		Minor wordsmithing changes.
	R311.3.2 Floor elevations ~~for~~ at other exterior doors. Doors other than the required egress door shall be provided with landings or floors not more than 7 3/4 inches (196 mm) below the top of the threshold. **Exception:** A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.		Minor wordsmithing changes.
	R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* that are not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.		Minor wordsmithing changes.

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	R311.5 ~~Construction.~~ **~~R311.5.1 Attachment.~~Landing, deck, balcony and stair construction and attachment.** Exterior landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal.		Minor wordsmithing changes.
	R311.7 Stairways. Where required by this code or provided, *stairways* shall comply with this section. **Exceptions:** 1. *Stairways* not within or serving a building, porch or deck. 2. *Stairways* leading to nonhabitable attics. 3. *Stairways* leading to crawl spaces.		New stairway requirements.
	R311.7.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. ~~Handrails shall not project more than 4 1/2 inches (114 mm) on either side of the stairway and the~~ The clear width of ~~the~~ stairway**s** at and below the handrail height, including treads and landings, shall be not less than 31 1/2 inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are ~~provided~~ **installed** on both sides. **Exception:** The width of spiral stairways shall be in accordance with Section R311.7.10.1.		Minor wordsmithing changes.
	R311.7.2 Headroom. The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway. **Exceptions:** 1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall ~~be allowed to~~ **not** project horizontally into the required headroom ~~**not**~~ more than 4 3/4 inches (121 mm). 2. The headroom for spiral stairways shall be in accordance with Section R311.7.10.1.		Minor wordsmithing changes.
	R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise ~~larger~~ greater than ~~151~~12 feet 7 inches (3835 mm) between floor levels or landings.		Wordsmithing changes to measurement, no change to distance.
	R311.7.4 Walkline. The walkline across winder treads and landings shall be concentric to the ~~curved~~ turn and parallel to the direction of travel ~~through the turn~~ entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the ~~side where~~ inside of the ~~winders are narrower.~~ turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking ~~surface of the winder. If~~ surface. Where winders are adjacent within ~~the~~ a flight, the point of the widest clear stair width of the adjacent winders shall be used.		Minor updates to base code requirements.

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	R311.7.5.1 Risers. The riser height shall be not more than 7 3/4 inches (196 mm). The riser height 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~~ At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below ~~do~~ shall not permit the passage of a 4-inch-diameter (102 mm) sphere. **Exceptions:** 1. The opening between adjacent treads is not limited on spiral stairways. 2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.		Minor changes to base code requirements.
	R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 3/8 inch (9.5mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and ~~do~~ shall not ~~have~~ be required to be within 3/8 inch (9.5 mm) of the rectangular tread depth. **Exception:** The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.		Minor wordsmithing changes.
	R311.7.5.3 Nosings. ~~The~~ Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing ~~shall be~~ not greater than 9/16 inch (14 mm) or a bevel not greater than 1/4 inch (12.7 mm). A nosing projection not less than 3/4 inch (19 mm) and not more than 1 1/4 inches (32 mm) shall be provided on ~~stairways with solid risers.~~ stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than 3/8 inch ~~(9.5 mm) between two stories, including the nosing at the level of floors and landings. Beveling of nosings shall not exceed 1/2 inch (12.7 mm).~~ within a stairway. **Exception**: A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).		Minor changes to base code requirements.
	R311.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. ~~Landings~~ For landings of shapes other than square or ~~rectangular shall be permitted provided that~~ rectangular, the depth at the walk line and the total area ~~is~~ shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight		Minor changes to base code requirements.

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	run, the depth in the direction of travel shall be not less than 36 inches (914 mm). **Exception:** A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.		
	R311.7.7 Stairway walking surface. The walking surface of treads and landings of *stairways* shall be sloped not steeper than 1 unit vertical in 48 ~~inches~~ units horizontal (2percent slope). **Exception:** Where the surface of a landing is required elsewhere in the code to drain surface water, the walking surface of the landing shall be sloped not steeper than 1 unit vertical in 20 units horizontal (5-percent slope) in the direction of travel.		New exception included for stairway walking surface requirements.
	R311.7.8 Handrails. Handrails shall be provided on not less than one side of each ~~continuous run of treads or~~ flight of stairs with four or more risers.		Minor updates to handrail requirements.
	R311.7.8.2 ~~Continuity.~~ Handrail projection. Handrails ~~**for stairways**~~ shall ~~be continuous for the full length of the flight, from a point directly above the top riser~~ not project more than 41/2 inches (114 mm) on either side of the ~~flight to a point directly above the lowest riser~~ stairway. **Exceptions:** ~~1. Handrails shall be permitted to be interrupted by a newel post at the turn.~~ ~~2. The use of a volute, turnout, starting easing or starting newel shall be allowed over the lowest tread.~~ Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than 61/2 inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.		Updates to handrail requirements.
	R311.7.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inches (38 mm) between the wall and the handrails.		New handrail clearance requirements.
	R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned toward a wall, guard walking surface continuous to itself, or ~~shall~~ terminate to a post ~~in newel posts or safety terminals~~. **Exceptions**: 1 Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.		New handrail continuity requirements.

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	2 A volute, turnout or starting easing shall be allowed to terminate over the lowest tread and over the top landing.		
	R311.7.8.35 Grip-size. Required handrails shall be of one of the following types or provide equivalent graspability. 1. Type I. Handrails with a circular cross section shall have an outside diameter of not less than 1 1/4 inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter ~~dimension~~ of not less than 4 inches (102 mm) and not greater than 6 ¼ inches (160 mm) ~~with~~ and a cross section ~~of dimension~~ of not more than 2 1/4 inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm). 2. Type II. Handrails with a perimeter greater than 6 1/4 inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within ~~a distance of~~ 3/4 inch (19 mm) measured vertically from the tallest portion of the profile and ~~achieve~~ have a depth of not less than 5/16 inch (8 mm) within 7/8 inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than 3/8 inch (10 mm) to a level that is not less than 1 3/4 inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than 1 1/4 inches (32 mm) and not more than 2 3/4 inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).		Base code renumbering and minor wordsmithing changes.
	R311.7.8.46 Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section ~~R507.3.~~ **R507.2.2.**		Base code renumbering.
	R311.7.9 Illumination. Stairways shall be provided with illumination in accordance with Section R303.7~~.~~ and R303.8.		Base code renumbering.
	R311.7.10.1 Spiral stairways. ~~Spiral stairways are permitted, provided that the~~ The clear width at and below the ~~handrail is~~ handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius ~~is~~ shall be not greater than 24 1/2 inches (622 mm). Each tread shall have a depth of not less than 6 3/4 inches (171 mm) at the walkline. ~~All treads~~ Treads shall be identical, and the rise shall be not more than 9 1/2 inches (241 mm). Headroom shall be not less than 6 feet 6 inches 1982 mm).		Updates to spiral stairway requirements.

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	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 that ~~the~~ 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 (508 mm). **Exception:** Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m2) or less where such devices do not provide exclusive access to a kitchen or bathroom.		New exception provided for alternating tread devices.
	R311.7.12 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that 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. **Exception:** Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m2) or less that do not provide exclusive access to a kitchen or bathroom.		New exception provided for ship ladders.
	R311.8 Ramps. Where required by this code or provided, *ramps* shall comply with this section. **Exception:** *Ramps* not within or serving a building, porch or deck.		New requirements for ramps.
	R311.8.1 Maximum slope. Ramps serving the egress door required by Section R311.2 shall have a slope of not more than 1 unit vertical in 12 units horizontal (8.3-percent slope). ~~All other~~ Other ramps shall have a maximum slope of 1 unit vertical in 8 units horizontal (12.5 percent). **Exception:** Where it is technically infeasible to comply because of site constraints, ramps shall have a slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent).		Minor wordsmithing change.
	R312.1.1 Where required. *Guards* shall be ~~located along~~ provided for those portions of open-sided walking surfaces, including floors, stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or *grade* below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a *guard*.		Minor wordsmithing change.
	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) in height as measured vertically above the adjacent walking surface or the line connecting the ~~leading edges of the treads.~~nosings. Exceptions: 1. *Guards* on the open sides of stairs shall have a height of not less than 34 inches (864 mm) measured vertically from a line connecting the ~~leading edges of the treads.~~ nosings.		Minor wordsmithing change.

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	2. Where the top of the *guard* serves as a handrail on the open sides of stairs, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) as measured vertically from a line connecting the ~~leading edges of the treads.~~ nosings.		
	R312.2.1 Window ~~sills~~ opening height. In *dwelling units*, where the ~~top~~ bottom of the ~~sill~~ clear opening of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 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: 1. Operable windows ~~with~~ openings ~~that~~ will not allow a 4-inch-diameter (102 mm) sphere to pass through ~~the opening~~ where the openings ~~is~~ are in ~~its~~ their largest opened position. 2. Operable windows that are provided with window opening control devices or fall prevention devices that comply with ASTM ~~F 2090.~~ F2090. 3. ~~Operable windows are provided with window opening control devices that comply with **Section R312.2.2**.~~		Minor updates to window opening height requirements.
	R312.2.2 ~~Window opening control devices~~ Emergency escape and rescue openings. ~~Window opening control devices shall comply with ASTM F2090. The~~Where an operable window serves as an *emergency escape and rescue opening*, a window opening control device or fall prevention device, after operation to release the control device or fall prevention device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by ~~Section~~ **Sections R310.2.1** and **R310.2.2**.		Updates to emergency escape and rescue opening requirements.
	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.		Minor changes to base code.
	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**.		Minor changes to base code.
~~**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 One- and two-family dwellings automatic ~~fire~~ sprinkler 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 a~~an automatic residential~~ sprinkler system.	~~**R313.2 One- and two-family dwellings automatic sprinkler systems.** An automatic sprinkler system shall be installed in one- and two-family *dwellings*. **Exception:** An automatic sprinkler system shall not be required for *additions* or *alterations* to existing buildings that are not already provided with a sprinkler system.~~	Minor changes to base code. No change to Houston amendment.

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~~**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 sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.~~	No change to Houston amendment.
	R314.2.2 Alterations, repairs and additions. Where *alterations*, *repairs* or *additions* requiring a permit occur, ~~**or** where 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, 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.~~		Minor changes to base code.
	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* 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. Not less than 3 feet (914 mm) horizontally from the door or opening of a bathroomthat contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section. 5. In the hallway and in the room open to the hallway in *dwelling units* where the ceiling height of a room open to a hallway serving bedrooms exceeds that of the hallway by 24 inches (610 mm) or more.		New smoke alarm location requirement.
	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)		New smoke alarm location requirement.

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	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*. 4. Smoke alarms *listed* and marked "helps reduce cooking nuisance alarms" shall not be installed less than 6 feet (1828 mm) horizontally from a permanently installed cooking *appliance*.		
	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 that could provide access for interconnection without the removal of interior finishes.~~		Base code exception removed.
	R315.2.2 Alterations, repairs and additions. Where *alterations*, repairs or *additions* requiring a permit occur, ~~or where one or more sleeping rooms are added or created in existing dwellings,~~ 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~~, is 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.~~ . 3. Installation, alteration or repairs of mechanical systems that are not fuel fired.		New exception provided for alteration/repairs.
	R315.5 Interconnectivity. Where more than one carbon monoxide alarm is required to be installed within an individual dwelling unit in accordance with Section R315.3, 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 carbon monoxide alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm. **Exception:** Interconnection of carbon monoxide 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		New carbon monoxide interconnectivity requirements.

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	basement available that could provide access for interconnection without the removal of interior finishes.		
	R315.5~~6~~ Power source.		Base code renumbering.
	R315.6~~7~~ Carbon monoxide detection systems.		Base code renumbering.
	R315.6~~7~~.1 General.		Base code renumbering.
	R315.6~~7~~.2 Location.		Base code renumbering.
	R315.6~~7~~.3 Permanent fixture.		Base code renumbering.
	R315.6~~7~~.4 Combination detectors. Combination carbon monoxide and smoke detectors ~~shall be permitted to be~~ installed in carbon monoxide detection systems in lieu of carbon monoxide ~~detectors, provided that they are~~ detectors shall be *listed* in accordance with UL 2075 and UL 268.		Base code renumbering and minor wordsmithing changes.
	R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall comply with Section R316.3.1 or R316.3.2. ~~have a flame spread index of not more than 75 and shall have a *smoke-developed index* of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723.~~ Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and *smoke-developed index*. **Exception:** ~~Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.~~Spray foam plastic insulation more than 4 inches (102 mm) in thickness shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 where tested at a thickness of 4 inches (102 mm) and at the density intended for use. Such spray foam plastic shall be separated from the interior of a building b y 1/2-inch (12.7 mm) gypsum wallboard or by a material that has been tested in accordance with **NFPA 275**, and shall meet the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test.		New exception provided for spray foam insulation.

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	R316.3.1 Foam plastic insulation 4 inches thick or less. Foam plastic insulation installed at 4 inches (102 mm) in thickness or less shall have a flame spread index of not more than 75 and a *smoke-developed index* of not more than 450 where tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723.		New foam insulation requirements.
	R316.3.2 Foam plastic insulation more than 4 inches thick. Foam plastic insulation installed at more than 4 inches (102 mm) in thickness shall have a flame spread index of not more than 75 and a *smoke-developed index* of not more than 450 where tested at a thickness of 4 inches (102 mm) in accordance with ASTM E84 or UL 723, provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.		No Houston amendment.
	R316.5.1 Masonry or concrete construction. The thermal barrier specified in Section R316.4 is not required in a masonry or concrete wall, floor or roof ~~when~~ where the foam plastic insulation is separated from the interior of the building by not less than a 1-inch (25 mm) thickness of masonry or concrete.		Minor wordsmithing changes.
	R316.5.4 Crawl spaces. The thermal barrier specified in Section R316.4 is not required where all of the following apply: 1. Crawl space access is required by Section R408.4. 2. Entry is made only for purposes of repairs or maintenance. 3. The foam plastic insulation has been tested in accordance with Section R316.6 or the foam plastic insulation is protected against ignition using one of the following ignition barrier materials: 3.1. 1 1/2-inch-thick (38 mm) mineral fiber insulation;. 3.2. 1/4-inch-thick (6.4 mm) wood structural panels;. 3.3. 3/8-inch (9.5 mm) particleboard;. 3.4. 1/4-inch (6.4 mm) hardboard;. 3.5. 3/8-inch (9.5 mm) gypsum board; or. 3.6. Corrosion-resistant steel having a base metal thickness of 0.016 inch (0.406 mm). 3.7. 1/4-inch (6.4 mm) fiber-cement panel, soffit or backer board.		New thermal barrier option added.
	R316.5.7 Foam backer board. The thermal barrier specified in Section R316.4 is not required where siding backer board foam plastic insulation has a thickness of not more than 0.5 inch (12.7 mm) and a potential heat of not more than 2000 Btu per square foot (22 720 kJ/m2) when tested in accordance with NFPA 259 ~~provided that:~~ and it complies with one or more of the following: 1. The foam plastic insulation is separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation~~;~~**.** 2. The foam plastic insulation is installed over existing *exterior wall* finish in conjunction with re-siding~~;~~ 3. The foam plastic insulation has been tested in accordance with 4. Section R316.6.		Minor wordsmithing changes.

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	R316.5.10 Interior finish. Foam plastics ~~shall be permitted~~ used as interior ~~finish where approved in accordance~~ finishes shall comply with Section R316.6~~. Foam plastics that are used as an interior finish~~ and shall meet the flame spread index and smoke-developed index requirements of Sections R302.9.1 and R302.9.2.		Minor wordsmithing changes.
	R316.5.11 Sill plates and headers. Foam plastic ~~shall be permitted to~~ be spray applied to sill plates and headers or installed in the perimeter joist space without the thermal barrier specified in Section R316.4 ~~subject to~~ shall comply with all of the following: 1. The thickness of the foam plastic shall be not more than 3 1/4 inches (83 mm). 2. The density of the foam plastic shall be in the range of 0.5 to 2.0 pounds per 3 cubic foot (8 to 32 kg/m2). 3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke-developed index of 450 or less when tested in accordance with ASTM ~~E 84~~ E84 or UL 723.		Minor wordsmithing changes.
	R316.5.13 Floors. The thermal barrier specified in Section R316.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation ~~when~~ where the foam plastic is covered by not more than a nominal 1/2 -inch-thick (12.7mm) wood structural panel or equivalent. The thermal barrier specified in Section R316.4 is required on the underside of the structural floor system that contains foam plastic insulation ~~when~~ where the underside of the structural floor system is exposed to the interior of the building.		Minor wordsmithing changes.
	SECTION R317 **PROTECTION OF WOOD AND** **WOOD-BASED PRODUCTS AGAINST DECAY** **R317.1 Location required.** Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1~~ for the species, product, preservative and end use. Preservatives shall be listed in Section 4 of AWPA U1~~. 1. ~~Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or wood girders where closer than 12 inches (305 mm) to the exposed ground in~~ In crawl spaces or unexcavated areas located within the periphery of the building foundation, wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) to exposed ground, wood girders where closer than 12 inches (305 mm) to exposed ground, and wood columns where closer than 8 inches (204 mm) to exposed ground. 2. Wood framing members, including columns, that rest directly on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground. 3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.		Updates to base code wood protection requirements.

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	4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends. 5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather. 6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier. 7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members. 8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. **Exception:** Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or preservative-treated wood where the structure is exposed to the weather. 9. Wood columns in contact with *basement* floor slabs unless supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above the concrete floor and separated from the concrete pier by an impervious moisture barrier.		
	~~**R317.1.3 Geographical areas.** In geographical areas where experience has demonstrated a specific need, *approved* naturally durable or pressure-preservative-treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances when **where** those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members may **typically** include:~~ ~~1. Horizontal members such as girders, joists and decking.~~ ~~2. Vertical members such as posts, poles and columns.~~ ~~3. Both horizontal and vertical members.~~		Base code section removed.

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	~~**R317.1.4 Wood columns.** Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.~~ ~~**Exceptions:**~~ ~~1. Columns exposed to the weather or in *basements* where supported by concrete piers or metal pedestals projecting 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.~~ ~~2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building when where supported by a concrete pier or metal pedestal at a height more than 8 inches (203 mm) from exposed earth and the earth is covered by an impervious moisture barrier.~~ ~~3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch (25 mm) above a concrete floor or 6 inches (152 mm) above exposed earth.~~		Base code section removed.
	~~**R317.1.5 Exposed glued-laminated timbers.** The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative treated wood.~~		Base code section removed.
	R317.3.1 Fasteners for preservative-treated wood. Fasteners, including nuts and washers, for preservative-treated wood shall be of hot-dipped, zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Staples shall be of stainless steel. Coating types and weights for connectors in contact with preservative-treated wood shall be in accordance with the connector manufacturer's recommendations. In the absence of manufacturer's recommendations, ~~a minimum of~~ not less than ASTM ~~A 653~~ A653 type G185 zinc-coated galvanized steel, or equivalent, shall be used. Exceptions: 1. 1/2 -inch-diameter (12.7 mm) or greater steel bolts. 2. Fasteners other than ~~nails~~ nails, staples and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM ~~B 695,~~ B695, Class 55 minimum. 3. Plain carbon steel fasteners in SBX/DOT and zinc borate preservative-treated wood in an interior, dry environment shall be permitted.		Minor update and wordsmithing changes.
	R317.3.2 Fastenings for wood foundations. Fastenings, including nuts and washers, for wood foundations shall be as required in ~~AF&PA~~ AWC PWF.		Minor change to reference standard.

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	R317.3.3 Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations. Fasteners, including nuts and washers, for fire-retardant-treated wood used in exterior applications or wet or damp locations shall be of hot-dipped, zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Fasteners other than ~~nails~~ nails, staples and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM ~~B 695,~~ B695, Class 55 minimum.		Minor updates and wordsmithing changes.
	SECTION R318 **PROTECTION AGAINST** **SUBTERRANEAN TERMITES** **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 by 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.		Minor wordsmithing changes.
	R318.3 Barriers. *Approved* physical barriers, such as metal or plastic sheeting or collars specifically designed for termite prevention, shall be installed in a manner to prevent termites from entering the structure. Shields placed on top of an exterior foundation wall ~~are permitted to~~ shall be used only if in combination with another method of protection.		Minor wordsmithing changes.
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		**SECTION R319** **SITE ADDRESS** **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	No change to Houston amendment.

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maintained in good and readable condition from the public right-of-way.		be used to identify the structure. Address identification shall be maintained in good and readable condition from the public right-of-way.	
	SECTION R320 **ACCESSIBILITY** **R320.1 Scope.** Where there are four or more *dwelling units* or *sleeping units* in a single structure, the provisions of Chapter 11 of the *International Building Code* for Group R-3 shall apply. **Exception:** Owner-occupied *lodging houses* with five or fewer guestrooms are not required to be accessible.	**SECTION R320** **ACCESSIBILITY** **R320.1 Scope.** Where there are four or more *dwelling units* or *sleeping units* in a single structure, the provisions ~~of Chapter 11 of the *International Building Code* for Group R-3~~ *Texas Accessibility Standards* contained within Texas Government Code, Chapter 469, as may be amended, shall apply.	New Houston amendment to coincide with IBC amendment referring accessibility requirements to state.
	~~**R320.1.1 Guestrooms.** A *dwelling* with guestrooms shall comply with the provisions of Chapter 11 of the *International Building Code* for Group R-3. For the purpose of applying the requirements of Chapter 11 of the *International Building Code*, guestrooms shall be considered to be sleeping units.~~ ~~**Exception:** Owner-occupied lodging houses with five or fewer guestrooms constructed in accordance with the *International Residential Code* are not required to be accessible.~~		Base code section removed.
	R320.2 Live/work units. In *live/work units*, the nonresidential portion shall be accessible in accordance with Sections 508.5.9 and 508.5.11 of the *International Building Code*. In a structure where there are four or more *live/work units*, the dwelling portion of the *live/work unit* shall comply with Section 1108.6.2.1 of the *International Building Code*.		New live/work unit requirements.
~~**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.~~		**SECTION R321** **ELEVATORS AND PLATFORM LIFTS** **R321.3 Accessibility.** Elevators or platform lifts that are part of an accessible route shall comply with the *Texas Accessibility Standards* contained within Texas Government Code, Chapter 469, as may be amended. ~~required by Chapter 11 of the *International Building Code*, shall comply with ICC A117.1.~~	New Houston amendment to coincide with IBC amendment referring accessibility requirements to state.
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 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.	**SECTION R322** **FLOOD-RESISTANT CONSTRUCTION** **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~~ repair 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. 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.	**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, and substantial improvement and *repair* 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 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. [**EDITORIAL NOTE:** THE REMAINDER OF THIS SECTION IS NOT ADOPTED BY THIS JURISDICTION.]	Update wording to be in line with base code, no major change to Houston amendment.

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	R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall be located at or above the elevation required in **Section** R322.2 or R322.3. If replaced as part of a substantial improvement, electrical systems, *equipment* and components; heating, ventilating, air-conditioning and plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall meet the requirements of this section. Systems, fixtures, and *equipment* and components shall not be mounted on or penetrate through walls intended to break away under flood loads. **Exception:** Locating electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* is permitted below the elevation required in Section R322.2 or R322.3 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 the ~~design flood~~ required elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.		Minor wordsmithing change – Section is not enforced per editorial note in Section R322.1.
	R322.2.1 Elevation requirements. 1. Buildings and structures in flood hazard areas, not including flood hazard areas designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher. 2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated to a height above the highest adjacent *grade* of not less than the depth number specified in feet (mm) on the FIRM plus 1 foot (305 mm), or not less than 3 feet (915 mm) if a depth number is not specified. 3. *Basement* floors that are below *grade* on all sides shall be elevated to or above base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher. 4. Garage and carport floors shall comply with one of the following: 4.1. They shall be elevated to or above the elevations required in Item 1 or Item 2, as applicable. 4.2. They shall be at or above *grade* on not less than one side. Where a garage or carport is enclosed by walls, the garage or carport shall be used solely for parking, building access or storage. **Exception:** Enclosed areas below the ~~design flood~~ elevation required in this section, including *basements* with		Updates to elevation requirements – Section is not enforced per editorial note in Section R322.1.

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	floors that are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.		
	R322.2.2 Enclosed area below~~ design flood~~ required elevation. Enclosed areas, including crawl spaces, that are below the~~ design flood~~ elevation required in Section R322.2.1 shall: 1. Be used solely for parking of vehicles, building access or storage. 2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1: 2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm) for each square foot (0.093 m) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.~~6~~7.2.2 of ASCE 24. 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall. 2.3. The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.		Minor base code updates -- Section is not enforced per editorial note in Section R322.1.
	R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that: 1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area~~ below the design flood elevation~~, each area shall have openings. 2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening. 3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.		Minor base code updates -- Section is not enforced per editorial note in Section R322.1.
	R322.3.2 Elevation requirements. 1. Buildings and structures erected within coastal high-hazard areas and Coastal AZones, shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is		Minor base code updates -- Section is not enforced per editorial note in Section R322.1.

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	elevated to or above the base flood elevation plus 1 foot (305 mm) or the design flood elevation, whichever is higher. 2. *Basement* floors that are below *grade* on all sides are prohibited. 3. Garages used solely for parking, building access or storage, and carports shall comply with Item 1 or shall be at or above *grade* on not less than one side and, if enclosed with walls, such walls shall comply with Item 6. ~~3.~~4. The use of fill for structural support is prohibited. ~~4.~~5. 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. ~~5.~~6. Walls and partitions enclosing areas below the ~~design flood~~ elevation required in this section shall meet the requirements of **Sections R322.3.5** and **R322.3.6**.		
	R322.3.3 Foundations. 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~~.~~ and shall comply with the following: 1. 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 R322.3.5**. 2. 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~~ and pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. 3. Columns and their supporting foundations shall be designed to resist combinedwave and wind loads, lateral and uplift, and shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the columns. ~~Pile systems design and installation shall be certified in accordance with Section R322.3.9.~~ 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 wavevelocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with **ASCE 24**. 4. Flood and wave loads shall be those associated with the design flood. Windloads shall be those required by this code. 5. Foundation designs and *construction documents* shall be prepared and sealed in accordance with **Section R322.3.9**.		New base code requirements -- Section is not enforced per editorial note in Section R322.1.

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	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 that 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.		
	R322.3.4 Concrete slabs. Concrete slabs used for parking, floors of enclosures, landings, decks, walkways, patios and similar uses that are located beneath structures, or slabs that are located such that if undermined or displaced during base flood conditions could cause structural damage to the building foundation, shall be designed and constructed in accordance with one of the following: **1.** To be structurally independent of the foundation system of the structure, to not transfer flood loads to the main structure, and to be frangible and break away under flood conditions prior to base flood conditions. Slabs shall be a maximum of 4 inches (102 mm) thick, shall not have turned-down edges, shall not contain reinforcing, shall have isolation joints at pilings and columns, and shall have control or construction joints in both directions spaced not more than 4 feet (1219 mm) apart. **2.** To be self-supporting, structural slabs capable of remaining intact and functional under base flood conditions, including erosion and local scour, and the main structure shall be capable of resisting any added flood loads and effects of local scour caused by the presence of the slabs.		New base code requirements -- Section is not enforced per editorial note in Section R322.1.
	R322.3.45 Walls below ~~design flood~~required elevation. Walls and partitions are permitted below the ~~elevated floor~~elevation required in **Section R322.3.2**, provided that such walls and partitions are not part of the structural support of the building or structure and: 1. Electrical, mechanical and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and 2. Are constructed with insect screening or open lattice; or 3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a resistance of not less than 10 (479 Pa) and not more than 20 pounds per square foot (958 Pa) as determined using allowable stress design; or 4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), as determined using allowable stress design, the *construction documents* shall include documentation prepared and sealed by a registered *design professional* that:		Minor base code updates -- Section is not enforced per editorial note in Section R322.1.

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	4.1. The walls and partitions below the ~~design flood~~ required elevation have been designed to collapse from a water load less than that which would occur during the base flood. 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on structural and nonstructural building components. Water-loading values used shall be those associated with the design flood. Wind-loading values shall be those required by this code. 5. Walls intended to break away under flood loads as specified in Item 3 or 4 have flood openings that meet the criteria in **Section R322.2.2**, Item 2.		
	R322.3.5~~5~~6 Enclosed areas below ~~design flood~~required elevation. Enclosed areas below the ~~design flood~~ elevation required in **Section R322.3.2** shall be used solely for parking of vehicles, building access or storage.		Minor base code updates -- Section is not enforced per editorial note in Section R322.1.
	R322.3.~~5~~6.1 Protection of building envelope.		Base code renumbering -- Section is not enforced per editorial note in Section R322.1.
	R322.3.7 Stairways and ramps. Stairways and ramps that are located below the lowest floor elevations specified in Section R322.3.2 shall comply with one or more of the following: **1.** Be designed and constructed with open or partially open risers and guards. **2.** Stairways and ramps not part of the required means of egress shall be designed and constructed to break away during design flood conditions without causing damage to the building or structure, including foundation. **3.** Be retractable, or able to be raised to or above the lowest floor elevation, provided that the ability to be retracted or raised prior to the onset of flooding is not contrary to the means of egress requirements of the code. **4.** Be designed and constructed to resist flood loads and minimize transfer of flood loads to the building or structure, including foundation. Areas below stairways and ramps shall not be enclosed with walls below the ~~design flood~~ required in Section R322.3.2 elevation unless such walls are constructed in accordance with Section R322.3.5.		New base code requirements -- Section is not enforced per editorial note in Section R322.1.
	R322.3.8 Decks and porches. Attached decks and porches shall meet the elevation requirements of Section R322.3.2 and shall either meet the foundation requirements of this section or shall be cantilevered from or knee braced to the building or structure. Self-supporting decks and porches that are below the elevation required in Section R322.3.2 shall not be enclosed by solid, rigid walls, including walls designed to break away. Self-		New base code requirements -- Section is not enforced per editorial note in Section R322.1.

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	supporting decks and porches shall be designed and constructed to remain in place during base flood conditions or shall be frangible and break away under base flood conditions.		
	R322.3.6~~9~~ Construction documents.		Base code renumbering -- Section is not enforced per editorial note in Section R322.1.
	R322.3.7~~10~~ Tanks.		Base code renumbering -- Section is not enforced per editorial note in Section R322.1.
	R323.1.1 Sealed documentation. The *construction documents* for all structural components and *impact protective systems* of the *storm shelter* shall be prepared and sealed by a *registered design professional* indicating that the design meets the criteria of **ICC 500**. **Exception:** *Storm shelters*, structural components and impact-protective systems that are *listed* and *labeled* to indicate compliance with **ICC 500**.		New construction document requirements for structural components of storm shelters.
	R324.3 Photovoltaic systems. Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.6~~7~~.1 ~~and~~ , NFPA 70~~. Inverters shall be listed~~ and ~~labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.~~manufacturer's installation instructions. The electrical portion of solar PV systems shall be designed and installed in accordance with **NFPA 70**.		Updated photovoltaic system requirements.
	R324.3.1 Equipment listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL 1703 or with both **UL 61730-1** and **UL 61730-2**. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction. Mounting systems *listed* and *labeled* in accordance with **UL 2703** shall be installed in accordance with the manufacturer's installation instructions and their listings.		Updated photovoltaic system requirements.
	R324.4 Rooftop-mounted photovoltaic systems. Rooftop-mounted photovoltaic panel systems installed on or above the roof covering shall be designed and installed in accordance with ~~Section R907.~~this section.		Minor wordsmithing changes.
	R324.4.1 ~~Roof live load~~**Structural requirements.** ~~Roof structures that provide support for photovoltaic panel systems shall be designed for applicable roof live load. The design of roof structures need not include roof live load in the areas covered by photovoltaic panel systems. Portions of roof structures not covered by photovoltaic panels shall be designed for roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for live load, LR, for the load case where the photovoltaic panel system is not present.~~ Rooftop-mounted *photovoltaic panel systems* shall be designed to structurally support the system and withstand applicable gravity loads in accordance		Updated photovoltaic system requirements.

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	with Chapter 3. The roof on which these systems are installed shall be designed and constructed to support the loads imposed by such systems in accordance with Chapter 8.		
	R324.4.1.1 Roof load. Portions of roof structures not covered with photovoltaic panel systems shall be designed for dead loads and roof loads in accordance with Sections R301.4 and R301.6. Portions of roof structures covered with photovoltaic panel systems shall be designed for the following load cases: **1.** Dead load (including photovoltaic panel weight) plus snow load in accordance with Table R301.2(1). **2.** Dead load (excluding photovoltaic panel weight) plus roof live load or snow load, whichever is greater, in accordance with Section R301.6.		New photovoltaic system requirements.
	R324.4.1.2 Wind load. Rooftop-mounted photovoltaic panel or module systems and their supports shall be designed and installed 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).		New photovoltaic system requirements.
	R324.4.2 Fire classification. Rooftop-mounted *photovoltaic panel systems* shall have the same fire classification as the roof assembly required in Section R902.		New photovoltaic system requirements.
	R324.4.3 Roof penetrations. Roof penetrations shall be flashed and sealed in accordance with Chapter 9.		New photovoltaic system requirements.
	R324.5 Building-integrated photovoltaic systems. Building-integrated photovoltaic (BIPV) systems that serve as roof coverings shall be designed and installed in accordance with **Section R905**.		Minor wordsmithing change.
	R324.5.2 Fire classification. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section R902.3.		New photovoltaic system requirements.
	R324.5.3 BIPV roof panels. BIPV roof panels shall comply with **Section R905.17**.		New photovoltaic system requirements.
	R324.6 Roof access and pathways. Roof access, pathways and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.		New photovoltaic system requirements.

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	Exceptions: **1.** Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access. **2.** Roof access, pathways and setbacks need not be provided where the code official has determined that rooftop operations will not be employed. **3.** These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less. **4.** BIPV systems *listed* in accordance with Section 690.12(B)(2) of **NFPA 70**, where the removal or cutting away of portions of the BIPV system during fire-fighting operations has been determined to not expose a fire fighter to electrical shock hazards.		
	R324.6.1 Pathways. Not fewer than two pathways, on separate roof planes from lowest roof edge to ridge and not less than 36 inches (914 mm) wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment.		New photovoltaic system requirements.
	R324.6.2 Setback at ridge. For photovoltaic arrays occupying not more than 33 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.		New photovoltaic system requirements.
	R324.6.2.1 Alternative setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or Section P2904, setbacks at ridges shall comply with one of the following: **1.** For photovoltaic arrays occupying not more than 66 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge. **2.** For photovoltaic arrays occupying more than 66 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.		New photovoltaic system requirements.
	~~R324.6.2.2~~ **R324.6.3 Emergency escape and rescue** ~~opening~~ **openings.** Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches		New photovoltaic system requirements.

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	(914 mm) wide shall be provided to the emergency escape and rescue opening. **Exception:** BIPV systems *listed* in accordance with Section 690.12(B)(2) of **NFPA 70**, where the removal or cutting away of portions of the BIPV system during firefighting operations has been determined to not expose a fire fighter to electrical shock hazards.		
	R324.67 Ground-mounted photovoltaic systems.		Base code renumbering.
	R324.67.1 Fire separation distances.		Base code renumbering.
	SECTION R325 **MEZZANINES** **R325.1 General.** Mezzanines shall comply with Sections R325 through R325.5. ~~*Habitable attics* shall comply with Section R325.6.~~		Base code renumbering.
	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. **Exception:** The aggregate area of a mezzanine located within a dwelling unit equipped with ~~a fire~~ an automatic sprinkler system in accordance with Section P2904 shall not be greater than one-half of the floor area of the room, provided that the mezzanine meets all of the following requirements: 1. Except for enclosed closets and bathrooms, the mezzanine is open to the room in which such mezzanine is located. 2. The opening to the room is unobstructed except for walls not more than 42 inches (1067 mm) in height, columns and posts. 3. The exceptions to Section R325.5 are not applied.		No Houston amendment.
	~~**R325.6 Habitable attic.** A habitable attic shall not be considered a story where complying with all of the following requirements:~~ ~~**1.** The occupiable floor area is not less than 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**.~~ ~~**3.** The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below.~~ ~~**4.** The floor of the occupiable space shall not extend beyond the exterior walls of the floor below.~~		Base code section removed and moved to Section R326.

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	SECTION R326 **HABITABLE ATTICS** **R326.1 General.** Habitable attics shall comply with Sections R326.2 and R326.3.		New requirements for habitable attics.
	R326.2 Minimum dimensions. A habitable attic shall have a floor area in accordance with Section R304 and a ceiling height in accordance with Section R305.		New requirements for habitable attics.
	R326.3 Story above grade plane. A habitable attic shall be considered a story above grade plane. **Exceptions:** A habitable attic shall not be considered to be a story above grade plane provided that the habitable attic meets all the following: 1. The aggregate area of the habitable attic is either of the following: 1.1. Not greater than one-third of the floor area of the story below. 1.2. Not greater than one-half of the floor area of the story below where the habitable attic is located within a dwelling unit equipped with a fire sprinkler system in accordance with Section P2904. 2. The occupiable space is enclosed by the roof assembly above, knee walls, if applicable, on the sides and the floor-ceiling assembly below. 3. The floor of the habitable attic does not extend beyond the exterior walls of the story below. 4. Where a habitable attic is located above a third story, the dwelling unit or townhouse unit shall be equipped with a fire sprinkler system in accordance with Section P2904.	**R326.3 Story above grade plane.** A habitable attic shall be considered a story above *grade plane*. **Exceptions:** A habitable attic shall not be considered to be a story above *grade plane* provided that the habitable attic meets all the following: 1. The aggregate area of the habitable attic is either of the following: 1.1. Not greater than one-third of the floor area of the story below. 1.2. Not greater than one-half of the floor area of the story below where the habitable attic is located within a dwelling unit equipped with a fire sprinkler system in accordance with Section P2904. 2. The occupiable space is enclosed by the roof assembly above, knee walls on the sides, if applicable, ~~on the sides~~ and the floor-ceiling assembly below. 3. The floor of the habitable attic does not extend beyond the exterior walls of the story below. 4. Where a habitable attic is located above a third story, the dwelling unit or townhouse unit shall be equipped with a fire sprinkler system in accordance with Section P2904.	New requirements for habitable attics. New Houston amendment based on previous Houston amendment for “habitable attic” definition; no change in enforcement.
	R326.4 Means of egress. The means of egress for habitable attics shall comply with the applicable provisions of **Section R311**.		No Houston amendment.
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*.	**SECTION ~~R326~~R327** **SWIMMING POOLS, SPAS AND HOT TUBS** **~~R326.1~~R327.1 General.**	**SECTION R327** **SWIMMINGS POOLS, SPAS AND HOT TUBS** **R327.1 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*.	Update section number, no major change to Houston amendment.
	SECTION ~~R327~~R328 **~~STATIONARY~~ ENERGY STORAGE ~~BATTERY~~ SYSTEMS** **~~R327.1~~R328.1 General.** ~~*Stationary storage battery system*~~ *Energy storage systems (ESS)* shall comply with the provisions of this section. **Exceptions:** 1. *ESS listed* and *labeled* in accordance with **UL 9540** and marked “For use in residential dwelling units”		Updates to energy storage requirements.

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	where installed in accordance with the manufacturer's instructions and **NFPA 70**. 2. *ESS* less than 1 kWh (3.6 megajoules).		
	~~**R327.2**~~**R328.2 Equipment listings.** ~~*Stationary storage battery systems*~~ *Energy storage systems (ESS)* shall be listed and labeled for residential use in accordance with UL 9540. **Exceptions**: ~~1.~~ Where approved, repurposed unlisted battery systems from electric vehicles are allowed to be installed outdoors or in detached sheds located not less than 5 feet (1524 mm) from exterior walls, property lines and public ways. ~~**2.** Battery systems that are an integral part of an electric vehicle are allowed provided that the installation complies with Section 625.48 of NFPA 70.~~ ~~**3.** Battery systems less than 1 kWh (3.6 megajoules).~~		Updates to energy storage requirements.
	~~**R327.3**~~**R328.3 Installation.** ~~*Stationary storage battery systems*~~*ESS* shall be installed in accordance with the manufacturer's instructions and their listing~~, if applicable, and shall not be installed within the habitable space of a dwelling unit~~.		Updates to energy storage requirements.
	R328.3.1 Spacing. Individual units shall be separated from each other by not less than 3 feet (914 mm) except where smaller separation distances are documented to be adequate based on large-scale Δre testing complying with Section 1207.1.5 of the *International Fire Code*.		New energy storage requirements.
	R328.4 Locations. *ESS* shall be installed only in the following locations: 1. Detached garages and detached accessory structures. 2. Attached garages separated from the dwelling unit living space in accordance with**Section R302.6**. 3. Outdoors or on the exterior side of exterior walls located not less than 3 feet (914 mm) from doors and windows directly entering the dwelling unit. 4. Enclosed utility closets, basements, storage or utility spaces within dwelling unitswith finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with not less than $^5/_8$-inch (15.9 mm) Type X gypsum wallboard. *ESS* shall not be installed in sleeping rooms, or closets or spaces opening directly into sleeping rooms.		New energy storage location requirements.
	R328.5 Energy ratings. Individual *ESS* units shall have a maximum rating of 20 kWh. The aggregate rating of the *ESS* shall not exceed: 1. 40 kWh within utility closets, basements, and storage or utility spaces. 2. 80 kWh in attached or detached garages and detached accessory structures. 3. 80 kWh on exterior walls. 4. 80 kWh outdoors on the ground.		New energy storage requirements.

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	ESS installations exceeding the permitted individual or aggregate ratings shall be installed in accordance with Section 1207 of the *International Fire Code*.		
	~~R327.4~~**R328.6 Electrical installation.** ~~*Stationary storage battery systems*~~*ESS* shall be installed in accordance with NFPA 70. Inverters shall be listed and labeled in accordance with UL 1741 or provided as part of the UL 9540 listing. Systems connected to the utility grid shall use inverters listed for utility interaction.		New energy storage requirements.
	R328.7 Fire detection. Rooms and areas within dwelling units, basements and attached garages in which *ESS* are installed shall be protected by smoke alarms in accordance with **Section R314**. A heat detector, listed and interconnected to the smoke alarms, shall be installed in locations within dwelling units and attached garages where smoke alarms cannot be installed based on their listing.		New energy storage requirements.
	~~R327.6~~**R328.8 Protection from impact.** ~~*Stationary storage battery systems*~~*ESS* installed in a location subject to vehicle damage shall be protected by *approved* barriers.		Minor update to base code language.
	~~R327.5~~**R328.9 Ventilation. Indoor installations of** ~~*stationary storage battery systems* that include batteries~~*ESS* that produce hydrogen or other flammable gases during charging shall be provided with mechanical ventilation in accordance with Section M1307.4.		Updates to energy storage requirements.
	R328.10 Electric vehicle use. The temporary use of an *owner* or occupant's electric powered vehicle to power a *dwelling unit* while parked in an attached or detached garage or outdoors shall comply with the vehicle manufacturer's instructions and **NFPA 70**.		New energy storage requirements.
	R328.11 Documentation and labeling. The following information shall be provided: 1. A copy of the manufacturer's installation, operation, maintenance and decommissioning instructions shall be provided to the owner or placed in a conspicuous location near the *ESS* equipment. 2. A label on the installed system containing the contact information for the qualified maintenance and service providers.		New energy storage requirements.
	SECTION R329 **STATIONARY ENGINE GENERATORS** **R329.1 General.** Stationary engine generators shall be *listed* and *labeled* in accordance with **UL 2200** and shall comply with this section. The connection of stationary engine generators to the premise wiring system shall be by means of a *listed* transfer switch.		New stationary engine generator requirements.
	R329.2 Installation. The installation of stationary engine generators shall be in an *approved* location and in accordance with the listing, the manufacturer's installation instructions and **Chapters 34** through **43**.		New stationary engine generator requirements.

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	SECTION R330 **STATIONARY FUEL CELL POWER SYSTEMS** **R330.1 General.** *Stationary fuel cell power systems* in new and existing buildings and structures shall comply with Section 1206 of the *International Fire Code*.		New stationary fuel cell power system requirements.

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	SECTION R401 **GENERAL** **R401.1 Application.** The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for buildings. In addition to the provisions of this chapter, the design and construction of foundations in flood hazard areas as established by Table R301.2(1) shall meet the provisions of Section R322. Wood foundations shall be designed and installed in accordance with AWC PWF. **Exception:** The provisions of this chapter shall be permitted to be used for wood foundations only in the following situations: 1. In buildings that have ~~no~~not more than two floors and a roof. 2. Where interior *basement* and foundation walls are constructed at intervals not exceeding 50 feet (15 240 mm). Wood foundations in Seismic Design Category D0 , D1 or D2 shall be designed in accordance with accepted engineering practice.		Minor wordsmithing change.
	R401.2 Requirements. Foundation construction shall be capable of accommodating all loads in accordance with Section R301 and of transmitting the resulting loads to the supporting soil. Fill soils that support footings and foundations shall be designed, installed and tested in accordance with accepted engineering practice. ~~Gravel fill used as footings for wood and precast concrete foundations shall comply with Section R403.~~		Gravel fill language removed in base code.
	R401.3 Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other *approved* point of collection that does not create a hazard. *Lots* shall be graded to drain surface water away from foundation walls. The *grade* shall fall ~~a minimum of~~not fewer than 6 inches (152 mm) within the first 10 feet (3048 mm). Exception: Where *lot lines*, walls, slopes or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), drains or swales shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped~~a minimum of~~not fewer than 2 percent away from the building.		Minor wordsmithing change.
	R401.4 Soil tests. Where quantifiable data created by accepted soil science methodologies indicate *expansive soils, compressible soils*, shifting soils or other questionable soil characteristics are likely to be present, the *building official* shall determine whether to require a soil test to determine the soil's characteristics at a		Minor wordsmithing change.

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	particular location. This test shall be done by an *approved agency* using an *approved* method.		
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.		**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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.

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	R402.1.2 Wood treatment. ~~**All**~~ Lumber and plywood shall be pressure-preservative treated and dried after treatment in accordance with AWPA U1 (Commodity Specification A, ~~Use Category 4B and Section 5.2),~~ Special Requirement 4.2), and shall bear the *label* of an accredited agency. Where lumber ~~and/~~or plywood is cut or drilled after treatment, the treated surface shall be field treated with copper naphthenate, the concentration of which shall contain ~~a minimum of~~not less than 2-percent copper metal, by repeated brushing, dipping or soaking until the wood ~~absorbs no~~cannot absorb more preservative.		Minor wordsmithing change.
	TABLE R403 **MINIMUM DEPTH (D) AND WIDTH (W) OF CRUSHED STONE FOOTING (inches)**		New base code table for depth/width of crushed stone footings.

NUMBER OF STORIES	UNIFORM WALL LOAD	DEPTH (D) AND WIDTH (W)	LOAD-BEARING VALUE OF SOIL (psf)																	
			1500			2000			2500			3000			3500			4000		
			MH, CH, CL, ML[c]			SC, GC, SM, GM, SP, SW[c]						GP, GW[c]								
			Wall width (inches)			Wall width (inches)			Wall width (inches)			Wall width (inches)			Wall width (inches)			Wall width (inches)		
			8	10	12	8	10	12	8	10	12	8	10	12	8	10	12	8	10	12
Conventional light-frame construction																				
1-story	1100 plf	D	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		W	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17
2-story	1800 plf	D	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		W	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17
3-story	2900 plf	D	14	12	10	9	7	5	6	4	4	4	4	4	4	4	4	4	4	4
		W	25	24	24	19	19	18	15	15	17	13	15	17	13	15	17	13	15	17
4-inch brick veneer over light-frame or 8-inch hollow concrete masonry																				
1-story	1500 plf	D	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		W	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17
2-story	2700 plf	D	12	11	9	8	6	4	5	4	4	4	4	4	4	4	4	4	4	4
		W	22	23	23	18	17	17	14	15	17	13	15	17	13	15	17	13	15	17
3-story	4000 plf	D	21	20	18	14	13	11	10	8	7	7	6	4	5	4	4	4	4	4
		W	33	34	33	25	26	25	20	20	21	17	17	17	14	15	17	13	15	17
8-inch solid or fully grouted masonry																				
1-story	2000 plf	D	7	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		W	17	17	17	13	15	17	13	15	17	13	15	17	13	15	17	13	15	17
2-story	3600 plf	D	19	17	15	12	11	9	9	7	5	6	4	4	4	4	4	4	4	4
		W	30	30	30	22	23	23	19	19	18	15	15	17	13	15	17	13	15	17
3-story	5300 plf	D	30	29	27	21	19	18	16	14	12	12	10	8	9	8	6	7	6	4
		W	43	44	44	33	32	33	27	27	26	22	22	22	22	20	19	17	17	17

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2.

a. Linear interpolation of stone depth between wall widths is permitted within each Load-Bearing Value of Soil (psf).

b. Crushed stone must be consolidated in 8-inch lifts with a plate vibrator.

c. Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R4045.1.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R403.1(1)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)[a, b, c, d]

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1,500	2,000	2,500	3,000	3,500	4,000
20 psf roof live load or 25 psf ground snow load	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	16~~18~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	13~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	15~~16~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	19~~22~~ × 6	14 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—slab-on-grade	16~~14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	18~~19~~ × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—plus basement	22 × 7 ~~25 × 8~~	16 ~~19~~ × 6	13 ~~15~~ × 6	12 ~~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	16~~19~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	13~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	16~~17~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6

Updated table for concrete footings.

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	2 story—plus basement	19~~23~~ × 6	14 ~~17~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—slab-on-grade	16~~15~~ × 6	14 ~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	19~~20~~ × 6	14 ~~15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—plus basement	22 × 7 ~~26 × 8~~	16 ~~20~~ × 6	13 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
50 psf	1 story—slab-on-grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	14~~16~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	18~~21~~ × 6	13 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	15~~14~~ × 6	13 ~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	17~~19~~ × 6	13 ~~14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	21~~25~~ × 7	15 ~~19~~ × 6	12 ~~15~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—slab-on-grade	18~~17~~ × 6	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	20~~22~~ × 6	15 ~~17~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—plus basement	24 × 8 ~~28 × 9~~	18 ~~21~~ × 6	14 ~~17~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	1 story—slab-on-grade	14~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	16~~18~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6

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70 psf	1 story—plus basement	19 × 6 ~~24 × 7~~	14 ~~18~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	17 ~~16~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	19 ~~21~~ × 6	14 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	22 × 7 ~~27 × 9~~	17 ~~20~~ × 6	13 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	3 story—slab-on-grade	20 ~~19~~ × 6	15 ~~14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	22 ~~25~~ × 7	16 ~~18~~ × 6	13 ~~15~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—plus basement	24 × 8 ~~30 × 10~~	19 ~~23~~ × 6	15 ~~18~~ × 6	13 ~~15~~ × 6	12 ~~13~~ × 6	12 × 6

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m².

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not ~~allowed~~permitted.
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 table is based on the following conditions and loads: building width, 32 feet; wall height, 9 feet; basement wall height, 8 feet; dead loads, 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; live loads, roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floors. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.
c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.
d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2-inch decrease in footing width and 1-inch decrease in footing depth are permitted for every 4 feet of decrease in building width provided that the minimum width is 12 inches and minimum depth is 6 inches.

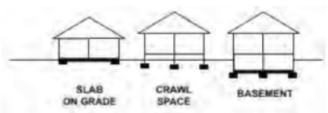

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TABLE R403.1(2)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER OR LATH AND PLASTER (inches)[a, b, c, d]

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LOAD-BEARING VALUE OF SOIL (psf)					
		1,500	2,000	2,500	3,000	3,500	4,000
20 psf roof live load or 25 psf ground snow load	1 story—slab-on-grade	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	18 ~~21~~ × 6	14 ~~15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	18 ~~15~~ × 6	13 ~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	23 ~~26~~ × 8	17 ~~20~~ × 6	14 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
	3 story—slab-on-grade	23 × 8 ~~20 × 6~~	17 ~~15~~ × 6	14 ~~12~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	25 × 9 ~~26 × 8~~	19 × 6	15 × 6	13 × 6	12 × 6	12 × 6
	3 story—plus basement	29 ~~32~~ × 11	21 ~~24~~ × 7	17 ~~19~~ × 6	14 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6
30 psf	1 story—slab-on-grade	13 ~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	15 ~~16~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	18 ~~22~~ × 6	14 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	18 ~~16~~ × 6	14 ~~12~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	20 ~~22~~ × 6	15 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6	12 × 6

Updated table for concrete footings.

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	2 story—plus basement	24 × 8 ~~27 × 9~~	18~~-21~~ × 6	14 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	3 story—slab-on-grade	23 × 8 ~~21 × 6~~	18~~-16~~ × 6	14 ~~13~~ × 6	12 × 6	12 × 6	12 × 6
	3 story—with crawl space	26 × 9 ~~27 × 8~~	19~~-20~~ × 6	15 ~~16~~ × 6	13 × 6	12 × 6	12 × 6
	3 story—plus basement	29~~-33~~ × 11	22~~-24~~ × 7	17 ~~20~~ × 6	14 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6
50 psf	1 story—slab-on-grade	14~~-13~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	17~~-18~~ × 6	13~~-14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	20 × 60~~-24 × 7~~	15~~-18~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	20~~-18~~ × 6	15~~-14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	22~~-24~~ × 7	17~~-18~~ × 6	13 ~~14~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—plus basement	25 × 9 ~~29 × 10~~	19~~-22~~ × 6	15 ~~18~~ × 6	13 ~~15~~ × 6	12 ~~13~~ × 6	12 × 6
	3 story—slab-on-grade	25 × 9 ~~27 × 7~~	19~~-18~~ × 6	15 ~~13~~ × 6	13 ~~12~~ × 6	12 × 6	12 × 6
	3 story—with crawl space	27 × 10~~-29 × 9~~	21 × 7~~-22 × 6~~	16 ~~17~~ × 6	14 × 6	12 × 6	12 × 6
	3 story—plus basement	31~~-35~~ × 12	23~~-26~~ × 8	18 ~~21~~ × 6	15 ~~17~~ × 6	13 ~~15~~ × 6	12 ~~13~~ × 6
	1 story—slab-on-grade	14~~-15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	17~~-20~~ × 6	14~~-15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	22 × 7 ~~26 × 8~~	16~~-20~~ × 6	13 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6

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70 psf	2 story—slab-on grade	21 × 7 ~~20 × 6~~	16 ~~15~~ × 6	13 ~~12~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	24 ~~26~~ × 8	18 ~~19~~ × 6	14 ~~15~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
	2 story—plus basement	27 × 10 ~~32 × 11~~	20 × 6 ~~24 × 7~~	16 ~~19~~ × 6	13 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6
	3 story—slab-on-grade	27 × 10 ~~26 × 8~~	20 ~~19~~ × 6	16 ~~15~~ × 6	13 × 6	12 × 6	12 × 6
	3 story—with crawl space	29 ~~31~~ × 11	22 ~~23~~ × 7	17 ~~19~~ × 6	15 ~~16~~ × 6	12 ~~13~~ × 6	12 × 6
	3 story—plus basement	32 × 12 ~~37 × 13~~	24 × 8 ~~28 × 9~~	19 ~~22~~ × 6	16 ~~18~~ × 6	14 ~~16~~ × 6	12 ~~14~~ × 6

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m^2.

a. ~~Interpolation allowed.~~ Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not ~~allowed~~permitted.
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 table is based on the following conditions and loads: building width, 32 feet; wall height, 9 feet; basement wall height, 8 feet; dead loads, 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; live loads, roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floors. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.
c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.
d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2-inch decrease in footing width and 1-inch decrease in footing depth are permitted for every 4 feet of decrease in building width provided that the minimum width is 12 inches and minimum depth is 6 inches.

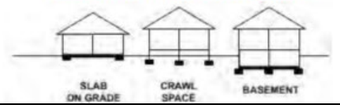

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TABLE R403.1(3)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR ~~FULLY~~ PARTIALLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b, c, d]

GROUND SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU OR CONCRETE	LOAD-BEARING VALUE OF SOIL (psf)					
		1,500	2,000	2,500	3,000	3,500	4,000
20 psf roof live load or 25 psf ground snow load	1 story—slab-on-grade	13~~-14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	16~~-19~~ × 6	12~~-14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	19 × 6 ~~25 × 8~~	14~~-19~~ × 6	12~~-15~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
	2 story—slab-on-grade	19 × 6 ~~23 × 7~~	14~~-18~~ × 6	12~~-14~~ × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	22 × 7 ~~29 × 9~~	16~~-22~~ × 6	13~~-17~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	2 story—plus basement	25 × 9 ~~35 × 12~~	19 × 6 ~~26 × 8~~	15~~-21~~ × 6	12 ~~17~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6
	3 story—slab-on-grade	25 × 9 ~~32 × 11~~	19 × 6 ~~24 × 7~~	15~~-19~~ × 6	13 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6
	3 story—with crawl space	28 × 10~~-38 × 14~~	21 × 7~~-28 × 9~~	17~~-23~~ × 6	14 ~~19~~ × 6	12 ~~16~~ × 6	12 ~~14~~ × 6
	3 story—plus basement	31 × 12~~-43 × 17~~	23 × 8~~-33 × 11~~	18 × 6~~-26 × 8~~	15 ~~22~~ × 6	13 ~~19~~ × 6	12 ~~16~~ × 6
30 psf roof live load or 40 psf ground snow load	1 story—slab-on-grade	13~~-15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	16~~-20~~ × 6	12~~-15~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	19 × 7 ~~26 × 8~~	14~~-20~~ × 6	12~~-16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
	2 story—slab-on-grade	19 × 6 ~~24 × 7~~	15~~-18~~ × 6	12~~-15~~ × 6	12 × 6	12 × 6	12 × 6

Updated table for concrete footings.

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30 psf	2 story—with crawl space	22 × 7 ~~30 × 10~~	16~~-22~~ × 6	13~~-18~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6	12 × 6
	2 story—plus basement	25 × 9 ~~36 × 13~~	19 × 6~~-27 × 8~~	15~~-21~~ × 6	13 ~~18~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6
	3 story—slab-on-grade	26 × 9 ~~33 × 12~~	19 × 6~~-25 × 7~~	15~~-20~~ × 6	13 ~~17~~ × 6	12 ~~14~~ × 6	12 × 6
	3 story—with crawl space	28 × 10~~-39 × 14~~	21 × 7~~-29 × 9~~	17 × 6~~-23 × 7~~	14 ~~19~~ × 6	12 ~~17~~ × 6	12 ~~14~~ × 6
	3 story—plus basement	31 × 12~~-44 × 17~~	23 × 8~~-33 × 12~~	19 × 6~~-27 × 8~~	16 ~~22~~ × 6	13 ~~19~~ × 6	12 ~~17~~ × 6
50 psf	1 story—slab-on-grade	15~~-17~~ × 6	12~~-13~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	18~~-22~~ × 6	13~~-17~~ × 6	12~~-13~~ × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	21 × 7 ~~28x9~~	16~~-21~~ × 6	12~~-17~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	2 story—slab-on-grade	21 × 7 ~~27 × 8~~	16~~-20~~ × 6	13~~-16~~ × 6	12 ~~13~~ × 6	12 × 6	12 × 6
	2 story—with crawl space	24 × 8 ~~32 × 11~~	18 × 6~~-24 × 7~~	14~~-19~~ × 6	12 ~~16~~ × 6	12 ~~14~~ × 6	12 × 6
	2 story—plus basement	27 × 10~~-38 × 14~~	20 × 6~~-28 × 9~~	16~~-23~~ × 6	13 ~~19~~ × 6	12 ~~16~~ × 6	12 ~~14~~ × 6
	3 story—slab-on-grade	27 × 10~~-35 × 13~~	20 × 6~~-27 × 8~~	16~~-21~~ × 6	14 ~~18~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6
	3 story—with crawl space	30 × 11~~-41 × 15~~	22 × 7~~-31 × 10~~	18 × 6~~-24 × 7~~	15 ~~20~~ × 6	13 ~~17~~ × 6	12 ~~15~~ × 6
	3 story—plus basement	33 × 13~~-47 × 18~~	25 × 9~~-35 × 12~~	20 × 6~~-28 × 9~~	16 × 6~~-23 × 7~~	14 ~~20~~ × 6	12 ~~17~~ × 6
	1 story—slab-on-grade	17~~19~~ × 6	13~~-14~~ × 6	12 × 6	12 × 6	12 × 6	12 × 6

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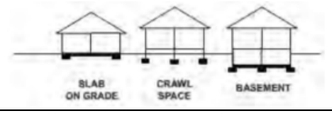
70 psf	1 story—with crawl space	19 × 6 ~~25 × 7~~	14~~18~~ × 6	12~~15~~ × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	22 × 7 ~~30 × 10~~	17~~23~~ × 6	13~~18~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6	12 × 6
	2 story—slab-on-grade	23 × 8 ~~29 × 9~~	17~~22~~ × 6	14~~17~~ × 6	12 ~~14~~ × 6	12 × 6	12 × 6
	2 story—with crawl space	25 × 9 ~~34 × 12~~	19 × 6~~26 × 8~~	15~~21~~ × 6	12 ~~17~~ × 6	12 ~~15~~ × 6	12 ~~13~~ × 6
	2 story—plus basement	28 × 10~~40 × 15~~	21 × 7~~30 × 10~~	17 × 6~~24 × 7~~	14 ~~20~~ × 6	12 ~~17~~ × 6	12 ~~15~~ × 6
	3 story—slab-on-grade	29 × 11~~38 × 14~~	22 × 7~~28 × 9~~	17~~23~~ × 6	14 ~~19~~ × 6	12 ~~16~~ × 6	12 ~~14~~ × 6
	3 story—with crawl space	31 × 12~~43 × 16~~	23 × 8~~32 × 11~~	19 × 6~~26 × 8~~	16 ~~21~~ × 6	13 ~~18~~ × 6	12 ~~16~~ × 6
	3 story—plus basement	34 × 13~~49 × 19~~	26 × 9~~37 × 13~~	21 × 7~~29 × 10~~	17 × 6~~24 × 7~~	15 ~~21~~ × 6	13 ~~18~~ × 6

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m².

a. ~~Interpolation allowed.~~Linear interpolation of footing width is permitted between the soil bearing pressures in the table. Extrapolation is not ~~allowed~~permitted.
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 table is based on the following conditions and loads: building width, 32 feet; wall height, 9 feet; basement wall height, 8 feet; dead loads, 15 psf roof and ceiling assembly, 10 psf floor assembly, 12 psf wall assembly; live loads, roof and ground snow loads as listed, 40 psf first floor, 30 psf second and third floors. Footing sizes are calculated assuming a clear span roof/ceiling assembly and an interior bearing wall or beam at each floor.
c. Where the building width perpendicular to the wall footing is greater than 32 feet, the footing width shall be increased by 2 inches and footing depth shall be increased by 1 inch for every 4 feet of increase in building width.
d. Where the building width perpendicular to the wall footing is less than 32 feet, a 2-inch decrease in footing width and 1-inch decrease in footing depth are permitted for every 4 feet of decrease in building width provided that the minimum width is 12 inches and minimum depth is 6 inches.



	R403.1 General. All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, crushed stone footings, wood foundations, or other *approved* structural systems ~~which~~that shall be of sufficient design to accommodate all loads according to Section R301 and to transmit the resulting loads to the soil within the limitations as determined from the character of the soil. Footings shall be supported on undisturbed natural soils or engineered fill. Concrete footing shall be designed and constructed in accordance with the provisions of Section R403 or in accordance with ACI 332.		Minor wordsmithing change.

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	R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable, but not less than 12 inches (305 mm) in width and 6 inches (152 mm) in depth. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be 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). Footings for precast foundations shall be in accordance with the details set forth in Section R403.4, Table R403.4, and Figures R403.4(1) and R403.4(2).		Update to concrete footing requirements.
	R403.1.2 Continuous footing in Seismic Design Categories D_0, D_1 and D_2. 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 r~~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 (1219 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.		Minor wordsmithing change.
	R403.1.3.1 Concrete stem walls with concrete footings. In Seismic Design Categories D_0, D_1 and D_2 where a construction joint is created between a concrete footing and a concrete stem wall, ~~a minimum of~~ not fewer than one No. 4 vertical bar shall be installed at not more than 4 feet (1219 mm) on center. The vertical bar shall have a standard hook and extend to the bottom of the footing and shall have support and cover as specified in Section R403.1.3.5.3 and extend ~~a minimum of~~ not less than 14 inches (357 mm) into the stem wall. Standard hooks shall comply with Section		Minor wordsmithing change.

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	R608.5.4.5. ~~A minimum of~~ Not fewer than one No. 4 horizontal bar shall be installed within 12 inches (305 mm) of the top of the stem wall and one No. 4 horizontal bar shall be located 3 to 4 inches (76 mm to 102 mm) from the bottom of the footing.		
	R403.1.3.2 Masonry stem walls with concrete footings. In Seismic Design Categories D_0, D_1 and D_2 where a masonry stem wall is supported on a concrete footing, ~~a minimum of~~ not fewer than one No. 4 vertical bar shall be installed at not more than 4 feet (1219 mm) on center. The vertical bar shall have a standard hook and extend to the bottom of the footing and shall have support and cover as specified in Section R403.1.3.5.3 and extend ~~a minimum of~~ not less than 14 inches (357 mm) into the stem wall. Standard hooks shall comply with Section R608.5.4.5. ~~A minimum of~~ Not fewer than one No. 4 horizontal bar shall be installed within 12 inches (305 mm) of the top of the wall and one No. 4 horizontal bar shall be located 3 to 4 inches (76 mm to 102 mm) from the bottom of the footing. Masonry stem walls shall be solid grouted.		Minor wordsmithing change.
	R403.1.3.3 Slabs-on-ground with turned-down footings. In Seismic Design Categories D_0, D_1 and D_2, slabs on groundcast monolithically with turned-down footings shall have ~~a minimum of~~ not fewer than one No. 4 bar at the top and the bottom of the footing or one No. 5 bar or two No. 4 bars in the middle third of the footing depth. Where the slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks on each end shall be installed at not more than 4 feet (1219 mm) on center in accordance with Figure R403.1.3, Detail 2. Standard hooks shall comply with Section R608.5.4.5.		Minor wordsmithing change.
	R403.1.3.5.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM ~~A 615~~A615, ~~A 706~~A706 or ~~A 996~~A996. ASTM ~~A 996~~A996 bars produced from rail steel shall be Type R. The minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa).		Updated reference standards.
	R403.1.4.1 Frost protection. Except where otherwise protected from frost, foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods: 1. Extended below the frost line specified in Table R301.2.(1). 2. Constructed in accordance with Section R403.3. 3. Constructed in accordance with ASCE 32. 4. Erected on solid rock. Footings shall not bear on frozen soil unless the frozen condition is permanent. Exceptions: 1. Protection of free-standing *accessory structures* with an area of 600 square feet (56 m2) or less, of light-frame construction, with an eave		Updates to footing protection requirements.

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	height of 10 feet (3048 mm) or less shall not be required. 2. Protection of free-standing *accessory structures* with an area of 400 square feet (37 m2) or less, of other than light-frame construction, with an eave height of 10 feet (3048mm) or less shall not be required. 3. ~~Decks not supported by a dwelling need not be provided with footings that extend below the frost line.~~ ~~Footings shall not bear on frozen soil unless the frozen condition is permanent.~~		
	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~~ in accordance with Section R505.3.1 or R603.3.1, as applicable. Wood sill plates supporting cold-formed steel framing shall be anchored to the foundation 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~~not greater than 6 feet (1829 mm) on center or *approved* anchors or anchor straps spaced as required to provide equivalent anchorage to 1/2 -inch-diameter (12.7 mm) anchor bolts. Bolts shall extend ~~a minimum of~~not less than 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~~not fewer than 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. Anchor bolts shall be permitted to be located while concrete is still plastic and before it has set. Where anchor bolts resist placement or the consolidation of concrete around anchor bolts is impeded, the concrete shall be vibrated to ensure full contact between the anchor bolts and concrete. 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~~ not fewer than one anchor bolt located in the center third of the plate section and shall be attached to		Updates to foundation anchorage requirements.

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	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).		
	R403.1.6.1 Foundation anchorage in Seismic Design Categories C, D_0, D_1 and D_2. In addition to the requirements of Section R403.1.6, the following requirements shall apply to wood light-frame structures in Seismic Design Categories D_0, D_1 and D_2 and wood light-frame townhouses in Seismic Design Category C. 1. Plate washers conforming to Section R602.11.1 shall be provided for all anchor bolts over the full length of required *braced wall lines* except where *approved* anchor straps are used. Properly sized cut washers shall be permitted for anchor bolts in wall lines not containing *braced wall panels*. 2. Interior braced wall plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when~~n~~re supported on a continuous foundation. 3. Interior bearing wall sole plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305 mm) of the ends of each plate section when~~n~~re supported on a continuous foundation. 4. The maximum anchor bolt spacing shall be 4 feet (1219 mm) for buildings over two stories in height. 5. Stepped cripple walls shall conform to Section R602.11.2. 6. Where continuous wood foundations in accordance with Section R404.2 are used, the force transfer shall have a capacity equal to or greater than the connections required by Section R602.11.1 or the *braced wall panel* shall be connected to the wood foundations in accordance with the *braced wall panel*-to-floor fastening requirements of Table R602.3(1).		Minor wordsmithing change.
	R403.1.7.3 Foundation elevation. On graded sites, the top of any exterior foundation shall extend above the elevation of the street gutter at point of discharge or the inlet of an *approved* drainage device ~~a minimum of~~ not less than 12 inches (305 mm) plus 2 percent. Alternate elevations are permitted subject to the approval of the *building official*, provided that it can be demonstrated that required drainage to the point of discharge and away from the structure is provided at all locations on the site.		Minor wordsmithing change.

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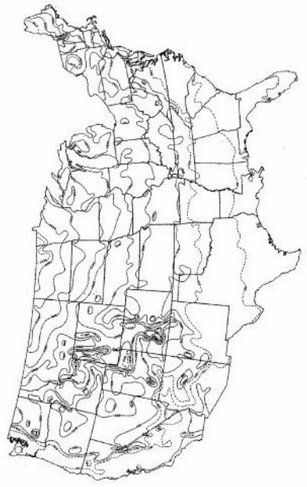
	R403.1.8 Foundations on expansive soils. Foundation and floor slabs for buildings located on expansive soils shall be designed in accordance with Section 1808.6 of the *International Building Code*. **Exception:** Slab-on-ground and other foundation systems ~~which~~ that have performed adequately in soil conditions similar to those encountered at the building site are permitted subject to the approval of the *building official*.		Minor wordsmithing change.
	R403.1.8.1 Expansive soils classifications. Soils meeting all ~~**four**~~ of the following provisions shall be considered to be expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted: 1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM ~~D 4318~~D4318. 2. More than 10 percent of the soil particles pass a No. 200 sieve (75 µm), determined in accordance with ASTM ~~D 422~~D422. 3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM ~~D 422~~D422. 4. Expansion Index greater than 20, determined in accordance with ASTM ~~D 4829~~D4829.		Minor wordsmithing change.
	 For SI: °C = [(°F) – 32]/1.8. Note: The air-freezing index is defined as cumulative degree days below 32°F. It is used as a measure of the combined magnitude and duration of air temperature below freezing. The index was computed over a 12-month period (July–June) for each of the 3,044 stations used in the above analysis. Dates from the 1951–80 period were fitted to a Weibull probability distribution to produce an estimate of the 100-year return period. **FIGURE R403.3(2)** **AIR-FREEZING INDEX AN ESTIMATE OF THE 100-YEAR RETURN PERIOD**		New figure for air-freezing index.

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	R403.3 Frost-protected shallow foundations. For buildings where the monthly mean temperature of the building is maintained at ~~a minimum of~~not less than 64°F (18°C), footings are not required to extend below the frost line when~~n~~re protected from frost by insulation in accordance with Figure R403.3(1) and Table R403.3(1). Foundations protected from frost in accordance with Figure R403.3(1) and Table R403.3(1) shall not be used for unheated spaces such as porches, utility rooms, garages and carports, and shall not be attached to basements or crawl spaces that are not maintained at a minimum monthly mean temperature of 64°F (18°C). Materials used below *grade* for the purpose of insulating footings against frost shall be *labeled* as complying with ASTM ~~C~~ 578C578.		Minor wordsmithing change.
	R403.3.1.1 Attachment to unheated slab-on-ground structure. Vertical wall insulation and horizontal insulation of frost-protected shallow foundations that adjoin a slab-on-ground foundation that does not have a monthly mean temperature maintained at ~~a minimum of~~ not less than 64°F (18°C) shall be in accordance with Figure R403.3(3) and Table R403.3(1). Vertical wall insulation shall extend between the frost-protected shallow foundation and the adjoining slab foundation. Required horizontal insulation shall be continuous under the adjoining slab foundation and through any foundation walls adjoining the frost- protected shallow foundation. Where insulation passes through a foundation wall, it shall be either of a type complying with this section and having bearing capacity equal to or greater than the structural loads imposed by the building, or the building shall be designed and constructed using beams, lintels, cantilevers or other means of transferring building loads such that the structural loads of the building do not bear on the insulation.		Minor wordsmithing change.
	R403.3.1.2 Attachment to heated structure. Where a frost-protected shallow foundation abuts a structure that has a monthly mean temperature maintained at ~~a minimum of~~ not less than 64°F (18°C), horizontal insulation and vertical wall insulation shall not be required between the frost-protected shallow foundation and the adjoining structure. Where the frost-protected shallow foundation abuts the heated structure, the horizontal insulation and vertical wall insulation shall extend along the adjoining foundation in accordance with Figure R403.3(4) a distance of not less than Dimension A in Table R403.3(1). **Exception:** Where the frost-protected shallow foundation abuts the heated structure to form an inside corner, vertical insulation extending along the adjoining foundation is not required.		Minor wordsmithing change.
	~~**TABLE R403.4**~~ ~~MINIMUM DEPTH OF CRUSHED STONE FOOTINGSa (D),~~ ~~(inches)~~		Base code table removed and relocated.

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	R403.4.1 Crushed stone footings. Clean crushed stone shall be free from organic, clayey or silty soils. Crushed stone shall be angular in nature and meet ASTM ~~C 33~~ C33, with the maximum size stone not to exceed 1/2 inch (12.7 mm) and the minimum stone size not to be smaller than 1/16 inch (1.6 mm). Crushed stone footings for precast foundations shall be installed in accordance with Figure R403.4(1) and Table R403.4. Crushed stone footings shall be consolidated using a vibratory plate in ~~a maximum of~~ not greater than 8-inch (203 mm) lifts. Crushed stone footings shall be limited to Seismic Design Categories A, B and C.		Minor wordsmithing change.
	TABLE R404.1.1(1) PLAIN MASONRY FOUNDATION WALLS[f] MAXIMUM UNSUPPORTED WALL HEIGHT (feet) | MAXIMUM UNBALANCED BACKFILL HEIGHT[c] (feet) | PLAIN MASONRY[a] MINIMUM NOMINAL WALL THICKNESS (inches) — Soil classes[b]: GW, GP, SW and SP | GM, GC, SM, SM-SC and ML | SC, MH, ML-CL and inorganic CL		Minor update to table.
	TABLE R404.1.1(2) 8-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ≥ 5 INCHES[a, c, f] MAXIMUM UNSUPPORTED WALL HEIGHT | HEIGHT OF UNBALANCED BACKFILL[e] | MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)[b, c] — Soil classes and lateral soil load[d] (psf per foot below grade): GW, GP, SW and SP soils 30 | GM, GC, SM, SM-SC and ML soils 45 | SC, ML-CL and inorganic CL soils 60		Minor update to table.
	TABLE R404.1.1(3) 10-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ≥ 6.75 INCHES[a, c, f] MAXIMUM UNSUPPORTED WALL HEIGHT | HEIGHT OF UNBALANCED BACKFILL[e] | MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)[b, c] — Soil classes and later soil load[d] (psf per foot below grade): GW, GP, SW and SP soils 30 | GM, GC, SM, SM-SC and ML soils 45 | SC, ML-CL and inorganic CL soils 60		Minor update to table.
	TABLE R404.1.1(4) 12-INCH MASONRY FOUNDATION WALLS WITH REINFORCING WHERE d ≥ 8.75 INCHES[a, c, f] MAXIMUM UNSUPPORTED WALL HEIGHT | HEIGHT OF UNBALANCED BACKFILL[e] | MINIMUM VERTICAL REINFORCEMENT AND SPACING (INCHES)[b, c] — Soil classes and lateral soil load[d] (psf per foot below grade): GW, GP, SW and SP soils 30 | GM, GC, SM, SM-SC and ML soils 45 | SC, ML-CL and inorganic CL soils 60		Minor update to table.
	R404.1.2 Design of masonry foundation walls. Masonry foundation walls shall be designed and constructed in accordance with the provisions of this section or in accordance with the provisions of TMS 402/~~**ACI 530/ASCE 5.**~~ Where TMS 402/~~**ACI 530/ASCE 5**~~ or the provisions of this section are used to design masonry foundation walls, project drawings, typical		Minor wordsmithing change.

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<table>
<tr>
<td></td>
<td>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.</td>
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<tr>
<td></td>
<td>TABLE R404.1.2(1)
MINIMUM HORIZONTAL REINFORCEMENT FOR CONCRETE BASEMENT WALLS[a, b]
<table><tr><th>MAXIMUM UNSUPPORTED ~~HEIGHT OF BASEMENT~~ WALL HEIGHT (feet)</th><th>LOCATION OF HORIZONTAL REINFORCEMENT</th></tr><tr><td>≤ 8</td><td>One No. 4 bar within 12 inches of the top of the wall story and one No. 4 bar near mid-height of the wall story.</td></tr><tr><td>> 8</td><td>One No. 4 bar within 12 inches of the top of the wall story and one No. 4 bar near third points in the wall story.</td></tr></table>For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa.
a. Horizontal reinforcement requirements are for reinforcing bars with a minimum yield strength of 40,000 psi and concrete with a minimum concrete compressive strength of 2,500 psi.
b. See Section R404.1.3.2 for minimum reinforcement required for foundation walls supporting above-grade concrete walls.</td>
<td></td>
<td>Minor update to table.</td>
</tr>
<tr>
<td></td>
<td>TABLE R404.1.2(8)
MINIMUM VERTICAL REINFORCEMENT FOR 6-, 8-, 10- AND 12-INCH NOMINAL FLAT BASEMENT WALLS[b, c, d, e, f, h, i, k, n, o]
<table><tr><th rowspan="5">MAXIMUM UNSUPPORTED WALL HEIGHT (feet)</th><th rowspan="5">MAXIMUM UNBALANCED BACKFILL HEIGHT[g] (feet)</th><th colspan="12">MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)</th></tr><tr><th colspan="12">Soil classes[a] and design lateral soil (psf per foot of depth)</th></tr><tr><th colspan="4">GW, GP, SW, SP 30</th><th colspan="4">GM, GC, SM, SM-SC and ML 45</th><th colspan="4">SC, ML-CL and inorganic CL 60</th></tr><tr><th colspan="12">Minimum nominal wall thickness (inches)</th></tr><tr><th>6</th><th>8</th><th>10</th><th>12</th><th>6</th><th>8</th><th>10</th><th>12</th><th>6</th><th>8</th><th>10</th><th>12</th></tr></table></td>
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<td>Minor update to table.</td>
</tr>
<tr>
<td></td>
<td>R404.1.2.1 Masonry foundation walls. Concrete masonry and clay masonry foundation walls shall be constructed as set forth in Table R404.1.1(1), R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall ~~also~~ comply with applicable provisions of Section R606. In buildings assigned to Seismic Design Categories D_0, D_1 and D_2, concrete masonry and clay masonry foundation walls shall also comply with Section R404.1.4.1. Rubble stone masonry foundation walls shall be constructed in accordance with Sections R404.1.8 and R606.~~3~~4.2. Rubble stone masonry walls shall not be used in Seismic Design Categories D0 , D1 and D2, or in townhouses in Seismic Design Category C.</td>
<td></td>
<td>Minor update to seismic requirements.</td>
</tr>
<tr>
<td>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</td>
<td></td>
<td>SECTION R404
FOUNDATION AND RETAINING WALLS
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,</td>
<td>No change to Houston amendment.</td>
</tr>
</table>

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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*.~~		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. ~~Where 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.~~	
	R404.1.3.3.2 Concrete mixing and delivery. Mixing and delivery of concrete shall comply with ASTM ~~C 94~~C94 or ASTM ~~C 685~~C685.		Updated reference standards.
	R404.1.3.3.3 Maximum aggregate size. The nominal maximum size of coarse aggregate shall not exceed one-fifth the narrowest distance between sides of forms, or three-fourths the clear spacing between reinforcing bars or between a bar and the side of the form. **Exception:** When~~n~~re *approved*, these limitations shall not apply where removable forms are used and workability and methods of consolidation permit concrete to be placed without honeycombs or voids.		Minor wordsmithing change.
	R404.1.3.3.4 Proportioning and slump of concrete. Proportions of materials for concrete shall be established to provide workability and consistency to permit concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding. Slump of concrete placed in removable forms shall not exceed 6 inches (152 mm). **Exception:** When~~n~~re *approved*, the slump is permitted to exceed 6 inches (152 mm) for concrete mixtures that are resistant to segregation, and are in accordance with the form manufacturer's recommendations. Slump of concrete placed in stay-in-place forms shall exceed 6 inches (152 mm). Slump of concrete shall be determined in accordance with ASTM ~~C 143~~ C143.		Minor wordsmithing change.
	R404.1.3.3.5 Consolidation of concrete. Concrete shall be consolidated by suitable means during placement and shall be worked around embedded items and reinforcement and into corners of forms. Where stay-in-place forms are used, concrete shall be consolidated by internal vibration. **Exception:** When~~n~~re *approved* for concrete to be placed in stay-in-place forms, self-consolidating concrete mixtures with slumps equal to or greater than 8 inches (203 mm) that are specifically		Minor wordsmithing change.

	designed for placement without internal vibration need not be internally vibrated.		
	R404.1.3.3.6 Form materials and form ties. Forms shall be made of wood, steel, aluminum, plastic, a composite of cement and foam insulation, a composite of cement and wood chips, or other *approved* material suitable for supporting and containing concrete. Forms shall be accurately positioned and secured before placing concrete and shall provide sufficient strength to contain concrete during the concrete placement operation. Form ties shall be steel, solid plastic, foam plastic, a composite of cement and wood chips, a composite of cement and foam plastic, or other suitable material capable of resisting the forces created by fluid pressure of fresh concrete.		Minor update to form requirements.
	R404.1.3.3.6.1 Stay-in-place forms. Stay-in-place concrete forms shall comply with this section. 1. Surface burning characteristics. The flame-spread index and smoke-developed index of forming material, other than foam plastic, left exposed on the interior shall comply with Section R302. The surface burning characteristics of foam plastic used in insulating concrete forms shall comply with Section R316.3. 2. Interior covering. Stay-in-place forms constructed of rigid foam plastic shall be protected on the interior of the building as required by Section R316. Where gypsum board is used to protect the foam plastic, it shall be installed with a mechanical fastening system. Use of adhesives in addition to mechanical fasteners is permitted. 3. Exterior wall covering. Stay-in-place forms constructed of rigid foam plastics shall be protected from sunlight and physical damage by the application of an approved exterior wall covering complying with this code. Exterior surfaces of other stay-in-place forming systems shall be protected in accordance with this code. 4. Termite protection. In areas where the probability of termite infestation is "very heavy" as indicated by Table R301.2(1) or Figure R301.2(~~6~~7), foam plastic insulation shall be permitted below grade on foundation walls in accordance with Section R318.4.		Minor wordsmithing change and base code renumbering.

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	5. Flat ICF wall system forms shall conform to ASTM ~~E 2634~~E2634.		
	R404.1.3.3.7.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM ~~A 615, A 706~~ A615, A706, or ~~A 996~~ A996. ASTM ~~A 996~~ A996 bars produced from rail steel shall be Type R. In buildings assigned to Seismic Design Category A, B or C, the minimum yield strength of reinforcing steel shall be 40,000 psi (Grade 40) (276 MPa). In buildings assigned to Seismic Design Category D0 , D1 or D2 , ~~reinforcing steel shall comply with the requirements of ASTM A706 for low-alloy steel with a~~ minimum yield strength ~~of~~ shall be 60,000 psi (Grade 60) (414 MPa).		Minor wordsmithing change.
	R404.1.3.3.7.6 Alternate grade of reinforcement and spacing. here tables in Section R404.1.3.2 specify vertical wall reinforcement based on minimum bar size and maximum spacing, which are based on Grade 60 (414 MPa) steel reinforcement, different size bars or bars made from a different grade of steel are permitted provided that an equivalent area of steel per linear foot of wall is provided. Use of Table R404.1.2(9) is permitted to determine the maximum bar spacing for different bar sizes than specified in the tables or bars made from a different grade of steel. Bars shall not be spaced less than one-half the wall thickness, or more than 48 inches (1219 mm) on center.		Minor wordsmithing change.
	R404.1.3.3.7.8 Construction joint reinforcement. Construction joints in foundation walls shall be made and located to not impair the strength of the wall. Construction joints in plain concrete walls, including walls required to have not less than No. 4 bars at 48 inches (1219 mm) on center by Sections R404.1.3.2 and R404.1.4.2, shall be located at points of lateral support, and ~~a minimum of~~ not fewer than one No. 4 bar shall extend across the construction joint at a spacing not to exceed 24 inches (610 mm) on center. Construction joint reinforcement shall have ~~a minimum of~~ not less than 12 inches (305 mm) embedment on both sides of the joint. Construction joints in reinforced concrete walls shall be located in the middle third of the span between lateral supports, or located and constructed as required for joints in plain concrete walls. Exception: Use of vertical wall reinforcement required by this code is permitted in lieu of		Minor wordsmithing change.

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	construction joint reinforcement provided that the spacing does not exceed 24 inches (610 mm), or the combination of wall reinforcement and ~~No.4~~ No. 4 bars described ~~above~~ in this section does not exceed 24 inches (610 mm).		
	R404.1.4.1 Masonry foundation walls. In buildings assigned to Seismic Design Category D_0, D1 or D_2, 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 (2438 mm). 2. Unbalanced backfill height shall not exceed 4 feet (1219 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~~ not greater than 4 feet (1219 mm) on center in grouted cells. Vertical reinforcement shall be tied to the horizontal reinforcement in the footings. 5. Foundation walls, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 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.		Minor wordsmithing change.
	R404.1.5.1 Masonry wall thickness. Masonry foundation walls shall be not less than the thickness of the wall supported, except that masonry foundation walls of ~~at least~~ not less than 8-inch (203 mm) nominal thickness shall be permitted under brick veneered frame walls and under 10-inch-wide (254 mm) cavity walls where the total height of the wall supported, including gables, is not more than 20 feet (6096 mm), provided that the requirements of Section R404.1.1 are met.		Minor wordsmithing change.
	R404.1.5.3 Pier and curtain wall foundations. Use of pier and curtain wall foundations shall be permitted to support light-frame construction not more than two stories in height, provided that the following requirements are met: 1. All load-bearing walls shall be placed on continuous concrete footings placed integrally with the exterior wall footings. 2. The minimum actual thickness of a load-bearing masonry wall shall be not less than 4 inches (102 mm) nominal or 3 3/8 inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced in accordance with Section R606.6.4.		Minor wordsmithing change.

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	3. Piers shall be constructed in accordance with Sections R606.7 and R606.7.1, and shall be bonded into the load-bearing masonry wall in accordance with Section R606.13.1 or R606.13.1.1. 4. The maximum height of a 4-inch (102 mm) load-bearing masonry foundation wall supporting wood-frame walls and floors shall be not more than 4 feet (1219 mm). 5. Anchorage shall be in accordance with Section R403.1.6, Figure R404.1.5(1), or as specified by engineered design accepted by the *building official*. 6. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry or 12 inches (305 mm) for hollow masonry. 7. In Seismic Design Categories D0 , D1 and D2, prescriptive reinforcement shall be provided in the horizontal and vertical direction. Provide minimum horizontal joint reinforcement of two No. 9 gage wires spaced not less than 6 inches (152 mm) or one 1/4 -inch-diameter (6.4 mm) wire at 10 inches (254 mm) on center vertically. Provide minimum vertical reinforcement of one No. 4 bar at 48 inches (1220 mm) on center horizontally grouted in place.		
	R404.1.6 Height above finished grade. Concrete and masonry foundation walls shall extend above the finished *grade* adjacent to the foundation at all points ~~a minimum of~~ not less than 4 inches (102 mm) where masonry veneer is used and ~~a minimum of~~ not less than 6 inches (152 mm) elsewhere.		Minor wordsmithing change.
	R404.2.1 Identification. Load-bearing lumber shall be identified by the grade *mark* of a lumber grading or inspection agency ~~which~~ that has been *approved* by an accreditation body that complies with DOC PS 20. In lieu of a grade *mark*, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section shall be accepted. Wood structural panels shall conform to DOC PS 1 or DOC PS 2 and shall be identified by a grade *mark* or certificate of inspection issued by an *approved agency*.		Minor wordsmithing change.
	R404.2.2 Stud size. The studs used in foundation walls shall be 2-inch by 6-inch (51 mm by 152 mm) members. When~~n~~re spaced 16 inches (406 mm) on center, a wood species with an *Fb* value of not less than 1,250 pounds per square inch (8619 kPa) as listed in ANSI AWC NDS shall be used. When~~n~~re spaced 12 inches (305 mm) on center, an *F* of not *b* less than 875 psi (6033 kPa) shall be required.		Minor wordsmithing change.
	R404.2.3 Height of backfill. For wood foundations that are not designed and installed in accordance with AWC PWF, the height of backfill against a foundation wall shall not exceed 4 feet (1219 mm). When~~n~~re the height of fill is more than 12 inches (305 mm) above the interior *grade* of a crawl space or floor of		Minor wordsmithing change.

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	a *basement*, the thickness of the plywood sheathing shall meet the requirements of Table R404.2.3.		
	R404.3 Wood sill plates. Wood sill plates shall be ~~a minimum of~~ not less than 2-inch by 4-inch (51 mm by 102 mm) nominal lumber. Sill plate anchorage shall be in accordance with Sections R403.1.6 and R602.11.		Minor wordsmithing change.
	SECTION R405 **FOUNDATION DRAINAGE** **R405.1 Concrete or masonry foundations.** Drains shall be provided around concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below *grade*. Drainage tiles, gravel or crushed stone drains, perforated pipe or other *approved* systems or materials shall be installed at or below the ~~area to be protected~~ top of the footing or below the bottom of the slab and shall discharge by gravity or mechanical means into an *approved* drainage system. Gravel or crushed stone drains shall extend not less than 1 foot (305 mm) beyond the outside edge of the footing and 6 inches (152 mm) above the top of the footing and be covered with an *approved* filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper. Except where otherwise recommended by the drain manufacturer, perforated drains shall be surrounded with an *approved* filter membrane or the filter membrane shall cover the washed gravel or crushed rock covering the drain. Drainage tiles or perforated pipe shall be placed on ~~a minimum of~~ not less than 2 inches (51 mm) of washed gravel or crushed rock not less than one sieve size larger than the tile joint opening or perforation and covered with not less than 6 inches (152 mm) of the same material. **Exception:** A drainage system is not required where the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I soils, as detailed in Table R405.1.		Minor wordsmithing change.
	SECTION R406 **FOUNDATION WATERPROOFING AND DAMPPROOFING** **R406.1 Concrete and masonry foundation dampproofing.** Except where required by Section R406.2 to be waterproofed, foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be dampproofed from the higher of (a) the top of the footing or (b) 6 inches (152 mm) below the top of the basement floor, to the finished grade. Masonry walls shall have not less than 3/8 inch (9.5 mm) ~~p~~Portland cement parging applied to the exterior of the wall. The parging shall be dampproofed in accordance with one of the following: 1. Bituminous coating. 2. Three pounds per square yard (1.63 kg/m2) of acrylic modified cement.		Minor wordsmithing change.

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	3. One-eighth-inch (3.2 mm) coat of surface-bonding cement complying with ASTM ~~C 887~~C887. 4. Any material permitted for waterproofing in Section R406.2. 5. Other *approved* methods or materials. **Exception:** Parging of unit masonry walls is not required where a material is approved for direct application to the masonry. Concrete walls shall be dampproofed by applying any one of the listed dampproofing materials or any one of the waterproofing materials listed in Section R406.2 to the exterior of the wall.		
	R406.2 Concrete and masonry foundation waterproofing. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below *grade* shall be waterproofed from the finished *grade* to the higher of the top of the footing or 6 inches (152 mm) below the top of the basement floor. Walls shall be waterproofed in accordance with one of the following: 1. Two-ply hot-mopped felts. 2. Fifty-five-pound (25 kg) roll roofing. 3. ~~Six-mil (0.15 mm) polyvinyl chloride.~~ 4. ~~Six-mil (0.15 mm) polyethylene.~~ 3. ~~5.~~ Forty-mil (1 mm) polymer-modified asphalt. 4. ~~6.~~ Sixty-mil (1.5 mm) flexible polymer cement. 5. ~~7.~~ One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating. 6. ~~8.~~ Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber. All joints in membrane waterproofing shall be lapped and sealed with an adhesive compatible with the membrane. **Exception:** Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and es-ters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. Cold-setting asphalt or hot asphalt shall conform to Type C of **ASTM D449**. Hot asphalt shall be applied at a temperature of less than 200°F (93°C).		Changes to waterproofing requirements.
	R406.4.1 Panel joints sealed. Precast concrete foundation panel joints shall be sealed full height with a sealant meeting ASTM ~~C 920~~ C920, Type S or M, *Grade* NS, Class 25, Use NT, M or A. Joint sealant shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing change.
	R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall be not less in nominal size than 4 inches by 4 inches (102 mm by 102 mm). Steel columns shall be not less than 3-inch-diameter (76 mm) Schedule 40 pipe manufactured in accordance with ASTM ~~A 53~~ A53 Grade B or *approved* equivalent. **Exception:** In Seismic Design Categories A, B and C, columns not more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement		Minor wordsmithing change.

	requirement within under-floor areas enclosed by a continuous foundation.		
	SECTION R408 **UNDER-FLOOR SPACE** **R408.1** ~~**Ventilation**~~ **Moisture control.** The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a *basement*) shall ~~have ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m^2) for each 150 square feet (14 m^2) of under-floor space area, unless the ground surface is covered by a Class 1 vapor retarder material. Where a Class 1 vapor retarder material is used, the minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m^2) for each 1,500 square feet (140 m^2) of under-floor space area. One such ventilating opening shall be within 3 feet (914 mm) of each corner of the building.~~ comply with Section R408.2 or R408.3.		Updated moisture control requirements.
	R408.2 Openings for under-floor ventilation. Ventilation openings through foundation or exterior walls surrounding the under-floor space shall be provided in accordance with this section. The minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 m^2) for each 150 square feet (14 m^2) of under-floor area. One ventilation opening shall be within 3 feet (915 mm) of each external corner of the ~~building~~under-floor space. Ventilation openings shall be covered for their height and width with any of the following materials provided that the least dimension of the covering shall not exceed $^1/_4$ inch (6.4 mm), and operational louvers are permitted: 1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick. 2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick. 3. Cast-iron grill or grating. 4. Extruded load-bearing brick vents. 5. Hardware cloth of 0.035 inch (0.89 mm) wire or heavier. 6. Corrosion-resistant wire mesh, with the least dimension being $^1/_8$ inch (3.2 mm) thick. **Exceptions:** 1. The total area of ventilation openings shall be permitted to be reduced to $^1/_{1,500}$ of the under-floor area where the ground surface is covered with an *approved* Class I vapor retarder material. 2. Where the ground surface is covered with an *approved* Class 1 vapor retarder material, ventilation openings are not required to be within 3 feet (915 mm) of each external corner of the under-floor space provided that the openings are placed to provide cross ventilation of the space.		Updated under-floor ventilation requirements.

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	R408.3 Unvented crawl space. ~~*Ventilation* openings in~~ For unvented under-floor spaces, ~~specified in Sections R408.1 and R408.2 shall not be required where~~ the following items ~~are~~ shall be provided: 1. Exposed earth ~~is~~ shall be covered with a continuous Class I vapor retarder. Joints of the vapor retarder shall overlap by 6 inches (152 mm) and shall be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (152 mm) up the stem wall and shall be attached and sealed to the stem wall or insulation. 2. One of the following ~~is~~ shall be provided for the under-floor space: 2.1. Continuously operated mechanical exhaust ventilation at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m2) of crawl space floor area, including an air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code. 2.2. *Conditioned air* supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated in accordance with Section N1102.2.11 of this code. 2.3. Plenum in existing structures complying with Section M1601.5, if under-floor space is used as a plenum. 2.4. Dehumidification sized ~~to provide 70 pints (33 liters) of moisture removal per day for every 1,000 square feet (93 m²) of *crawl space* floor area~~ in accordance with manufacturer's specifications.		Minor wordsmithing change.
	R408.4 Access. Access shall be provided to all under-floor spaces. Access openings through the floor shall be ~~a minimum of~~ not smaller than 18 inches by 24 inches (457 mm by 610 mm). Openings through a perimeter wall shall be not less than 16 inches by 24 inches (407 mm by 610 mm). Where any portion of the through-wall access is below *grade*, an areaway not less than 16 inches by 24 inches (407 mm by 610 mm) shall be provided. The bottom of the areaway shall be below the threshold of the access opening. Through wall access openings shall not be located under a door to the residence. See Section M1305.1.4 for access requirements where mechanical *equipment* is located under floors.		Minor wordsmithing change.
	R408.5 Removal of debris. The under-floor *grade* shall be cleaned of all vegetation and organic material. ~~**All w**~~Wood forms used for placing concrete shall be removed before a building is occupied or used for any purpose. ~~All c~~Construction materials shall be removed before a building is occupied or used for any purpose.		Minor wordsmithing change.
	R408.8 Under-floor vapor retarder. In Climate Zones 1A, 2A and 3A below the warm-humid line, a continuous Class I or II vapor retarder shall be provided on the exposed face of air permeable insulation installed between the floor joists and exposed to the grade in the underfloor space. The vapor retarder shall have a maximum water vapor permeance of 1.5 perms when tested in accordance with Procedure B of **ASTM E96**.		New requirements for under-floor vapor retarder.

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	Exception: The vapor retarder shall not be required in unvented *crawl spaces* constructed in accordance with **Section R408.3**.		

2015 Houston IRC Amendments	2021 IRC – Chapter 5 – Floors	2021 Houston IRC Amendments	Code Change Summary
	R502.1.1.1 Preservative-treated lumber. Preservative treated dimension lumber shall ~~**also**~~ be identified as required by Section R317.2.		Minor wordsmithing change.
	R502.2.2 Blocking and subflooring. Blocking for fastening panel edges or fixtures shall be ~~a minimum of~~ not less than utility grade lumber. Subflooring shall be ~~a minimum of~~ not less than utility grade lumber, No. 4 common grade boards or wood structural panels as specified in Section R503.2. Fireblocking shall be of any grade lumber.		Minor wordsmithing change.
	R502.3.2 Other floor joists. **Table R502.3.1(2)** shall be used to determine the maximum allowable span of floor joists that support other areas of the building, other than sleeping ~~rooms~~ areas and *attics*, provided that the design *live load* does not exceed 40 pounds per square foot (1.92 kPa) and the design dead load does not exceed 20 pounds per square foot (0.96 kPa).		Minor wordsmithing change.

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TABLE R502.3.3(1)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY[a, b, c, f, g, h] (Floor live load ≤ 40 psf, roof live load ≤ 20 psf)

MEMBER & SPACING	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lb)[d, e]											
	Ground Snow Load											
	≤ 20 psf			30 psf			50 psf			70 psf		
	Roof Width			Roof Width			Roof Width			Roof Width		
	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft
2 × 8 @ 12"	20" (177)	15" (227)	—	18" (209)	—	—	—	—	—	—	—	—
2 × 10 @ 16"	29" (228)	21" (297)	16" (364)	26" (271)	18" (354)	—	20" (375)	—	—	—	—	—
2 × 10 @ 12"	36" (166)	26" (219)	20" (270)	34" (198)	22" (263)	16" (324)	26" (277)	—	—	19" (356)	—	—
2 × 12 @ 16"	—	32" (287)	25" (356)	36" (263)	29" (345)	21" (428)	29" (367)	20" (484)	—	23" (471)	—	—
2 × 12 @ 12"	—	42" (209)	31" (263)	—	37" (253)	27" (317)	36" (271)	27" (358)	17" (447)	31" (348)	19" (462)	—
2 × 12 @ 8"	—	48" (136)	45" (169)	—	48" (164)	38" (206)	—	40" (233)	26" (294)	36" (230)	29" (304)	18" (379)

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

a. Tabulated values are for clear-span roof supported solely by exterior bearing walls.
b. Spans are based on No. 2 Grade lumber of Douglas fir-larch, Southern pine, hem-fir and spruce-pine-fir for repetitive (three or more) members. ~~No.1 or better shall be used for Southern pine.~~
c. Ratio of backspan to cantilever span shall be not less than 3:1.
d. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
e. Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
f. See **Section R301.2.2.6**, Item 1, for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Category D_0, D_1 or D_2 and townhouses in Seismic Design Category C, D_0, D_1 or D_2.
g. A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
h. Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

Minor updates to floor joist table.

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TABLE R502.3.3(1)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY[a, b, c, f, g, h] (Floor live load ≤ 40 psf, roof live load ≤ 20 psf)

MEMBER & SPACING	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lb)[d, e]											
	Ground Snow Load											
	≤ 20 psf			30 psf			50 psf			70 psf		
	Roof Width			Roof Width			Roof Width			Roof Width		
	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft	24 ft	32 ft	40 ft
2 × 8 @ 12"	20" (177)	15" (227)	—	18" (209)	—	—	—	—	—	—	—	—
2 × 10 @ 16"	29" (228)	21" (297)	16" (364)	26" (271)	18" (354)	—	20" (375)	—	—	—	—	—
2 × 10 @ 12"	36" (166)	26" (219)	20" (270)	34" (198)	22" (263)	16" (324)	26" (277)	—	—	19" (356)	—	—
2 × 12 @ 16"	—	32" (287)	25" (356)	36" (263)	29" (345)	21" (428)	29" (367)	20" (484)	—	23" (471)	—	—
2 × 12 @ 12"	—	42" (209)	31" (263)	—	37" (253)	27" (317)	36" (271)	27" (358)	17" (447)	31" (348)	19" (462)	—
2 × 12 @ 8"	—	48" (136)	45" (169)	—	48" (164)	38" (206)	—	40" (233)	26" (294)	36" (230)	29" (304)	18" (379)

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

a. Tabulated values are for clear-span roof supported solely by exterior bearing walls.
b. Spans are based on No. 2 Grade lumber of Douglas fir-larch, Southern pine, hem-fir and spruce-pine-fir for repetitive (three or more) members. ~~No.1 or better shall be used for Southern pine.~~
c. Ratio of backspan to cantilever span shall be not less than 3:1.
d. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
e. Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
f. See **Section R301.2.2.6**, Item 1, for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Category D_0, D_1 or D_2 and townhouses in Seismic Design Category C, D_0, D_1 or D_2.
g. A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
h. Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

Minor updates to floor joist table.

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	TABLE R502.3.3(2) **CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY[a, b, e, f]**		Minor updates to floor joist table.

MEMBER SIZE	SPACING	MAXIMUM CANTILEVER SPAN (uplift force at backspan support in lb)[c, d]		
		Ground Snow Load		
		≤ 30 psf	50 psf	70 psf
2 × 8	12"	42" (139)	39" (156)	34" (165)
2 × 8	16"	36" (151)	34" (171)	29" (180)
2 × 10	12"	61" (164)	57" (189)	49" (201)
2 × 10	16"	53" (180)	49" (208)	42" (220)
2 × 10	24"	43" (212)	40" (241)	34" (255)
2 × 12	16"	72" (228)	67" (260)	57" (268)
2 × 12	24"	58" (279)	54" (319)	47" (330)

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

a. Spans are based on No. 2 Grade lumber of Douglas fir-larch, Southern pine, hem-fir, and spruce-pine-fir for repetitive (three or more) members. ~~No.1 or better shall be used for Southern pine.~~
b. Ratio of backspan to cantilever span shall be not less than 2:1.
c. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
d. Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).
e. A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
f. Linear interpolation shall be permitted for ground snow loads other than shown.

	R502.6 Bearing. The ends of each joist, beam or girder shall have not less than 1 1/2 inches (38 mm) of bearing on wood or metal, ~~and~~ have not less than 3 inches of bearing (76 mm) on masonry or concrete ~~except where~~ or be supported by approved joist hangers. Alternatively, the ends of joists shall be supported on a 1-inch by 4-inch (25 mm by 102 mm) ribbon strip and shall be nailed to the adjacent stud ~~or by the use of approved joist hangers~~. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch-minimum (51 mm) nominal thickness shall be provided under the joist, beam or girder. The sill plate shall provide a minimum nominal bearing area of 48 square inches (30 865 ~~square~~ mm²).		Minor updates to beam/girder bearings.
	R502.8.1 Sawn lumber. Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches (102 mm) or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches (51 mm) to the top or bottom of the member, or to any other hole located in the member. Where the member is ~~also~~ notched, the hole shall not be closer than 2 inches (51 mm) to the notch.		Minor wordsmithing change.

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	R502.10 Framing of openings. Openings in floor framing shall be framed with ~~a~~ header and trimmer joists. Where the header joist span does not exceed 4 feet (1219 mm), the header joist shall be a single member the same size as the floor joist. Single trimmer joists shall be used to carry a single header joist that is located within 3 feet (914 mm) of the trimmer joist bearing. Where the header joist span exceeds 4 feet (1219 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.		Minor wordsmithing change.
	R502.11.3 Alterations to trusses. Truss members and components shall not be cut, notched, spliced or otherwise altered in any way without the approval of a registered *design professional*. *Alterations* resulting in the addition of load that exceeds the design load for the truss, shall not be permitted without verification that the truss is capable of supporting the additional loading.		Minor wordsmithing change.
	R502.11.4 Truss design drawings. Truss design drawings, prepared in compliance with Section R502.11.1, shall be submitted to the *building official* and *approved* prior to installation. Truss design drawings shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified as follows: 1. Slope or depth, span and spacing. 2. Location of all joints. 3. Required bearing widths. 4. Design loads as applicable: 4.1. Top chord live load. 4.2. Top chord dead load. 4.3. Bottom chord live load. 4.4. Bottom chord dead load. 4.5. Concentrated loads and their points of application. 4.6. Controlling wind and earthquake loads. 5. Adjustments to lumber and joint connector design values for conditions of use. 6. Each reaction force and direction. 7. Joint connector type and description, such as size, thickness or gage, and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface. 8. Lumber size, species and grade for each member. 9. Connection requirements for: 9.1. Truss-to-girder-truss. 9.2. Truss ply-to-ply. 9.3. Field splices. 10. Calculated deflection ratio ~~and/or~~, maximum description for live and total load, or both. 11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent		Minor wordsmithing change.

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	continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents. 12. Required permanent truss member bracing location.		
	R503.2.1 Identification and grade. Wood structural panel sheathing used for structural purposes shall conform to CSA O325, CSA O437 DOC PS 1~~,~~ or DOC PS 2~~, CSA O437 or CSA O325~~. Panels shall be identified for grade, bond classification and Performance Category by a grade mark or certificate of inspection issued by an approved agency. The Performance Category value shall be used as the "nominal panel thickness" or "panel thickness" wherever referenced in this code		Minor wordsmithing change.
	R504.3 Materials. Framing materials, including sleepers, joists, blocking and plywood subflooring, shall be pressure-preservative treated and dried after treatment in accordance with AWPA U1 (Commodity Specification A, ~~Use Category 4B and Section 5.2~~)Special Requirement 4.2), and shall bear the *label* of an accredited agency.		Minor wordsmithing change.
	R505.1.1.1 Alternate applications. Cold-formed steel floor framing for buildings exceeding the applicability limits of **Section R505.1.1** is permitted to be designed and constructed in accordance with **AISI S230**, subject to the limits therein.		New requirements and referenced standard for cold-formed steel floor framing.
	R505.1.2 In-line framing. Where supported by cold-formed steel-framed walls in accordance with **Section R603**, cold-formed steel floor framing shall be constructed with floor joists located in-line with load-bearing studs located below the joists in accordance with the tolerances specified in **AISI S240**, Section B1.2.3. ~~Figure R505.1.2 and the tolerances specified as follows:~~ ~~1. The maximum tolerance shall be 3/4 inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.~~ ~~2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be 1/8 inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.~~		New requirements and referenced standard for cold-formed steel floor framing.
	R505.1.3 Floor trusses. Cold-formed steel trusses shall be designed, braced and installed in accordance with AISI ~~S100, Section D4~~ S230, Section D8. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the **SBCA Cold-Formed Steel Building Component Safety Information (CFSBCSI), Guide to Good Practice for Handling, Installing & Bracing of Cold Formed Steel Trusses**. Truss members shall not be notched, cut or altered in any manner without an *approved* design.		New requirements and referenced standard for cold-formed steel floor framing.

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	R505.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ~~ASTM A1003: Structural Grades 33 Type H and 50 Type H~~ **AISI S240**, Section A3.		New referenced standard for cold-formed steel.
	R505.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a metallic coating complying with **AISI S240**, Section A4. ~~ASTM A1003 and one of the following:~~ ~~1. Not less than G 60 in accordance with ASTM A653.~~ ~~2. Not less than AZ 50 in accordance with ASTM A792.~~		New referenced standard for cold-formed steel.
	R505.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel floor framing members shall comply with ~~Figure R505.2.3(1) and with the dimensional and thickness requirements specified in Table R505.2.3. Additionally, all C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be 1/2 inch (12.7 mm). Track sections shall comply with Figure R505.2.3(2) and shall have a minimum flange width of 1 1/4 inch (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified.~~ **AISI S230**, Section A4.3 and material grade requirements as specified in **AISI S230**, Section A4.4.		New referenced standard for cold-formed steel.
	~~**TABLE R505.2.3**~~ ~~**COLD-FORMED STEEL JOIST SIZES AND THICKNESS**~~		Base code table removed.
	~~**FIGURE R505.2.3(1)**~~ ~~**C-SHAPED SECTION**~~		Base code figure removed.
	~~**FIGURE R505.2.3(2)**~~ ~~**TRACK SECTION**~~		Base code figure removed.
	R505.2.4 Identification. Load-bearing cold-formed steel framing members shall meet the product identification requirements of **AISI S240**, Section A5.5. ~~have a legible *label*, stencil, stamp or embossment with the following information as a minimum:~~ ~~1. Manufacturer's identification.~~ ~~2. Minimum base steel thickness in inches (mm).~~ ~~3. Minimum coating designation.~~ ~~4. Minimum yield strength, in kips per square inch (ksi) (MPa).~~		Updated to include new referenced standard.

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	R505.2.5 Fastening. Screws for steel-to-steel connections shall be installed with a minimum edge distance and center-to-center spacing of 1/2 inch (12.7 mm), shall be self-drilling tapping, and shall conform to ASTM ~~C 1513~~ C1513. Floor sheathing shall be attached to cold-formed steel joists with minimum No. 8 self-drilling tapping screws that conform to ASTM ~~C 1513~~ C1513. Screws attaching floor sheathing to cold-formed steel joists shall have a minimum head diameter of 0.292 inch (7.4 mm) with countersunk heads and shall be installed with a minimum edge distance of 3/8 inch (9.5 mm). Gypsum board ceilings shall be attached to cold-formed steel joists with minimum No. 6 screws conforming to ASTM ~~C 954~~ C954 or ASTM ~~C 1513~~ C1513 with a bugle-head style and shall be installed in accordance with Section R702. For all connections, screws shall extend through the steel ~~a minimum of~~ not fewer than three exposed threads. ~~All f~~Fasteners shall have a rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.		Minor wordsmithing changes.
	R505.2.6 Web holes, web hole reinforcing and web hole patching. Web holes~~, web hole reinforcing, and web hole patching shall be in accordance with this section~~ in floor framing members shall comply with the conditions as prescribed in **AISI S230**, Section A4.5. Web holes not in compliance with the conditions as prescribed in **AISI S230**, Section A4.5 shall be reinforced in accordance with the provisions of **AISI S230**, Section A4.6 or patched in accordance with the provisions of **AISI S230**, Section A4.7.		Updated requirements per AISI S230 standard.
	~~**R505.2.6.1 Web holes.** Web holes in floor joists shall comply with all of the following conditions:~~ ~~1. Holes shall conform to **Figure R505.2.6.1**.~~ ~~2. Holes shall be permitted only along the centerline of the web of the framing member.~~ ~~3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).~~ ~~4. Holes shall have a web hole width not greater than 0.5 times the member depth, or $2^1/_2$ inches (64.5 mm).~~ ~~5. Holes shall have a web hole length not exceeding $4^1/_2$ inches (114 mm).~~ ~~6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).~~ ~~Framing members with web holes not conforming to these requirements shall be reinforced in accordance with **Section R505.2.6.2**, patched in accordance with **Section R505.2.6.3** or designed in accordance with accepted engineering practices.~~		Base code section removed.
	~~**FIGURE R505.2.6.1**~~ ~~**FLOOR JOIST WEB HOLES**~~		Base code figure removed.

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	~~**R505.2.6.2 Web hole reinforcing.** Reinforcement of web holes in floor joists not conforming to the requirements of **Section R505.2.6.1** shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of **Section R505.2.6.1** for the member being reinforced. The steel reinforcing shall be not thinner than the thickness of the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $^1/_2$ inch (12.7 mm).~~		Base code section removed.
	~~**R505.2.6.3 Hole patching.** Patching of web holes in floor joists not conforming to the requirements in **Section R505.2.6.1** shall be permitted in accordance with either of the following methods:~~ ~~1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed the following size limits:~~ ~~1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.~~ ~~1.2. The length of the hole, measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.~~ ~~2. Web holes not exceeding the dimensional requirements in **Section R505.2.6.3**, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with **Figure R505.2.6.3**. The steel patch shall, as a minimum, be of the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $^1/_2$ inch (12.7 mm).~~		Base code section removed.
	~~**FIGURE R505.2.6.3** **FLOOR JOIST WEB HOLE PATCH**~~		Base code figure removed.
	R505.3.2 Minimum floor joist sizes. Floor joist size and thickness shall be determined in accordance with the limits set forth in Table R505.3.2 for single or continuous spans. Where continuous joist members are used, the interior bearing supports shall be located within 2 feet (610 mm) of midspan of the cold-formed steel joists, and the individual spans shall not exceed the spans in Table R505.3.2. Floor joists shall have a		Minor wordsmithing change.

bearing support length of not less than 1 1/2 inches (38 mm) for exterior wall supports and 3 1/2 inches (89 mm) or interior wall supports. Tracks shall be not less than 33 mils (0.84 mm) thick except ~~when~~ where used as part of a floor header or trimmer in accordance with Section R505.3.8. Bearing stiffeners shall be installed in accordance with Section R505.3.4.

TABLE R505.3.2
ALLOWABLE SPANS FOR COLD-FORMED STEEL JOISTS-SINGLE OR CONTINUOUS SPANS[a, b, c, d, e, f]

JOIST DESIGNATION	30 PSF LIVE LOAD Spacing (inches)				40 PSF LIVE LOAD Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	~~11'-7"~~ 11'-8"	~~10'-7"~~ 10'-4"	~~9'-6"~~ 9'-5"	~~8'-6"~~ 8'-5"	10'-7"	~~9'-3"~~ 9'-2"	~~8'-6"~~ 8'-5"	7'-6"
550S162-43	12'-8"	11'-6"	~~10'-10"~~ 10'-8"	~~10'-2"~~ 10'-5"	11'-6"	~~10'-6"~~ 10'-4"	9'-10"	~~9'-1"~~ 9'-3"
550S162-54	13'-7"	12'-4"	11'-7"	10'-9"	12'-4"	~~11'-2"~~ 11'-3"	~~10'-6"~~ 10'-7"	~~9'-9"~~ 9'-10"
550S162-68	14'-7"	13'-3"	12'-6"	11'-7"	13'-3"	12'-0"	11'-4"	10'-6"
800S162-33	~~15'-8"~~ 14'-6"	~~13'-11"~~ 12'-6"	~~12'-9"~~ 11'-5"	~~11'-5"~~ 10'-3"	~~14'-3"~~ 12'-10"	~~12'-5"~~ 11'-1"	~~11'-3"~~ 10'-2"	~~9'-0"~~ 9'-1"
800S162-43	~~17'-1"~~ 17'-0"	~~15'-6"~~ 15'-1"	~~14'-7"~~ 13'-9"	~~13'-7"~~ 12'-4"	~~15'-6"~~ 15'-5"	~~14'-1"~~ 13'-5"	~~13'-3"~~ 12'-3"	~~12'-4"~~ 10'-11"
800S162-54	~~18'-4"~~ 18'-3"	~~16'-8"~~ 16'-7"	15'-8"	~~14'-7"~~ 14'-6"	~~16'-8"~~ 16'-7"	~~15'-2"~~ 15'-1"	~~14'-3"~~ 14'-2"	~~13'-3"~~ 13'-2"
800S162-68	19'-9"	17'-11"	~~16'-10"~~ 16'-11"	15'-8"	17'-11"	16'-3"	15'-4"	~~14'-2"~~ 14'-3"
1000S162-43	~~20'-6"~~ 19'-4"	~~18'-8"~~ 16'-9"	~~17'-6"~~ 15'-3"	~~15'-8"~~ 13'-8"	~~18'-8"~~ 17'-2"	~~16'-11"~~ 14'-10"	~~15'-6"~~ 13'-7"	~~13'-11"~~ 12'-2"
1000S162-54	~~22'-1"~~ 21'-9"	~~20'-0"~~ 19'-9"	~~18'-10"~~ 18'-7"	~~17'-6"~~ 17'-3"	~~20'-0"~~ 19'-9"	~~18'-2"~~ 18'-0"	~~17'-2"~~ 16'-11"	~~15'-11"~~ 15'-8"
1000S162-68	~~23'-9"~~ 23'-7"	~~21'-7"~~ 21'-5"	~~20'-3"~~ 20'-2"	~~18'-10"~~ 18'-9"	~~21'-7"~~ 21'-5"	~~19'-7"~~ 19'-6"	~~18'-5"~~ 18'-4"	~~17'-1"~~ 17'-0"
~~1200S162-43~~	~~23'-9"~~	~~20'-10"~~	~~19'-0"~~	~~16'-8"~~	~~21'-5"~~	~~18'-6"~~	~~16'-6"~~	~~13'-2"~~
1200S162-54	~~26'-9"~~ 25'-1"	~~23'-4"~~ 22'-10"	~~22'-0"~~ 21'-6"	~~20'-1"~~ 19'-9"	~~23'-4"~~ 22'-10"	~~21'-3"~~ 20'-9"	~~20'-0"~~ 19'-6"	~~17'-10"~~ 17'-6"
1200S162-68	~~27'-8"~~ 27'-3"	~~26'-1"~~ 24'-9"	~~23'-8"~~ 23'-4"	~~21'-11"~~ 21'-8"	~~26'-1"~~ 24'-9"	~~22'-10"~~ 22'-6"	~~21'-6"~~ 21'-2"	~~21'-1"~~ 19'-8"

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mil = 0.0254 mm.
a. Deflection criteria: *L*/480 for live loads, *L*/240 for total loads.
b. Floor dead load = 10 psf.
c. Table provides the maximum clear span in feet and inches.
d. Bearing stiffeners are to be installed at all support points and concentrated loads.
e. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thickness. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thickness.
f. Table R505.3.2 is not applicable for 800S162-33 and 1000S162-43 continuous joist members.

Update to table for allowable span distances.

R505.3.3.2 Joist bottom flange bracing/blocking. Floor joists with spans that exceed 12 feet (3658 mm) shall have the bottom flanges laterally braced in accordance with one of the following:

1. Gypsum board installed with minimum No. 6 screws in accordance with Section R702.
2. Continuous steel straps installed in accordance with Figure R505.3.3.2(1). Steel straps shall be spaced at ~~a maximum of~~ not greater than 12 feet (3658 mm) on center and shall be ~~at least~~ not less than 1 1/2 inches (38 mm) in width and 33 mils (0.84 mm) in thickness. Straps shall be fastened to the bottom flange of each joist with one No. 8 screw, fastened to blocking with two No. 8 screws, and fastened at each end (of strap) with two No. 8 screws. Blocking in accordance with Figure R505.3.3.2(1) or R505.3.3.2(2) shall be installed between joists at each end of the continuous strapping and at a maximum spacing of 12 feet (3658 mm) measured along the continuous strapping (perpendicular to the joist run). Blocking shall also be located at the termination of all straps. As an alternative to blocking at the ends, anchoring the strap to a stable

Minor wordsmithing changes.

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	building component with two No. 8 screws shall be permitted.		
	R505.3.3.3 Blocking at interior bearing supports. Blocking is not required for continuous back-to-back floor joists at bearing supports. Blocking shall be installed between every other joist for single continuous floor joists across bearing supports in accordance with Figure R505.3.1(7). Blocking shall consist of C-shaped or track section with a minimum thickness of 33 mils (0.84 mm). Blocking shall be fastened to each adjacent joist through a 33-mil (0.84 mm) clip angle, bent web of blocking or flanges of web stiffeners with two No. 8 screws on each side. The minimum depth of the blocking shall be equal to the depth of the joist minus 2 inches (51 mm). The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm).		Minor wordsmithing changes.
	R505.3.3.4 Blocking at cantilevers. Blocking shall be installed between every other joist over cantilever bearing supports in accordance with Figure R505.3.1(4), R505.3.1(5) or R505.3.1(6). Blocking shall consist of C-shaped or track section with minimum thickness of 33 mils (0.84 mm). Blocking shall be fastened to each adjacent joist through bent web of blocking, 33 mil clip angle or flange of web stiffener with two No. 8 screws at each end. The depth of the blocking shall be equal to the depth of the joist. The minimum length of the angle shall be equal to the depth of the joist minus 2 inches (51 mm). Blocking shall be fastened through the floor sheathing and to the support with three No. 8 screws (top and bottom).		Minor wordsmithing changes.
	R505.3.7 Splicing. Joists and other structural members shall not be spliced without an *approved* design. Splicing of tracks shall conform to Figure R505.3.7.		Minor update, no major change to code.
	R506.2.3 Vapor retarder. A minimum ~~6~~10-mil (~~0.006~~ 0.010 inch; ~~152 µm~~ 0.254 mm) ~~polyethylene or approved~~ vapor retarder conforming to **ASTM E1745** Class A requirements with joints lapped not less than 6 inches (152 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where ~~no~~ a base course ~~exists~~ does not exist. **Exception:** The vapor retarder is not required for the following: 1. Garages, utility buildings and other unheated *accessory structures*. 2. For unheated storage rooms having an area of less than 70 square feet (6.5 2 m) and carports.		Minor updates to vapor retarder requirements.

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	3. Driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date. 4. Where *approved* by the *building official*, based on local site conditions.		
	SECTION R507 **EXTERIOR DECKS** **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~~. Decks shall be designed for the *live load* required in **Section R301.5** or the ground snow load indicated in **Table R301.2**, whichever is greater. For decks using materials and conditions not prescribed in this section, refer to Section R301. ~~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.~~		New requirements for exterior decks.
	~~**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.~~		Base code section removed.
	~~**TABLE R507.2**~~ ~~**DECK LEDGER CONNECTION TO BAND JOISTa,b**~~ ~~(Deck live load = 40 psf, deck dead load = 0 psf, snow load 40 psf)~~		Base code table removed.
	~~**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.~~		Base code section removed.
	~~**TABLE R507.2.1**~~ ~~**PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS**~~		Base code table removed.

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	~~**FIGURE R507.2.1(1)**~~ ~~**PLACEMENT OF LAG SCREWS AND BOLTS IN LEDGERS**~~		Base code figure removed.
	~~**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 9 1/2 -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.~~		Base code section removed.
	~~**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).~~		Base code section removed.
	~~**FIGURE 507.2.3(1)**~~ ~~**DECK ATTACHMENT FOR LATERAL LOADS**~~		Base code figure removed.
	~~**FIGURE R507.2.3(2)**~~ ~~**DECK ATTACHMENT FOR LATERAL LOADS**~~		Base code figure removed.
	~~**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 not less than 1,500 pounds (6672 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 (3336 N).~~		Base code section removed.
	R507.2 Materials. Materials used for the construction of decks shall comply with this section.		New exterior deck requirements.
	R507.2.1 Wood materials. Wood materials shall be No. 2 grade or better lumber, preservative-treated in accordance with Section R317, or *approved*, naturally durable lumber, and termite protected where required in accordance with Section R318. Where design in accordance with Section R301 is provided, wood structural members shall be designed using the wet service factor defined in AWC NDS. Cuts, notches and		New exterior deck requirements.

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	drilled holes of preservative treated wood members shall be treated in accordance with Section R317.1.1. All preservative-treated wood products in contact with the ground shall be labeled for such usage.		
	R507.2.1.1 Engineered wood products. Engineered wood products shall be in accordance with Section R502.		New exterior deck requirements.
	R~~507.3~~507.2.2 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~~ ASTM D7032 and ~~the requirements of~~ this ~~S~~section 507.3.		Base code renumbering and minor wordsmithing.
	R~~507.3.1~~507.2.2.1 Labeling. Plastic composite deck boards and stair treads, or their packaging, shall bear a label that indicates compliance ~~to~~ with ~~ASTM D 7032~~ ASTM D7032 and includes the allowable load and maximum allowable span determined in accordance with ~~ASTM D 7032~~ ASTM D7032. Plastic or composite handrails and guards, or their packaging, shall bear a label that indicates compliance to ~~ASTM D 7032~~ ASTM D7032 and includes the maximum allowable span determined in accordance with ~~ASTM D 7032~~ ASTM D7032.		Base code renumbering and minor wordsmithing.
	R~~507.3.2~~507.2.2.2 Flame spread index. Plastic composite deck boards, stair treads, guards, and handrails shall exhibit a flame spread index not exceeding 200 when tested in accordance with ~~ASTM E 84~~ ASTM E 84 or UL 723 with the test specimen remaining in place during the test. **Exception:** Plastic composites determined to be noncombustible.		Base code renumbering and minor wordsmithing.
	R~~507.3.3~~507.2.2.3 Decay resistance.		Base code renumbering.
	R~~507.3.4~~ 507.2.2.4 Termite resistance. Where required by Section 318, plastic composite deck boards, stair treads, guards and handrails containing wood, cellulosic or other biodegradable materials shall be termite resistant in accordance with ~~ASTM D 7032~~ ASTM D7032.		Base code renumbering and minor wordsmithing.
	~~R~~507.3.5507.2.2.5 Installation of plastic composites.		Base code renumbering.

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R507.2.3 Fasteners and connectors. Metal fasteners and connectors used for all decks shall be in accordance with Section R317.3 and Table R507.2.3.

New deck fastener requirements.

TABLE R507.2.3
FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS[a, b]

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING[e]
Nails and timber rivets	In accordance with ASTM F1667	Hot-dipped galvanized per ASTM A153	Stainless steel, silicon bronze or copper
Bolts[c] Lag screws[d] (including nuts and washers)	In accordance with ASTM A307 (bolts), ASTM A563 (nuts), ASTM F844 (washers)	Hot-dipped galvanized per ASTM A153, Class C (Class D for 3/8-inch diameter and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connectors	Per manufacturer's specification	ASTM A653 type G185 zinc-coated galvanized steel or post hot-dipped galvanized per ASTM A123 providing a minimum average coating weight of 2.0 oz./ft^2 (total both sides)	Stainless steel

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Equivalent materials, coatings and finishes shall be permitted.
b. Fasteners and connectors exposed to salt water or located within 300 feet of a salt water shoreline shall be stainless steel.
c. Holes for bolts shall be drilled a minimum 1/32 inch and a maximum 1/16 inch larger than the bolt.
d. Lag screws 1/2 inch and larger shall be predrilled to avoid wood splitting per the National Design Specification (NDS) for Wood Construction.
e. Stainless-steel-driven fasteners shall be in accordance with ASTM F1667.

New updates and table for fastener requirements.

TABLE R507.2.3
FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS[a, b]

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING[e]
Nails and ~~timber~~ glulam rivets	In accordance with **ASTM F1667**	Hot-dipped galvanized per **ASTM A153**, Class D for 3/8-inch diameter and less	Stainless steel, silicon bronze or copper
Bolts[c] Lag screws[d] (including nuts and washers)	In accordance with **ASTM A307** (bolts), **ASTM A563** (nuts), **ASTM F844** (washers)	Hot-dipped galvanized per **ASTM A153**, Class C (Class D for 3/8-inch diameter and less) or mechanically galvanized per **ASTM B695**, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connectors	Per manufacturer's specification	**ASTM A653** type G185 zinc-coated galvanized steel or post hot-dipped galvanized per **ASTM A123** providing a minimum average coating weight of 2.0 oz./ft^2 (total both sides)	Stainless steel

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.
a. Equivalent materials, coatings and finishes shall be permitted.
b. Fasteners and connectors exposed to salt water or located within 300 feet of a salt water shoreline shall be stainless steel.
c. Holes for bolts shall be drilled a minimum 1/32 inch and a maximum 1/16 inch larger than the bolt.
d. Lag screws 1/2 inch and larger shall be predrilled to avoid wood splitting per the *National Design Specification (NDS) for Wood Construction.*
e. Stainless-steel-driven fasteners shall be in accordance with **ASTM F1667**.

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	R507.2.4 Flashing. Flashing shall be corrosion-resistant metal of nominal thickness not less than 0.019 inch (0.48 mm) or *approved* nonmetallic material that is compatible with the substrate of the structure and the decking materials.		New flashing requirements.
	R507.2.5 Alternate materials. Alternative materials, including glass and metals, shall be permitted.		New requirements for alternate materials.
	R507.3 Footings. Decks shall be supported on concrete footings or other *approved* structural systems designed to accommodate all loads in accordance with **Section R301**. Deck footings shall be sized to carry the imposed loads from the deck structure to the ground as shown in **Figure R507.3**. ~~The footing depth shall be in accordance with Section R403.1.4.~~ **Exceptions:** 1. Footings shall not be required for free-standing decks consisting of joists directly supported on grade over their entire length. 2. Footings shall not be required for free-standing decks that meet all of the following criteria: 2.1. The joists bear directly on *precast concrete* pier blocks at grade without support by beams or posts. 2.2. The area of the deck does not exceed 200 square feet (18.6 m^2). 2.3. The walking surface is not more than 20 inches (508 mm) above grade atany point within 36 inches (914 mm) measured horizontally from the edge.		Updated deck footing requirements.
	R507.3.1 Minimum size. The minimum size of concrete footings shall be in accordance with Table R507.3.1, based on the tributary area and allowable soil-bearing pressure in accordance with Table R401.4.1.		New footing minimum size requirements.

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TABLE R507.3.1
MINIMUM FOOTING SIZE FOR DECKS

LIVE OR GROUND SNOW LOAD[b] (psf)	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOILS[a, c, d] (psf) 1500[e]			2000[e]			2500[e]			≥ 3000[e]		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)
40	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	14	16	6	12	14	6	12	14	6	12	14	6
	60	17	19	6	15	17	6	13	15	6	12	14	6
	80	20	22	7	17	19	6	15	17	6	14	16	6
	100	22	25	8	19	21	6	17	19	6	15	17	6
	120	24	27	9	21	23	7	19	21	6	17	19	6
	140	26	29	10	22	25	8	20	23	7	18	21	6
	160	28	31	11	24	27	9	21	24	8	20	22	7
50	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	15	17	6	13	15	6	12	14	6	12	14	6
	60	19	21	6	16	18	6	14	16	6	13	15	6
	80	21	24	8	19	21	6	17	19	6	15	17	6
	100	24	27	9	21	23	7	19	21	6	17	19	6
	120	26	30	10	23	26	8	20	23	7	19	21	6
	140	28	32	11	25	28	9	22	25	8	20	23	7
	160	30	34	12	26	30	10	24	27	9	21	24	8
60	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	16	19	6	14	16	6	13	14	6	12	14	6
	60	20	23	7	17	20	6	16	18	6	14	16	6
	80	23	26	9	20	23	7	18	20	6	16	19	6
	100	26	29	10	22	25	8	20	23	7	18	21	6
	120	28	32	11	25	28	9	22	25	8	20	23	7
	140	31	35	12	27	30	10	24	27	9	22	24	8
	160	33	37	13	28	32	11	25	29	10	23	26	9
70	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	18	20	6	15	17	6	14	15	6	12	14	6
	60	21	24	8	19	21	6	17	19	6	15	17	6
	80	25	28	9	21	24	8	19	22	7	18	20	6
	100	28	31	11	24	27	9	21	24	8	20	22	7
	120	30	34	12	26	30	10	24	27	9	21	24	8
	140	33	37	13	28	32	11	25	29	10	23	26	9
	160	35	40	15	30	34	12	27	31	11	25	28	9

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted, extrapolation not permitted.
b. Based on highest load case: Dead + Live or Dead + Snow.
c. Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for 6 x 6 post.
d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.
e. Area, in square feet, of deck surface supported by post and footings.

New table for deck footing size.

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	TABLE R507.3.1 **MINIMUM FOOTING SIZE FOR DECKS** LOAD-BEARING VALUE OF SOILS[a, c, e] (psf) 1,500[a] 2,000[a] ~~2500[a]~~ ≥ 3,000[a] LIVE OR GROUND SNOW LOAD[b] (psf) | TRIBUTARY AREA (ft^2) | Side of a square footing (inches) | Diameter of a round footing (inches) | Thickness (inches)[f] | ~~Side of a square footing (inches~~ | ~~Diameter of a round footing (inches)~~ | ~~Thickness (inches~~ 40: 5: 7 / 8 / 6 / 7 / 8 / 6 20: ~~42~~10 / ~~44~~12 / 6 / ~~42~~0 / ~~44~~0 / 6 40: 14 / 16 / 6 / 12 / 14 / 6 60: 17 / 19 / 6 / 15 / 17 / 6 80: 20 / 22 / 7 / 17 / 19 / 6 100: 22 / 25 / 8 / 19 / 21 / 6 120: 24 / 27 / 9 / 21 / 23 / 7 140: 26 / 29 / 10 / 22 / 25 / 8 160: 28 / 31 / 11 / 24 / 27 / 9 50: 5: 7 / 8 / 6 / 7 / 8 / 6 20: ~~42~~11 / ~~44~~13 / 6 / ~~42~~10 / ~~44~~11 / 6 40: 15 / 17 / 6 / 13 / 15 / 6 60: 19 / 21 / 6 / 16 / 18 / 6 80: 21 / 24 / 8 / 19 / 21 / 6 100: 24 / 27 / 9 / 21 / 23 / 7 120: 26 / 30 / 10 / 23 / 26 / 8 140: 28 / 32 / 11 / 25 / 28 / 9 160: 30 / 34 / 12 / 26 / 30 / 10 60: 5: 7 / 8 / 6 / 7 / 8 / 6 20: 12 / 14 / 6 / ~~42~~11 / ~~44~~12 / 6 40: 16 / 19 / 6 / 14 / 16 / ~~6~~8 60: 20 / 23 / 7 / 17 / 20 / 6 80: 23 / 26 / 9 / 20 / 23 / 7 100: 26 / 29 / 10 / 22 / 25 / 8 120: 28 / 32 / 11 / 25 / 28 / 9 140: 31 / 35 / 12 / 27 / 30 / 10 160: 33 / 37 / 13 / 28 / 32 / 11 : 5: 7 / 8 / 6 / 7 / 8 / 6 20: 12 / 14 / 6 / ~~42~~11 / ~~44~~13 / 6 40: 18 / 20 / 6 / 15 / 17 / 6 70: 60: 21 / 24 / 8 / 19 / 21 / 6 80: 25 / 28 / 9 / 21 / 24 / 8 100: 28 / 31 / 11 / 24 / 27 / 9 120: 30 / 34 / 12 / 26 / 30 / 10 140: 33 / 37 / 13 / 28 / 32 / 11 160: 35 / 40 / 15 / 30 / 34 / 12 ~~42 / 44 / 6~~ ~~44 / 46 / 6~~ ~~46 / 48 / 6~~ ~~48 / 20 / 6~~ ~~20 / 23 / 7~~ ~~22 / 25 / 8~~ ~~24 / 27 / 9~~ ~~25 / 29 / 10~~ ~~27 / 31 / 11~~ ~~12 / 14 / 6~~ ~~13 / 15 / 6~~ ~~15 / 17 / 6~~ ~~17 / 19 / 6~~ ~~19 / 21 / 6~~ ~~21 / 24 / 8~~ ~~23 / 26 / 9~~ ~~42 / 44 / 6~~ ~~44 / 46 / 6~~ ~~46 / 48 / 6~~ ~~48 / 20 / 6~~ ~~20 / 23 / 7~~ ~~22 / 25 / 8~~ ~~24 / 27 / 9~~ ~~25 / 29 / 10~~ ~~27 / 31 / 11~~ 7 / 8 / 6 / ~~42~~0 / ~~44~~0 / 6 12 / 14 / 6 / ~~42~~10 / ~~44~~12 / 6 14 / 16 / 6 / 12 / 14 / 6 15 / 17 / 6 / 13 / 15 / 6 17 / 19 / 6 / 14 / 16 / 6 18 / 21 / 6 / 15 / 17 / 6 19 / 21 / 6 / 17 / 19 / 6 20 / 22 / 7 / 18 / 21 / 6 21 / 24 / 8 / 20 / 22 / 7 22 / 24 / 8 / 21 / 24 / 8 23 / 26 / 9 / 23 / 26 / 9 7 / 8 / 6 / ~~42~~0 / ~~44~~0 / 6 12 / 14 / 6 / ~~42~~10 / ~~44~~12 / 6 15 / 17 / 6 / 13 / 15 / 6 18 / 20 / 6 / 15 / 17 / 6 20 / 22 / 7 / 17 / 19 / 6 21 / 24 / 8 / 18 / 21 / 6 23 / 26 / 9 / 20 / 23 / 7 25 / 28 / 9 / 21 / 24 / 8 For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kPa. a. Interpolation permitted, extrapolation not permitted. b. Based on highest load case: Dead + Live or Dead + Snow. c. ~~Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for 6 x 6 post.~~Footing dimensions shall allow complete bearing of the post. d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides. e. Area, in square feet, of deck surface supported by post and footings. f. Minimum thickness shall only apply to plain concrete footings.		
	R507.3.2 Minimum depth. ~~Deck footings shall extend below the frost line specified in Table R301.2(1) in accordance with Section R403.1.4.1.~~Deck footings shall be placed not less than 12 inches (305 mm) below the undisturbed ground surface. ~~**Exceptions:**~~ ~~1. Free-standing decks that meet all of the following criteria:~~ ~~1.1. The joists bear directly on *precast concrete* pier blocks at grade without support by beams or posts.~~ ~~1.2. The area of the deck does not exceed 200 square feet (18.9 m^2).~~ ~~1.3. The walking surface is not more than 20 inches (616 mm) above grade at any point within 36 inches (914 mm) measured horizontally from the edge.~~ ~~2. Free-standing decks need not be provided with footings that extend below the frost line.~~		Updated to deck footing requirements.
	R507.3.3 Frost protection. Where decks are attached to a frost-protected structure, deck footings shall be protected from frost by one or more of the following methods: 1. Extending below the frost line specified in **Table R301.2**. 2. Erecting on solid rock. 3. Other *approved* methods of frost protection.		New frost protection requirements for deck footings.
	~~**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.~~		Base code section removed.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	~~**Table R507.4**~~ ~~**Maximum Joist Spacing**~~		Base code table removed.
	R507.4 Deck posts. For single-level ~~wood-framed decks with beams sized in accordance with Table R507.5~~, ~~deck~~ wood post size shall be in accordance with Table R507.4.		New deck post requirements.
	TABLE R507.4 **DECK POST HEIGHT[a]** DECK POST SIZE | MAXIMUM HEIGHT[a, b] (feet-inches) 4 × 4 | 6-9[c] 4 × 6 | 8 6 × 6 | 14 8 × 8 | 14 For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa. a. Measured to the underside of the beam. b. Based on 40 psf live load. c. The maximum permitted height is 8 feet for one-ply and two-ply beams. The maximum permitted height for three-ply beams on post cap is 6 feet 9 inches.		New deck post height table.

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TABLE R507.4
DECK POST HEIGHT

LOADS (psf)[b]	POST SPECIES[c]	POST SIZE[d]	TRIBUTARY AREA (ft^2)[g, h]							
			20	40	60	80	100	120	140	160
			MAXIMUM DECK POST HEIGHT[a] (feet-inches)							
40 live load	Southern pine	4 × 4	14-0	13-8	11-0	9-5	8-4	7-5	6-9	6-2
		4 × 6	14-0	14-0	13-11	12-0	10-8	9-8	8-10	8-2
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas fir[e] Hem-fir[e] Spruce-pine-fir[e]	4 × 4	14-0	13-6	10-10	9-3	8-0	7-0	6-2	5-3
		4 × 6	14-0	14-0	13-10	11-10	10-6	9-5	8-7	7-10
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	4 × 4	14-0	13-2	10-3	8-1	5-8	NP	NP	NP
		4 × 6	14-0	14-0	13-6	11-4	9-9	8-4	6-9	4-7
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	13-7	9-7
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Southern pine	4 × 4	14-0	12-2	9-10	8-5	7-5	6-7	5-11	5-4
		4 × 6	14-0	14-0	12-6	10-9	9-6	8-7	7-10	7-3
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	13-4
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

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50 ground snow load	Douglas fir[e] Hem-fir[e] Spruce-pine-fir[e]	4 × 4	14-0	12-1	9-8	8-2	7-1	6-2	5-3	**4-2**
		4 × 6	14-0	14-0	12-4	**10-7**	9-4	8-4	**7-7**	**6-11**
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	**12-10**
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	4 × 4	14-0	11-8	9-0	6-10	3-7	NP	NP	NP
		4 × 6	14-0	14-0	12-0	10-0	8-6	7-0	5-3	NP
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	10-8	2-4
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
60 ground snow load	Southern pine	4 × 4	14-0	11-1	8-11	7-7	6-7	5-10	5-2	4-6
		4 × 6	14-0	14-0	11-4	9-9	8-7	7-9	7-1	6-6
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	12-9	11-2
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas fir[e] Hem-fir[e] Spruce-pine-fir[e]	4 × 4	14-0	10-11	8-8	7-3	6-2	5-0	3-7	NP
		4 × 6	14-0	13-11	11-2	9-7	8-4	7-5	6-8	5-11
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	12-2	10-2
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	4 × 4	14-0	10-6	7-9	4-7	NP	NP	NP	NP
		4 × 6	14-0	13-7	10-9	8-9	7-0	4-9	NP	NP
		6 × 6	14-0	14-0	14-0	14-0	14-0	9-9	NP	NP
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

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70 ground snow load	Southern pine	4 × 4	14-0	10-2	8-2	6-11	5-11	5-2	4-4	3-4
		4 × 6	14-0	12-11	10-5	8-11	7-10	7-1	6-5	5-10
		6 × 6	14-0	14-0	14-0	14-0	14-0	12-9	10-11	8-7
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas fir[e] Hem-fir[e] Spruce-pine-fir[e]	4 × 4	14-0	10-1	7-11	6-6	5-3	3-7	NP	NP
		4 × 6	14-0	12-10	10-3	8-9	7-7	6-8	5-10	4-11
		6 × 6	14-0	14-0	14-0	14-0	14-0	12-2	9-9	5-9
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	4 × 4	14-0	9-5	6-5	NP	NP	NP	NP	NP
		4 × 6	14-0	12-6	9-8	7-7	5-3	NP	NP	NP
		6 × 6	14-0	14-0	14-0	14-0	10-8	NP	NP	NP
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

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

NP = Not Permitted.

a. Measured from the underside of the beam to the top of footing or pier.
b. 10 psf dead load. Snow load not assumed to be concurrent with live load.
c. No. 2 grade, wet service factor included.
d. Notched deck posts shall be sized to accommodate beam size in accordance with **Section R507.5.2**.
e. Includes incising factor.
f. Incising factor not included.
g. Area, in square feet, of deck surface supported by post and footings.
h. Interpolation permitted. Extrapolation not permitted.

~~TABLE R507.4~~
~~DECK POST HEIGHT[a]~~

~~DECK POST SIZE~~	~~MAXIMUM HEIGHT[a,b] (feet-inches)~~
~~4 × 4~~	~~6-9[c]~~
~~4 × 6~~	~~8~~
~~6 × 6~~	~~14~~
~~8 × 8~~	~~14~~

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

~~a. Measured to the underside of the beam.~~
~~b. Based on 40 psf live load.~~
~~c. The maximum permitted height is 8 feet for one-ply and two-ply beams. The maximum permitted height for three-ply beams on post cap is 6 feet 9 inches.~~

R507.4.1 Deck post to deck footing connection. Where posts bear on concrete footings in accordance with Section R403 and Figure R507.4.1, lateral restraint shall be provided by manufactured connectors or a minimum post embedment of 12 inches (305 mm) in surrounding soils or concrete piers. Other footing systems shall be permitted.

Exception: Where expansive, compressible, shifting or other questionable soils are present, surrounding soils shall not be relied on for lateral support.

New deck post connection requirements.

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	~~**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 not greater than one-fourth of the actual, adjacent joist span.~~		Base code section removed.
	~~**TABLE R507.5**~~ ~~**DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)**~~		Base code table removed.
	~~**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 □ 0.128-inch) nails or (3) No. 10 □ 3-inch (76 mm) long wood screws.~~		Base code section removed.
	R~~507.6~~507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.**~~6~~**5, shall be in accordance with ~~Table R507.5~~**Tables R507.5(1)** through **R507.5(4)**. Beam plies shall be fastened together with two rows of 10d (3-inch □ 0.128-inch) 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 multispan beams shall be located at interior post locations.~~ ~~Allowable~~ actual beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.		Updates to deck beam requirements.

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~~TABLE R507.5~~TABLE R507.5(1)

MAXIMUM DECK BEAM SPAN ~~LENGTHSa, b, g (feet - inches) 40 PSF LIVE LOAD~~[c]

BEAM SPECIES[c,d]	BEAM SIZE[d]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i,] ~~LESS THAN OR EQUAL TO:~~ (feet)						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	~~4-11~~ 4-7	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	~~2-10~~ 3-10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	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~~ 7-5	7-0
	3 – 2 × 6	~~8-2~~ 8-6	7-5	6-8	6-1	5-8	5-3	~~5-0~~ 4-11
	3 – 2 × 8	~~10-10~~ 10-11	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 10	13-0	~~11-3~~ 11-2	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
	~~3 × 6 or 2~~ 1 – 2 x 6	~~5-5~~ 4-1	~~4-8~~ 3-6	~~4-2~~ 3-0	~~3-10~~ 2-8	~~3-6~~ 2-5	~~3-4~~ 2-3	~~2-9~~ 2-1
	~~3 × 8 or 2~~ 1 – 2 × 8	~~6-10~~ 5-6	~~5-11~~ 4-8	~~5-4~~ 4-0	~~4-10~~ 3-6	~~4-6~~ 3-2	~~4-1~~ 2-11	~~3-8~~ 2-9
	~~3 × 10 or 2~~ 1 – 2 × 10	~~8-4~~ 6-8	~~7-3~~ 5-10	~~6-6~~ 5-1	~~5-11~~ 4-6	~~5-6~~ 4-1	~~5-1~~ 3-9	~~4-8~~ 3-6
	~~3 × 12 or 2~~ 1 – 2 × 12	~~9-8~~ 7-9	~~8-5~~ 6-9	~~7-6~~ 6-0	~~6-10~~ 5-6	~~6-4~~ 5-0	~~5-11~~ 3-9	~~5-7~~ 3-6

Updates to deck beam span table.

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Douglas fir-larch[e,j] Hem-fir[e,j] Spruce-pine-fir[e,j],~~redwood, western cedars, ponderosa pine[f], red pine[f]~~	~~4 × 6~~ 2 – 2 × 6	~~6-5~~ 6-1	~~5-6~~ 5-3	~~4-11~~ 4-9	~~4-6~~ 4-4	~~4-2~~ 3-11	~~3-11~~ 3-7	~~3-8~~ 3-3
	~~4 × 8~~ 2 – 2 × 8	~~8-5~~ 8-2	~~7-3~~ 7-1	~~6-6~~ 6-4	~~5-11~~ 5-9	~~5-6~~ 5-2	~~5-2~~ 4-8	~~4-10~~ 4-4
	~~4 × 10~~ 2 – 2 × 10	~~9-11~~ 10-0	8-7	~~7-8~~ 7-9	7-0	6-6	~~6-1~~ 6-0	~~5-8~~ 5-6
	~~4 × 12~~ 2 – 2 × 12	~~11-5~~ 11-7	~~9-11~~ 10-0	~~8-10~~ 8-11	~~8-1~~ 8-2	~~7-6~~ 7-7	~~7-0~~ 7-1	~~6-7~~ 6-8
	3 – 2 × 6	~~7-4~~ 7-8	6-8	6-0	5-6	5-1	4-9	4-6
	3 – 2 × 8	~~9-8~~ 10-3	~~8-6~~ 8-10	~~7-7~~ 7-11	~~6-11~~ 7-3	~~6-5~~ 6-8	~~6-0~~ 6-3	~~5-8~~ 5-11
	3 – 2 × 10	~~12-0~~ 12-6	~~10-5~~ 10-10	~~9-4~~ 9-8	~~8-6~~ 8-10	~~7-10~~ 8-2	~~7-4~~ 7-8	~~6-11~~ 7-2
	3 – 2 × 12	~~13-11~~ 14-6	~~12-4~~ 12-7	~~10-9~~ 11-3	~~9-10~~ 10-3	~~9-1~~ 9-6	~~8-6~~ 8-11	~~8-1~~ 8-5
Redwood[h] Western cedars[h] Ponderosa pine[h] Red pine[h]	1 – 2 × 6	4-2	3-7	3-1	2-9	2-6	2-3	2-2
	1 – 2 × 8	5-4	4-7	4-1	3-7	3-3	3-0	2-10
	1 – 2 × 10	6-6	5-7	5-0	4-7	4-2	3-10	3-7
	1 – 2 × 12	7-6	6-6	5-10	5-4	4-11	4-7	4-4
	2 – 2 × 6	6-2	5-4	4-10	4-5	4-0	3-8	3-4
	2 – 2 × 8	7-10	6-10	6-1	5-7	5-2	4-10	4-5
	2 – 2 × 10	9-7	8-4	7-5	6-9	6-3	5-10	5-6
	2 – 2 × 12	11-1	9-8	8-7	7-10	7-3	6-10	6-5
	3 – 2 × 6	7-8	6-9	6-0	5-6	5-1	4-9	4-6
	3 – 2 × 8	9-10	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, 1 pound = 0.454 kg.

a. Interpolation permitted. Extrapolation not permitted.
b. Beams supporting a single span of joists with or without cantilever.
~~a.~~ 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 at the end~~. Snow load is not assumed to be concurrent with live load.
~~b. Beams supporting deck joists from one side only.~~
~~c.~~ d. No. 2 grade, wet service factor included.
~~d.~~ e. Beam depth shall be equal to or greater than ~~or equal to depth of joists with~~ the depth of intersecting joist for a flush beam ~~condition~~ connection.
~~g.~~ f. Beam cantilevers are limited to the adjacent beam's span divided by 4.

~~e.~~ g. Includes incising factor.
~~f.~~ h. ~~Northern species.~~ Incising factor not included.
i. Deck joist span as shown in **Figure R507.5**.
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with **Table R507.5(5)**.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R507.5(2)
MAXIMUM DECK BEAM SPAN—50 PSF GROUND SNOW LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH (feet)[a, i, j]						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	4-6	3-11	3-6	3-2	2-11	2-9	2-7
	1 – 2 × 8	5-9	4-11	4-5	4-0	3-9	3-6	3-3
	1 – 2 × 10	6-9	5-10	5-3	4-9	4-5	4-2	3-11
	1 – 2 × 12	8-0	6-11	6-2	5-8	5-3	4-11	4-7
	2 – 2 × 6	6-8	5-9	5-2	4-9	4-4	4-1	3-10
	2 – 2 × 8	8-6	7-4	6-7	6-0	5-7	5-2	4-11
	2 – 2 × 10	10-1	8-9	7-10	7-1	6-7	6-2	5-10
	2 – 2 × 12	11-11	10-3	9-2	8-5	7-9	7-3	6-10
	3 – 2 × 6	7-11	7-2	6-6	5-11	5-6	5-1	4-10
	3 – 2 × 8	10-5	9-3	8-3	7-6	6-11	6-6	6-2
	3 – 2 × 10	12-8	10-11	9-9	8-11	8-3	7-9	7-3
	3 – 2 × 12	14-11	12-11	11-6	10-6	9-9	9-1	8-7
Douglas fir-larch[g] Hem-fir[g] Spruce-pine-fir[g]	1 – 2 × 6	4-0	3-5	2-11	2-7	2-4	2-2	2-0
	1 – 2 × 8	5-4	4-7	3-11	3-5	3-1	2-10	2-8
	1 – 2 × 10	6-7	5-8	4-11	4-5	4-0	3-8	3-5
	1 – 2 × 12	7-7	6-7	5-11	5-4	4-10	4-6	4-2
	2 – 2 × 6	6-0	5-2	4-7	4-2	3-10	3-5	3-2
	2 – 2 × 8	8-0	6-11	6-2	5-8	5-0	4-7	4-2
	2 – 2 × 10	9-9	8-5	7-7	6-11	6-4	5-10	5-4
	2 – 2 × 12	11-4	9-10	8-9	8-0	7-5	6-11	6-6
	3 – 2 × 6	7-6	6-6	5-9	5-3	4-11	4-7	4-4
	3 – 2 × 8	10-0	8-8	7-9	7-1	6-6	6-1	5-8
	3 – 2 × 10	12-3	10-7	9-6	8-8	8-0	7-6	7-0
	3 – 2 × 12	14-3	12-4	11-0	10-1	9-4	8-9	8-3
Redwood[h]	1 – 2 × 6	4-1	3-6	3-0	2-8	2-5	2-3	2-1
	1 – 2 × 8	5-2	4-6	4-0	3-6	3-2	2-11	2-9
	1 – 2 × 10	6-4	5-6	4-11	4-6	4-1	3-9	3-6
	1 – 2 × 12	7-4	6-4	5-8	5-2	4-10	4-6	4-3
	2 – 2 × 6	6-1	5-3	4-8	4-4	3-11	3-6	3-3

New deck beam span table for ground snow loads.

Western cedars[h] Ponderosa pine[h] Red pine[h]	2 – 2 × 8	7-8	6-8	5-11	5-5	5-0	4-8	4-3
	2 – 2 × 10	9-5	8-2	7-3	6-8	6-2	5-9	5-5
	2 – 2 × 12	10-11	9-5	8-5	7-8	7-2	6-8	6-3
	3 – 2 × 6	7-1	6-5	5-11	5-5	5-0	4-8	4-5
	3 – 2 × 8	9-4	8-4	7-5	6-10	604	5-11	5-7
	3 – 2 × 10	11-9	10-2	9-1	8-4	7-8	7-2	6-9
	3 – 2 × 12	13-8	11-10	10-7	9-8	8-11	8-4	7-10

For SI: 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.
b. Beams supporting a single span of joists with or without cantilever.
c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load not assumed to be concurrent with live load.
d. No. 2 grade, wet service factor included.
e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
g. Includes incising factor.
h. Incising factor not included.
i. Deck joist span as shown in **Figure R507.5**.
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with **Table R507.5(5)**.

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TABLE R507.5(3)
MAXIMUM DECK BEAM SPAN—60 PSF GROUND SNOW LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	4-2	3-7	3-3	2-11	2-9	2-6	2-5
	1 – 2 × 8	5-3	4-7	4-1	3-9	3-5	3-3	3-0
	1 – 2 × 10	6-3	5-5	4-10	4-5	4-1	3-10	3-7
	1 – 2 × 12	7-5	6-5	5-9	5-3	4-10	4-6	4-3
	2 – 2 × 6	6-2	5-4	4-9	4-4	4-0	3-9	3-7
	2 – 2 × 8	7-10	6-10	6-1	5-7	5-2	4-10	4-6
	2 – 2 × 10	9-4	8-1	7-3	6-7	6-1	5-8	5-4
	2 – 2 × 12	11-0	9-6	8-6	7-9	7-2	6-9	6-4
	3 – 2 × 6	7-5	6-9	6-0	5-6	5-1	4-9	4-6
	3 – 2 × 8	9-9	8-6	7-8	6-11	6-5	6-0	5-8
	3 – 2 × 10	11-8	10-2	9-1	8-3	7-8	7-2	6-9
	3 – 2 × 12	13-9	11-11	10-8	9-9	9-0	8-5	7-11
Douglas fir-larch[g] Hem-fir[g] Spuce-pine-fir[g]	1 – 2 × 6	3-8	3-1	2-8	2-4	2-2	2-0	1-10
	1 – 2 × 8	5-0	4-1	3-6	3-1	2-10	2-7	2-5
	1 – 2 × 10	6-1	5-2	4-6	4-0	3-7	3-4	3-2
	1 – 2 × 12	7-1	6-1	5-5	4-10	4-5	4-1	3-10
	2 – 2 × 6	5-6	4-9	4-3	3-10	3-5	3-1	2-10
	2 – 2 × 8	7-5	6-5	5-9	5-0	4-6	4-1	3-9
	2 – 2 × 10	9-0	7-10	7-0	6-4	5-9	5-2	4-10
	2 – 2 × 12	10-6	9-1	8-1	7-5	6-10	6-4	5-10
	3 – 2 × 6	6-11	6-0	5-4	4-11	4-6	4-2	3-10
	3 – 2 × 8	9-3	8-0	7-2	6-6	6-1	5-6	5-0
	3 – 2 × 10	11-4	9-10	8-9	8-0	7-5	6-11	6-5
	3 – 2 × 12	13-2	11-5	10-2	9-4	8-7	8-1	7-7
	1 – 2 × 6	3-9	3-2	2-9	2-5	2-2	2-0	1-11
	1 – 2 × 8	4-10	4-2	3-7	3-2	2-11	2-8	2-6
	1 – 2 × 10	5-10	5-1	4-6	4-1	3-8	3-5	3-3
	1 – 2 × 12	6-10	5-11	5-3	4-10	4-5	4-2	3-11

New deck beam span table for ground snow loads.

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Redwood[h] Western cedars[h] Ponderosa pine[h] Red pine[h]	2 – 2 × 6	5-7	4-10	4-4	3-11	3-6	3-2	2-11
	2 – 2 × 8	7-1	6-2	5-6	5-0	4-7	4-2	3-10
	2 – 2 × 10	8-8	7-6	6-9	6-2	5-8	5-4	4-11
	2 – 2 × 12	10-1	8-9	7-10	7-2	6-7	6-2	5-10
	3 – 2 × 6	6-8	6-1	5-5	5-0	4-7	4-3	3-11
	3 – 2 × 8	8-9	7-9	6-22	6-4	5-20	5-5	5-3
	3 – 2 × 10	10-11	9-5	8-5	7-8	7-3	6-8	6-3
	3 – 2 × 12	12-8	10-11	9-9	8-11	8-3	7-9	7-3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation allowed. Extrapolation is not allowed.
b. Beams supporting a single span of joists with or without cantilever.
c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load not assumed to be concurrent with live load.
d. No. 2 grade, wet service factor included.
e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
g. Includes incising factor.
h. Incising factor not included.
i. Deck joist span as shown in **Figure R507.5**.
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with **Table R507.5(5)**.

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TABLE R507.5(4)
MAXIMUM DECK BEAM SPAN—70 PSF GROUND SNOW LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH (feet)[a, i, j]						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	3-11	3-4	3-0	2-9	2-6	2-4	2-3
	1 – 2 × 8	4-11	4-3	3-10	3-6	3-3	3-0	2-10
	1 – 2 × 10	5-10	5-1	4-6	4-2	3-10	3-7	3-4
	1 – 2 × 12	6-11	6-0	5-4	4-11	4-6	4-3	4-0
	2 – 2 × 6	5-9	5-0	4-6	4-1	3-9	3-6	3-4
	2 – 2 × 8	7-4	6-4	5-8	5-2	4-10	4-6	4-3
	2 – 2 × 10	8-9	7-7	6-9	6-2	5-8	5-4	5-0
	2 – 2 × 12	10-3	8-11	8-0	7-3	6-9	6-3	5-11
	3 – 2 × 6	7-0	6-3	5-7	5-1	4-9	4-5	4-2
	3 – 2 × 8	9-3	8-0	7-2	6-6	6-0	5-8	5-4
	3 – 2 × 10	10-11	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 12	12-11	11-2	10-0	9-1	8-5	7-11	7-5
Douglas fir-larch[g] Hem-fir[g] Spruce-pine-fir[g]	1 – 2 × 6	3-5	2-10	2-5	2-2	2-0	1-10	1-9
	1 – 2 × 8	4-7	3-8	3-2	2-10	2-7	2-5	2-4
	1 – 2 × 10	5-8	4-9	4-1	3-8	3-4	3-1	2-11
	1 – 2 × 12	6-7	5-8	5-0	4-6	4-1	3-10	3-7
	2 – 2 × 6	5-2	4-6	4-0	3-5	3-1	2-10	2-7
	2 – 2 × 8	6-11	6-0	5-3	4-7	4-1	3-8	3-5
	2 – 2 × 10	8-5	7-4	6-6	5-10	5-2	4-9	4-5
	2 – 2 × 12	9-10	8-6	7-7	6-11	6-4	5-9	5-4
	3 – 2 × 6	6-6	5-7	5-0	4-7	4-2	3-9	3-5
	3 – 2 × 8	8-8	7-6	6-8	6-1	5-6	5-0	4-7
	3 – 2 × 10	10-7	9-2	8-2	7-6	6-11	6-4	5-10
	3 – 2 × 12	12-4	10-8	9-7	8-9	8-1	7-7	7-1
Redwood[h]	1 – 2 × 6	3-6	2-11	2-6	2-3	2-0	1-11	1-9
	1 – 2 × 8	4-6	3-10	3-3	2-11	2-8	2-6	2-4
	1 – 2 × 10	5-6	4-9	4-2	3-9	3-5	3-2	3-0
	1 – 2 × 12	6-4	5-6	4-11	4-6	4-2	3-11	3-8
	2 – 2 × 6	5-3	4-7	4-1	3-6	3-2	2-11	2-8

New deck beam span table for ground snow loads.

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<table>
<tr>
<td></td>
<td>
<table>
<tr><td rowspan="7">Western cedars[h]
Ponderosa pine[h]
Red pine[h]</td><td>2 – 2 × 8</td><td>6-8</td><td>5-9</td><td>5-2</td><td>4-8</td><td>4-2</td><td>3-10</td><td>3-6</td></tr>
<tr><td>2 – 2 × 10</td><td>8-2</td><td>7-1</td><td>6-4</td><td>5-9</td><td>5-4</td><td>4-10</td><td>4-6</td></tr>
<tr><td>2 – 2 × 12</td><td>9-5</td><td>8-2</td><td>7-4</td><td>6-8</td><td>6-2</td><td>5-9</td><td>5-5</td></tr>
<tr><td>3 – 2 × 6</td><td>6-4</td><td>5-8</td><td>5-1</td><td>4-8</td><td>4-3</td><td>3-10</td><td>3-6</td></tr>
<tr><td>3 – 2 × 8</td><td>8-4</td><td>7-3</td><td>6-5</td><td>5-11</td><td>5-5</td><td>5-1</td><td>4-8</td></tr>
<tr><td>3 – 2 × 10</td><td>10-2</td><td>8-10</td><td>7-11</td><td>7-2</td><td>6-8</td><td>6-3</td><td>5-11</td></tr>
<tr><td>3 – 2 × 12</td><td>11-10</td><td>10-3</td><td>9-2</td><td>8-4</td><td>7-9</td><td>7-3</td><td>6-10</td></tr>
</table>
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.
a. Interpolation allowed. Extrapolation is not allowed.
b. Beams supporting a single span of joists with or without cantilever.
c. Dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 180 at cantilever. Snow load not assumed to be concurrent with live load.
d. No. 2 grade, wet service factor included.
e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
g. Includes incising factor.
h. Incising factor not included.
i. Deck joist span as shown in **Figure R507.5**.
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with **Table R507.5(5)**.

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN [for use with Note j in Tables R507.5(1), R507.5(2), R507.5(3) and R507.5(4)]
<table>
<tr><th>C/J[a]</th><th>JOIST SPAN FACTOR</th></tr>
<tr><td>0 (no cantilever)</td><td>0.66</td></tr>
<tr><td>1/12 (0.87)</td><td>0.72</td></tr>
<tr><td>1/10 (0.10)</td><td>0.80</td></tr>
<tr><td>1/8 (0.125)</td><td>0.84</td></tr>
<tr><td>1/6 (0.167)</td><td>0.90</td></tr>
<tr><td>1/4 (0.250)</td><td>1.00</td></tr>
</table>
For SI: 1 foot = 304.8 mm.
a. C = actual joist cantilever length (feet); J = actual joist span length (feet).
</td>
<td></td>
<td>New deck joist span table.</td>
</tr>
<tr>
<td></td>
<td>**R507.6 Deck joists.** Maximum allowable spans for wood deck joists, as shown in Figure R507.6, shall be in accordance with Table R507.6. The maximum joist spacing shall be limited by the decking materials in accordance with **Table R507.7**. ~~The maximum joist cantilever shall be limited to one-fourth of the joist span or the maximum cantilever length specified in Table R507.6, whichever is less.~~</td>
<td></td>
<td>Updated deck joists requirements.</td>
</tr>
<tr>
<td></td>
<td>**FIGURE R507.6**
TYPICAL DECK JOIST SPANS</td>
<td></td>
<td>New figure for deck joist spans.</td>
</tr>
</table>

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TABLE R507.6
DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)

SPECIES[a]	SIZE	ALLOWABLE JOIST SPAN[b] SPACING OF DECK JOISTS (inches)			MAXIMUM CANTILEVER[c, f] SPACING OF DECK JOISTS WITH CANTILEVERS[c] (inches)		
		12	16	24	12	16	24
Southern pine	2 × 6	9-11	9-0	7-7	1-3	1-4	1-6
	2 × 8	13-1	11-10	9-8	2-1	2-3	2-5
	2 × 10	16-2	14-0	11-5	3-4	3-6	2-10
	2 × 12	18-0	16-6	13-6	4-6	4-2	3-4
Douglas fir-larch[d], hem-fir[d], spruce-pine-fir[d]	2 × 6	9-6	8-8	7-2	1-2	1-3	1-5
	2 × 8	12-6	11-1	9-1	1-11	2-1	2-3
	2 × 10	15-8	13-7	11-1	3-1	3-5	2-9
	2 × 12	18-0	15-9	12-10	4-6	3-11	3-3
Redwood, western cedars, ponderosa pine[e], red pine[e]	2 × 6	8-10	8-0	7-0	1-0	1-1	1-2
	2 × 8	11-8	10-7	8-8	1-8	1-10	2-0
	2 × 10	14-11	13-0	10-7	2-8	2-10	2-8
	2 × 12	17-5	15-1	12-4	3-10	3-9	3-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. No. 2 grade with wet service factor.

b. Ground snow load, live load = 40 psf, dead load = 10 psf, L/D = 360.

c. Ground snow load, live load = 40 psf, dead load = 10 psf, L/D = 360 at main span, L/D = 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.

New table for deck joist span requirements.

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TABLE R507.6

MAXIMUM DECK JOIST SPANS ~~FOR COMMON LUMBER SPECIES (ft. - in.)~~

LOAD[a] (psf)	JOIST SPECIES~~*~~[b]	JOIST SIZE	ALLOWABLE JOIST SPAN[b, c] (feet-inches)			MAXIMUM CANTILEVER~~*~~[b, d, f] (feet-inches)							
			Joist spacing ~~SPACING OF DECK JOISTS~~ (inches)			~~SPACING OF DECK JOISTS WITH CANTILEVERS*~~ (inches) Joist back span[a] (feet)							
			12	16	24	4	6	8	10	12	14	16	18	~~24~~
40 live load	Southern pine	2 × 6	9-11	9-0	7-7	1-0	1-6	1-5	NP	~~1-3~~ NP	NP	~~1-4~~ NP	NP	~~1-6~~
		2 × 8	13-1	11-10	9-8	1-0	1-6	2-0	2-6	~~2-1~~ 2-3	NP	~~2-3~~ NP	NP	~~2-5~~
		2 × 10	16-2	14-0	11-5	1-0	1-6	2-0	2-6	~~3-4~~ 3-0	3-4	~~3-6~~ 3-4	NP	~~2-10~~
		2 × 12	18-0	16-6	13-6	1-0	1-6	2-0	2-6	~~4-6~~ 3-0	3-6	~~4-2~~ 4-0	4-1	~~3-4~~
	~~Douglas fir-larch[e]; hem-fir[e] spruce-pine-fir[e]~~ Douglas fir-larch[e] Hem-fir[e] Spruce-pine-fir[e]	2 × 6	9-6	~~8-8~~ 8-4	~~7-2~~ 6-10	1-0	1-6	1-4	NP	~~1-2~~ NP	NP	~~1-3~~ NP	NP	~~1-5~~
		2 × 8	12-6	11-1	9-1	1-0	1-6	2-0	2-3	~~1-11~~ 2-0	NP	~~2-1~~ NP	NP	~~2-3~~
		2 × 10	15-8	13-7	11-1	1-0	1-6	2-0	2-6	~~3-1~~ 3-0	3-3	~~3-5~~ NP	NP	~~2-9~~
		2 × 12	18-0	15-9	12-10	1-0	1-6	2-0	2-6	~~4-6~~ 3-0	3-6	3-11	**3-11**	~~3-3~~
	~~Redwood, western cedars, ponderosa pine[e], red pine[e]~~ Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	2 × 6	8-10	8-0	~~7-0~~ 6-10	1-0	1-4	1-1	NP	~~1-0~~ NP	NP	~~1-1~~ NP	NP	~~1-2~~
		2 × 8	11-8	10-7	8-8	1-0	1-6	2-0	1-11	~~1-8~~ NP	NP	~~1-10~~ NP	NP	~~2-0~~
		2 × 10	14-11	13-0	10-7	1-0	1-6	2-0	2-6	~~2-8~~ 3-0	2-9	~~2-10~~ NP	NP	~~2-8~~
		2 × 12	17-5	15-1	12-4	1-0	1-6	2-0	2-6	~~3-10~~ 3-0	3-6	~~3-9~~ 3-8	NP	~~3-1~~
		2 × 6	9-2	8-4	7-4	1-0	1-6	1-5	NP	NP	NP	NP	NP	

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50 ground snow load	Southern pine	2 × 8	12-1	11-0	9-5	1-0	1-6	2-0	2-5	2-3	NP	NP	NP	
		2 × 10	15-5	13-9	11-3	1-0	1-6	2-0	2-6	3-0	3-1	NP	NP	
		2 × 12	18-0	16-2	13-2	1-0	1-6	2-0	2-6	3-0	3-6	3-10	3-10	
	Douglas fir-larch[e] Hem-fir[e] Spruce-pine-fir[e]	2 × 6	8-10	8-0	**6-8**	1-0	1-6	1-4	NP	NP	NP	NP	NP	
		2 × 8	11-7	10-7	**8-11**	1-0	1-6	2-0	2-3	NP	NP	NP	NP	
		2 × 10	14-10	13-3	10-10	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP	
		2 × 12	17-9	15-5	12-7	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP	
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	2 × 6	8-3	7-6	6-6	1-0	1-4	1-1	NP	NP	NP	NP	NP	
		2 × 8	10-10	9-10	8-6	1-0	1-6	2-0	1-11	NP	NP	NP	NP	
		2 × 10	13-10	12-7	10-5	1-0	1-6	2-0	2-6	2-9	NP	NP	NP	
		2 × 12	16-10	14-9	12-1	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP	
60 ground snow load	Southern pine	2 × 6	8-8	7-10	6-10	1-0	1-6	1-5	NP	NP	NP	NP	NP	
		2 × 8	11-5	10-4	8-9	1-0	1-6	2-0	2-4	NP	NP	NP	NP	
		2 × 10	14-7	12-9	10-5	1-0	1-6	2-0	2-6	2-11	2-11	NP	NP	
		2 × 12	17-3	15-0	12-3	1-0	1-6	2-0	2-6	3-0	3-6	3-7	NP	
	Douglas fir-larch[e] Hem-fir[e] Spruce-pine-fir[e]	2 × 6	8-4	7-6	6-2	1-0	1-6	1-4	NP	NP	NP	NP	NP	
		2 × 8	10-11	9-11	8-3	1-0	1-6	2-0	2-2	NP	NP	NP	NP	
		2 × 10	13-11	12-4	10-0	1-0	1-6	2-0	2-6	2-10	NP	NP	NP	
		2 × 12	16-6	14-3	11-8	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP	

	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	2 × 6	7-9	7-0	6-2	1-0	1-4	NP	NP	NP	NP	NP	NP
		2 × 8	10-2	9-3	7-11	1-0	1-6	2-0	1-11	NP	NP	NP	NP
		2 × 10	13-0	11-9	9-7	1-0	1-6	2-0	2-6	2-7	NP	NP	NP
		2 × 12	15-9	13-8	11-2	1-0	1-6	2-0	2-6	3-0	3-2	NP	NP
70 ground snow load	Southern pine	2 × 6	8-3	7-6	6-5	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	10-10	9-10	8-2	1-0	1-6	2-0	2-2	NP	NP	NP	NP
		2 × 10	13-9	11-11	9-9	1-0	1-6	2-0	2-6	2-9	NP	NP	NP
		2 × 12	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP
	Douglas fir-larch[e] Hem-fir[e] Spruce-pine-fir[e]	2 × 6	7-11	7-1	5-9	1-0	1-6	NP	NP	NP	NP	NP	NP
		2 × 8	10-5	9-5	7-8	1-0	1-6	2-0	2-1	NP	NP	NP	NP
		2 × 10	13-3	11-6	9-5	1-0	1-6	2-0	2-6	2-8	NP	NP	NP
		2 × 12	15-5	13-4	10-11	1-0	1-6	2-0	2-6	3-0	3-3	NP	NP
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	2 × 6	7-4	6-8	5-10	1-0	1-4	NP	NP	NP	NP	NP	NP
		2 × 8	9-8	8-10	7-4	1-0	1-6	1-11	NP	NP	NP	NP	NP
		2 × 10	12-4	11-0	9-0	1-0	1-6	2-0	2-6	2-6	NP	NP	NP
		2 × 12	14-9	12-9	10-5	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

NP = Not Permitted.

a. Dead load = 10 psf. Snow load not assumed to be concurrent with live load.
~~a.~~b. No. 2 grade, ~~with~~ wet service factor included.
~~b.~~c. ~~Ground snow load, live load = 40 psf, dead load = 10 psf,~~ L/Δ = 360 at main span.
~~c.~~d. ~~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.~~e. Includes incising factor.
~~e.~~f. ~~Northern species with no~~Incising factor not included.
~~f.~~ ~~Cantilevered spans not exceeding the nominal depth of the joist are permitted.~~
g. Interpolation allowed. Extrapolation is not allowed.

R507.6.1 Deck joist bearing. *The ends of joists shall have not less than 1 1/2 inches (38 mm) of bearing on* wood or metal and not less than 3 inches (76 mm) of bearing on concrete or masonry over its entire width. Joists bearing on top of a multiple-ply beam or ledger shall be fastened in accordance with Table R602.3(1). Joists bearing on top of a single-ply beam or ledger shall be attached by a mechanical connector. Joist framing into the side of a beam or ledger board shall be supported by approved joist hangers.

New deck joist requirements.

R507.6.2 Deck joist lateral restraint. Joist ends and bearing locations shall be provided with lateral resistance 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

New deck joist requirements.

	rim joists, they shall be secured to the end of each joist with not fewer than three 10d (3-inch by 0.128-inch) (76 mm by 3.3 mm) nails or three No. 10x 3-inch (76 mm) long wood screws.		
	~~R507.7 Deck joist and deck beam bearing.~~ ~~The ends of each joist and beam shall have not less than 1 1/2 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.~~		Base code section removed.
	~~R507.7.1 Deck post to deck beam.~~ ~~Deck beams shall be attached to deck posts in accordance with Figure R507.7.1 or by other equivalent means capable to resist 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.~~		Base code section removed.
	~~FIGURE R507.7.1~~ **~~DECK BEAM TO DECK POST~~**		Base code figure removed.
	R507.7 Decking. Maximum allowable spacing for joists supporting wood decking, excluding *stairways*, shall be in accordance with Table R507.7. Wood decking shall be attached to each supporting member with not less than two 8d threaded nails or two No. 8 wood screws. Maximum allowable spacing for joists supporting *plastic composite* decking shall be in accordance with **Section R507.2**. Other approved decking or fastener systems shall be installed in accordance with the manufacturer's installation requirements.		New decking spacing requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	TABLE R507.7 **MAXIMUM JOIST SPACING FOR DECKING** **DECKING MATERIAL TYPE AND NOMINAL SIZE** / **MAXIMUM ON-CENTER JOIST SPACING** (Decking perpendicular to joist / Decking diagonal to joist[a]) 1 1/4-inch-thick wood — 16 inches — 12 inches 2-inch-thick wood — 24 inches — 16 inches Plastic composite — In accordance with Section R507.2 — In accordance with Section R507.2 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. TABLE R507.7 MAXIMUM JOIST SPACING FOR WOOD DECKING DECKING MATERIAL TYPE AND NOMINAL SIZE / ~~MAXIMUM ON-CENTER JOIST SPACING~~ (DECKING PERPENDICULAR TO JOIST: Single span[c], Multiple span[c] / DECKING DIAGONAL TO JOIST[a]: Single span[c], Multiple span[c]) Maximum on-center joist spacing (inches) 1 1/4-inch-thick wood[b] — 12 — 16 ~~inches~~ — 8 — 12 ~~inches~~ 2-inch-thick wood — 24 — 24 ~~inches~~ — 18 — 24 ~~16~~ ~~inches~~ ~~Plastic composite~~ — ~~In accordance with Section R507.2~~ — ~~In accordance with Section R507.2~~ 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. b. Other maximum span provided by an accredited lumber grading or inspection agency. c. Individual wood deck boards supported by two joists shall be considered single span and three or more joists shall be considered multiple span.		New and updated tables for deck joist spacing.
	~~**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.~~		Base code section removed.
	~~**TABLE R507.8**~~ ~~**DECK POST HEIGHT**~~		Base code table removed.
	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.		New deck post footing requirements.
	FIGURE R507.8.1 **TYPICAL DECK POSTS TO DECK FOOTINGS**		New deck post figure.

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	R507.8 Vertical and lateral supports. 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. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. For decks with cantilevered framing members, connection 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. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting.		New deck anchor support requirements.
	R507.9 Vertical and lateral supports at band joist. Vertical and lateral supports for decks shall comply with this section.		New deck anchor support requirements.
	R507.9 Vertical and lateral supports at band joist. Vertical and lateral supports for decks shall comply with this section.		New deck anchor support requirements.
	R507.9.1.1 Ledger details. Deck ledgers 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 shall not support concentrated loads from beams or girders. Deck ledgers shall not be supported on stone or masonry veneer.		New deck anchor support requirements.
	R507.9.1.2 Band joist details. Band joists supporting a ledger shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir or better lumber or a minimum 1-inch ~~by 9$^{1}/_{2}$ inch~~ (25 mm ~~× 241 mm~~) ~~dimensional, Douglas fir or better, laminated veneer lumber~~ nominal engineered wood rim boards in accordance with Section R502.1.7. Band joists shall bear fully on the primary structure capable of supporting all required loads.		New deck anchor support requirements.
	R507.9.1.3 Ledger to band joist details. Fasteners used in deck ledger connections in accordance with Table R507.9.1.3(1) shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.9.1.3(2) and Figures R507.9.1.3(1) and R507.9.1.3(2).		New deck anchor support requirements.

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TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOISTa, b
(Deck live load = 40 psf, deck dead load = 10 psf, snow load 40 psf)

CONNECTION DETAILS	JOIST SPAN						
	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						
1/2-inch diameter lag screw with 1/2-inch maximum sheathing[c, d]	30	23	18	15	13	11	10
1/2-inch diameter bolt with 1/2-inch maximum sheathing[d]	36	36	34	29	24	21	19
1/2-inch diameter bolt with 1-inch maximum sheathing[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 R703.4 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 1/2-inch thickness of stacked washers shall be permitted to substitute for up to 1/2 inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

New table for deck connection requirements.

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TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOIST

LOAD[c] (psf)	JOIST SPAN[a] (feet)	ON-CENTER SPACING OF FASTENERS[b] (inches)		
		$^1/_2$-inch diameter lag screw with $^1/_2$-inch maximum sheathing[d, e]	$^1/_2$-inch diameter bolt with $^1/_2$-inch maximum sheathing[e]	$^1/_2$-inch diameter bolt with 1-inch maximum sheathing[f]
40 live load	6	30	36	36
	8	23	36	36
	10	18	34	29
	12	15	29	24
	14	13	24	21
	16	11	21	18
	18	10	19	16
50 ground snow load	6	29	36	36
	8	22	36	35
	10	17	33	28
	12	14	27	23
	14	12	23	20
	16	11	20	17
	18	9	18	15
60 ground snow load	6	25	36	36
	8	18	35	30
	10	15	28	24
	12	12	23	20
	14	10	20	17
	16	9	17	15
	18	8	15	13
70 ground snow load	6	22	36	35
	8	16	31	26
	10	13	25	21
	12	11	20	17
	14	9	17	15
	16	8	15	13
	18	7	13	11

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

a. Interpolation permitted. Extrapolation is not permitted.
b. Ledgers shall be flashed in accordance with **Section R703.4** to prevent water from contacting the house band joist.
c. Dead Load = 10 psf. Snow load shall not be assumed to act concurrently with live load.
d. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
e. Sheathing shall be wood structural panel or solid sawn lumber.
f. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or foam sheathing. Up to $^1/_2$-inch thickness of stacked washers shall be permitted to substitute for up to $^1/_2$ inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

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	~~TABLE R507.9.1.3(1)~~ ~~DECK LEDGER CONNECTION TO BAND JOIST[a, b] (Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40 psf)~~ ~~CONNECTION DETAILS~~ / ~~JOIST SPAN~~ / ~~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~~ ~~½-inch diameter lag screw with ½-inch maximum sheathing[c, d]~~ / ~~30~~ / ~~23~~ / ~~18~~ / ~~15~~ / ~~13~~ / ~~11~~ / ~~10~~ ~~½-inch diameter bolt with ½-inch maximum sheathing[d]~~ / ~~36~~ / ~~36~~ / ~~34~~ / ~~29~~ / ~~24~~ / ~~21~~ / ~~19~~ ~~½-inch diameter bolt with 1-inch maximum sheathing[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 R703.4** 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 where combined with wood structural panel or lumber sheathing.~~		
	R507.10 Exterior guards. *Guards* shall be constructed to meet the requirements of Sections R301.5 and R312, and this section.		New guard requirements for decks.
	R507.10.1 Support of guards. Where *guards* are supported on deck framing, *guard* loads shall be transferred to the deck framing with a continuous load path to the deck joists.		New guard requirements for decks.
	R507.10.1.1 Guards supported by side of deck framing. Where *guards* are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners in end grain withdrawal are not permitted.		New guard requirements for decks.
	R507.10.1.2 Guards supported on top of deck framing. Where *guards* are mounted on top of the decking, the *guards* shall be connected to the deck framing or blocking and installed in accordance with manufacturer's instructions to transfer the *guard* loads to the adjacent joists.		New guard requirements for decks.
	R507.10.2 Wood posts at deck guards. Where 4-inch by 4-inch (102 mm by 102 mm) wood posts support guard loads applied to the top of the guard, such posts shall not be notched at the connection to the supporting structure.		New guard requirements for decks.

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	R507.10.3 Plastic composite guards. *Plastic composite guards* shall comply with the provisions of Section R507.2.2.		New guard requirements for decks.
	R507.10.4 Other guards. Other *guards* shall be in accordance with either manufacturer's instructions or accepted engineering principles.		New guard requirements for decks.
2015 Houston IRC Amendments	**2021 IRC – Chapter 6 – Wall Construction**	**2021 Houston IRC Amendments**	**Code Change Summary**
	R602.1.11 Structural insulated panels. *Structural insulated panels* shall be manufactured and identified in accordance with ANSI/APA PRS 610.1.		New insulated structural panel requirements.
	R602.2 Grade. Studs shall be a minimum No. 3, standard or stud grade lumber. **Exception:** Bearing studs not supporting floors and nonbearing studs shall be permitted to be utility grade lumber, provided **that** the studs are spaced in accordance with Table R602.3(5).		No Houston amendment.

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TABLE R602.3(1)
FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Roof		
1	Blocking between ceiling joists or rafters to top plate	4-8d box (2 1/2" × 0.113") or 3-8d common (2 1/2" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Toe nail
2	Ceiling joists to top plate	4-8d box (2 1/2" × 0.113"); or 3-8d common (2 1/2" × 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 {(see Sections ~~R802.3.1,~~ R802.3**5**.2 and Table R802.5.~~1~~**2**~~(9)~~)}	4-10d box (3" × 0.128"); or 3-16d common (3 1/2" × 0.162"); or 4-3" × 0.131" nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) {(see Sections ~~R802.3.1 and~~ R802.3**5**.2 and Table R802.5.~~1~~**2**~~(9)~~)}	Table R802.5.1(9)	Face nail
5	Collar tie to rafter, face nail or 1 1/4"	4-10d box (3" × 0.128"); or 3-10d common (3" × 0.148"); or	Face nail each rafter

Updates throughout table for fastening requirements.

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	× 20 ga. ridge strap to rafter	4-3" × 0.131" nails	
6	Rafter or roof truss to plate	3-16d box nails (3 1/2" × 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
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d (3 1/2" × 0.135"); or 3-10d common (3 1/4" × 0.148"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	Toe nail
		3-16d box 3 1/2" × 0.135"); or 2-16d common (3 1/2" × 0.162"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	End nail
	Wall		
8	Stud to stud (not at braced wall panels)	16d common (3 1/2" × 0.162")	24" o.c. face nail
		10d box (3" × 0.128"); or 3" × 0.131" nails	16" o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d box (3 1/2" × 0.135"); or 3" × 0.131" nails	12" o.c. face nail
		16d common (3 1/2" × 0.162")	16" o.c. face nail
10	Built-up header (2" to 2" header with 1/2" spacer)	16d common (3 1/2" × 0.162")	16" o.c. each edge face nail
		16d box (3 1/2" × 0.135")	12" o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 1/2" × 0.113"); or 4-8d common (2 1/2" × 0.131"); or 4-10d box (3" × 0.128")	Toe nail
12	Top plate to top plate	16d common (3 1/2" × 0.162")	16" o.c. face nail
		10d box (3" × 0.128"); or 3" × 0.131" nails	12" o.c. face nail
13	Double top plate splice ~~for SDCs A-D2 with seismic braced wall line spacing < 25'~~	8-16d common (3 1/2" × 0.162"); or 12-16d box (3 1/2" × 0.135"); or 12-10d box (3" × 0.128"); or 12-3" × 0.131" nails	Face nail on each side of end joint (minimum 24" lap splice length each side of end joint)
	~~Double top plate splice SDCs D0 - D1 or D2 and braced wall line spacing ≥ 25'~~	~~12-16d (3 1/4" × 0.135")~~	

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ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION	
		Floor		
24	2" subfloor to joist or girder	3-16d box (3 1/2" × 0.135"); or 2-16d common (3 1/2" × 0.162")	Blind and face nail	
25	2" planks (plank & beam—floor & roof)	3-16d box (3 1/2" × 0.135"); or 2-16d common (3 1/2" × 0.162")	At each bearing, face nail	
26	Band or rim joist to joist	3-16d common (3 1/2" × 0.162") 4-10 box (3" × 0.128"), or 4-3" × 0.131" nails; or 4-3" × 14 ga. staples, 7/16" crown	End nail	
27	Built-up girders and beams, 2-inch lumber layers	20d common (4" × 0.192"); or	Nail each layer as follows: 32" o.c. at top and bottom and staggered.	
		10d box (3" × 0.128"); or 3" × 0.131" nails	24" o.c. face nail at top and bottom staggered on opposite sides	
		And: 2-20d common (4" × 0.192"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Face nail at ends and at each splice	
28	Ledger strip supporting joists or rafters	4-16d box (3 1/2" × 0.135"); or 3-16d common (3 1/2" × 0.162"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	At each joist or rafter, face nail	
29	Bridging **or blocking** to joist	2-10d **box** (3" × 0.128"), **or 2-8d common (21/2" × 0.31"; or 2-3" × 0.31") nails**	Each end, toe nail	
ITEM	**DESCRIPTION OF BUILDING ELEMENTS**	**NUMBER AND TYPE OF FASTENER[a, b, c]**	**SPACING OF FASTENERS**	
			Edges (inches)[h]	**Intermediate supports[c, e] (inches)**
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
30	3/8" – 1/2"	6d common (2" × 0.113") nail (subfloor, wall)i 8d common (2 1/2" × 0.131") nail (roof), **or** **RSRS-01 (2 3/8" × 0.113")nail (roof)[j]**	6	12[f]

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31	1 9/32" – 1"	8d common nail (2 1/2" × 0.131") ; or RSRS-01 (2 3/8" × 0.113")nail (roof)[j]	6	12[f]
32	1 1/8" – 1 1/4"	10d common (3" × 0.148") nail; or 8d (2 1/2" × 0.131") deformed nail	6	12
Other wall sheathing[g]				
33	1/2" structural cellulosic fiberboard sheathing	1 1/2" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga staple with 7/16" or 1" crown ~~staple 16 ga., 1 1/4" long~~	3	6
34	2 5/32" structural cellulosic fiberboard sheathing	1 3/4" galvanized roofing nail, 7/16" head diameter, or 1 1/2" long 16 ga staple with 7/16" or 1" crown ~~staple 16 ga., 1 1/4" long~~	3	6
35	1/2" gypsum sheathing[d]	1 1/2" galvanized roofing nail; staple galvanized, 1 1/2" long; 1 1/4" screws, Type W or S	7	7
36	5/8" gypsum sheathing[d]	1 3/4" galvanized roofing nail; staple galvanized, 1 5/8" long; 1 5/8" screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				
37	3/4" and less	6d deformed (2" × 0.120") nail; or 8d common (2 1/2" × 0.131") nail	6	12
38	7/8" – 1"	8d common (2 1/2" × 0.131") nail; or 8d deformed (2 1/2" × 0.120") nail	6	12
39	1 1/8" – 1 1/4"	10d common (3" × 0.148") nail; or 8d deformed (2 1/2" × 0.120") nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.

b. Staples are 16 gage wire and have a minimum 7/16-inch on diameter crown width.

c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.

e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).

f. ~~Where the ultimate design wind speed is 130 mph or less, nails for attaching~~ For wood structural panel roof sheathing attached to gable end ~~wall~~ roof framing , and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 6 inches on ~~center. Where~~ center where the ultimate design wind speed is ~~greater~~ less than 130 ~~mph, nails for attaching panel roof sheathing to intermediate supports~~ mph and shall be spaced ~~6 inches on center for minimum 48 inch distance from ridges, eaves and gable end walls; and~~ 4 inches on center ~~to gable end wall framing~~ where the ultimate design wind speed is 130 mph or greater but less than 140 mph.

g. Gypsum sheathing shall conform to ASTM ~~C 1396~~ C1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM ~~C 208~~ C208.

h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.

i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.

j. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

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TABLE R602.3(1)
FASTENING SCHEDULE

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Roof		
1	Blocking between ceiling joists, rafters or trusses to top plate or other framing below	4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail
	Blocking between rafters or truss not at the wall top plates, to rafter or truss	2-8d common (2 1/2″ × 0.131″); or 2-3″ × 0.131″ nails	Each end toe nail
		2-16d common (3 1/2″ × 0.162″); or 3-3″ × 0.131″ nails	End nail
	Flat blocking to truss and web filler	16d common (3 1/2″ × 0.162″); or (3″ × 0.131″ nails	6″ o.c. face nail
2	Ceiling joists to top plate	4-8d box (2 1/2″ × 0.113″); or 3-8d common (2 1/2″ × 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 [see **Section R802.5.2** and **Table R802.5.2(1)**]	4-10d box (3″ × 0.128″); or 3-16d common (3 1/2″ × 0.162″); or 4-3″ × 0.131″ nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) [see **Section R802.5.2** and **Table R802.5.2(1)**]	**Table R802.5.2(1)**	Face nail
5	Collar tie to rafter, face nail ~~or 1 1/4″ × 20 ga. ridge strap to rafter~~	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	3-16d box (3 1/2″ × 0.135″); or 3-10d common (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	4-16d box (3 1/2″ × 0.135″); or 3-10d common (3″ × 0.148″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	Toe nail

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	roof rafter to minimum 2″ ridge beam	3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	End nail
Wall			
8	Stud to stud (not at braced wall panels)	16d common (3 1/2″ × 0.162″)	24″ o.c. face nail
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	16″ o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d box (3 1/2″ × 0.135″); or 3″ × 0.131″ nails	12″ o.c. face nail
		16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
10	Built-up header (2″ to 2″ header with 1/2″ spacer)	16d common (3 1/2″ × 0.162″)	16″ o.c. each edge face nail
		16d box (3 1/2″ × 0.135″)	12″ o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 1/2″ × 0.113″); or 4-8d common (2 1/2″ × 0.131″); or 4-10d box (3″ × 0.128″)	Toe nail
12	Adjacent full-height stud to end of header	4-16d box (3 1/2″ × 0.135″); or 3-16d common (3 1/2″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	End nail
~~12~~13	Top plate to top plate	16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	12″ o.c. face nail
~~13~~14	Double top plate splice	8-16d common (3 1/2″ × 0.162″); or 12-16d box (3 1/2″ × 0.135″); or 12-10d box (3″ × 0.128″); or 12-3″ × 0.131″ nails	Face nail on each side of end joint (minimum 24″ lap splice length each side of end joint)
~~14~~15	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3 1/2″ × 0.162″)	16″ o.c. face nail
		16d box (3 1/2″ × 0.135″); or 3″ × 0.131″ nails	12″ o.c. face nail
~~15~~16	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3 1/2″ × 0.135″); or 2-16d common (3 1/2″ × 0.162″); or 4-3″ × 0.131″ nails	~~3 each 16″ o.c. face nail2 each 16″ o.c. face nail 4 each~~ 16″ o.c. face nail

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~~16~~17	Top or bottom plate to stud	4-8d box ($2^1/_2$″ × 0.113″); or 3-16d box ($3^1/_2$″ × 0.135″); or 4-8d common ($2^1/_2$″ × 0.131″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	Toe nail
		3-16d box ($3^1/_2$″ × 0.135″); or 2-16d common ($3^1/_2$″ × 0.162″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	End nail
~~17~~18	Top plates, laps at corners and intersections	3-10d box (3″ × 0.128″); or 2-16d common ($3^1/_2$″ × 0.162″); or 3-3″ × 0.131″ nails	Face nail
~~18~~19	1″ brace to each stud and plate	3-8d box ($2^1/_2$″ × 0.113″); or 2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2 staples $1^3/_4$″	Face nail
~~19~~20	1″ × 6″ sheathing to each bearing	3-8d box ($2^1/_2$″ × 0.113″); or 2-8d common ($2^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2 staples, 1″ crown, 16 ga., $1^3/_4$″ long	Face nail
~~20~~21	1″ × 8″ and wider sheathing to each bearing	3-8d box ($2^1/_2$″ × 0.113″); or 3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3 staples, 1″ crown, 16 ga., $1^3/_4$″ long	Face nail
		Wider than 1″ × 8″ 4-8d box ($2^1/_2$″ × 0.113″); or 3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 4 staples, 1″ crown, 16 ga., $1^3/_4$″ long	
Floor			
~~21~~22	Joist to sill, top plate or girder	4-8d box ($2^1/_2$″ × 0.113″); or 3-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Toe nail
~~22~~23	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box ($2^1/_2$″ × 0.113″)	4″ o.c. toe nail
		8d common ($2^1/_2$″ × 0.131″); or 10d box (3″ × 0.128″); or 3″ × 0.131″ nails	6″ o.c. toe nail

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~~23~~24	1″ × 6″ subfloor or less to each joist	3-8d box ($2^1/_2$″ × 0.113″); or 2-8d common ($2^1/_2$″ × 0.131″); or 3-10d box (3″ × 0.128″); or 2 staples, 1″ crown, 16 ga., $1^3/_4$″ long	Face nail
Floor			
~~24~~25	2″ subfloor to joist or girder	3-16d box ($3^1/_2$″ × 0.135″); or 2-16d common ($3^1/_2$″ × 0.162″)	Blind and face nail
~~25~~26	2″ planks (plank & beam—floor & roof)	3-16d box ($3^1/_2$″ × 0.135″); or 2-16d common ($3^1/_2$″ × 0.162″)	At each bearing, face nail
~~26~~27	Band or rim joist to joist	3-16d common ($3^1/_2$″ × 0.162″); or 4-10 box (3″ × 0.128″); or 4-3″ × 0.131″ nails; or 4-3″ × 14 ga. staples, $^7/_{16}$″ crown	End nail
~~27~~28	Built-up girders and beams, 2-inch lumber layers	20d common (4″ × 0.192″); or	Nail each layer as follows: 32″ o.c. at top and bottom and staggered.
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	24″ o.c. face nail at top and bottom staggered on opposite sides
		And: 2-20d common (4″ × 0.192″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Face nail at ends and at each splice
~~28~~29	Ledger strip supporting joists or rafters	4-16d box ($3^1/_2$″ × 0.135″); or 3-16d common ($3^1/_2$″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	At each joist or rafter, face nail
~~29~~30	Bridging or blocking to joist, rafter or truss	2-10d box (3″ × 0.128″); or 2-8d common ($2^1/_2$″ × 0.131″); or 3″ × 0.131″ nails	Each end, toe nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING OF FASTENERS	
			Edges[h] (inches)	Intermediate supports[c, e] (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				

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~~30~~31	3/8" – 1/2"	6d common or deformed (2" × 0.113" × 0.266" head); 2 3/8" × 0.113" × 0.266" head nail (subfloor, wall)[f] ~~8d common (2 1/2" × 0.131") nail (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof)[f]~~	6	~~12~~6[f]
		8d common (2 1/2" × 0.131") nail (roof); or RSRS-01 (2 3/8" × 0.113") nail (roof)[b]	6	6[f]
~~31~~32	19/32" – ~~1"~~ 3/4"	8d common (2-2 1/2" × 0.131") nail (subfloor, wall)	6	12
		8d common ~~nail~~ (2 1/2" × 0.131") nail (roof); or RSRS-01; (2 3/8" × 0.113") nail (roof)[b]	6	6~~12~~[f]
		Deformed 2 3/8" × 0.113" × 0.266" head (wall or subfloor)	6	12
~~32~~ 33	~~1 1/8"~~ 7/8" – 1 1/4"	10d common (3" × 0.148") nail; or ~~8d~~ (2 1/2" × 0.131 × 0.281" head) deformed nail	6	12
Other wall sheathing[g]				
~~33~~34	1/2" structural cellulosic fiberboard sheathing	1 1/2" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga. staple with 7/16" or 1" crown	3	6
~~34~~ 35	25/32" structural cellulosic fiberboard sheathing	1 3/4" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga. staple with 7/16" or 1" crown	3	6
~~35~~ 36	1/2" gypsum sheathing[d]	1 1/2" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga.; staple galvanized, 1 1/2" long; 7/16" or 1" crown or 1 1/4" screws, Type W or S	7	7
~~36~~ 37	5/8" gypsum sheathing[d]	1 3/4" × 0.120" galvanized roofing nail, 7/16" head diameter, or 1 1/4" long 16 ga.; staple galvanized, 1 1/2" long; 7/16" or 1" crown or 1 1/4" screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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~~37~~ 38	$^3/_4$" and less	Deformed (2" × 0.113") or ~~6d~~ Deformed (2" × 0.120") nail; or 8d common ($2^1/_2$" × 0.131") nail	6	12
~~38~~ 39	$^7/_8$" – 1"	8d common ($2^1/_2$" × 0.131") nail; or Deformed (2" × 0.113"); or ~~8d~~ Deformed ($2^1/_2$" × 0.120") nail	6	12
~~39~~ 40	$1^1/_8$" – $1^1/_4$"	10d common (3" × 0.148") nail; or Deformed (2" × 0.113"); or ~~8d~~ Deformed ($2^1/_2$" × 0.120") nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections are carbon steel and shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less. Connections using nails and staples of other materials, such as stainless steel, shall be designed by accepted engineering practice or approved under **Section R104.11**.

~~b. Staples are 16 gage wire and have a minimum $^7/_{16}$-inch on diameter crown width.~~

~~j.~~b. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in **ASTM F1667**.

c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.

d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.

e. Spacing of fasteners not included in this table shall be based on **Table R602.3(2)**.

f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at ~~6~~4 inches on center where the ultimate design wind speed is ~~less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph.~~ greater than 130 mph in Exposure B or greater than 110 mph in Exposure C.

g. Gypsum sheathing shall conform to **ASTM C1396** and shall be installed in accordance with **ASTM C1280** or **GA 253**. Fiberboard sheathing shall conform to **ASTM C208**.

h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.

i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.

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TABLE R602.3(2)
ALTERNATE ATTACHMENTS TO TABLE R602.3(1)

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION[a, b] OF FASTENER AND LENGTH (inches)	SPACING[c] OF FASTENERS	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels subfloor, roof[g] and wall sheathing to framing and particleboard wall sheathing to framing[f]			
Up to 1/2	Staple 15 ga. 1 3/4	4	8
	0.097–0.099 Nail 2 1/4	3	6
	Staple 16 ga. 1 3/4	3	6
19/32 and 5/8	0.113 Nail 2	3	6
	Staple 15 and 16 ga. 2	4	8
	0.097–0.099 Nail 2 1/4	4	8
23/32 and 3/4	Staple 14 ga. 2	4	8
	Staple 15 ga. 1 3/4	3	6
	0.097–0.099 Nail 2 1/4	4	8
	Staple 16 ga. 2	4	8
1	Staple 14 ga. 2 1/4	4	8
	0.113 Nail 2 1/4	3	6
	Staple 15 ga. 2 1/4	4	8
	0.097–0.099 Nail 2 1/2	4	8

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION[a, b] OF FASTENER AND LENGTH (inches)	SPACING[c] OF FASTENERS	
		Edges (inches)	Body of panel[d] (inches)
Floor underlayment; plywood-hardboard-particleboard[f]-fiber-cement[h]			
Fiber-cement			
1/4	~~3d,~~ 1 1/4 long × 0.099" corrosion-resistant, ring shank nails (finished flooring other than tile)	3	6
	Staple 18 ga., 7/8 long, 1/4 crown (finished flooring other than tile)	3	6

Updates throughout table for alternate attachment requirements.

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	$1^1/_4$ long × .121 shank × .375 head diameter corrosion-resistant (galvanized or stainless steel) roofing nails (for tile finish)	8	8
	$1^1/_4$ long, No. 8 × .375 head diameter, ribbed wafer-head screws (for tile finish)	8	8
Plywood			
$^1/_4$ and $^5/_{16}$	$1^1/_4$ ring or screw shank nail-minimum $12^1/_2$ ga. (0.099") shank diameter	3	6
	Staple 18 ga., $^7/_8$, $^3/_{16}$ crown width	2	5
$^{11}/_{32}$, $^3/_8$, $^{15}/_{32}$ and $^1/_2$	$1^1/_4$ ring or screw shank nail-minimum $12^1/_2$ ga. (0.099") shank diameter	6	8[e]
$^{19}/_{32}$, $^5/_8$, $^{23}/_{32}$ and $^3/_4$	$1^1/_2$ ring or screw shank nail-minimum $12^1/_2$ ga. (0.099") shank diameter	6	8
	Staple 16 ga. $1^1/_2$	6	8
Hardboard[f]			
0.200	$1^1/_2$ long × 0.080" ring-grooved shank underlayment nail	6	6
	~~4d~~$1^3/_8$ long × 0.080" polymer cement-coated sinker nail	6	6
	Staple 18 ga., $^7/_8$ long (plastic coated)	3	6
Particleboard			
$^1/_4$	~~4d~~$1^1/_2$ long × 0.099" ring-grooved shank underlayment nail	3	6
	Staple 18 ga., $^7/_8$ long, $^3/_{16}$ crown	3	6
$^3/_8$	~~6d~~2 long × 0.120" ring-grooved shank underlayment nail	6	10
	Staple 16 ga., $1^1/_8$ long, $^3/_8$ crown	3	6
$^1/_2$, $^5/_8$	~~6d~~2 long × 0.120" ring-grooved shank underlayment nail	6	10
	Staple 16 ga., $1^5/_8$ long, $^3/_8$ crown	3	6

For SI: 1 inch = 25.4 mm.

a. Nail is a general description and shall be permitted to be T-head, modified round head or round head.
b. Staples shall have a minimum crown width of $^7/_{16}$-inch ~~on diameter~~ except as noted.
c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
d. Fasteners shall be placed in a grid pattern throughout the body of the panel.
e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
f. Hardboard underlayment shall conform to **CPA/ANSI A135.4**.
g. ~~Specified alternate~~Alternate fastening is only permitted ~~attachments~~ for roof sheathing ~~shall be permitted~~ where the ultimate design wind speed is less than ~~130 mph. Fasteners attaching wood structural panel roof sheathing to gable end wall framing shall be installed using the spacing listed for panel edges.~~or equal to 110 mph, and where fasteners are installed 3 inches on center at all supports.
h. Fiber-cement underlayment shall conform to **ASTM C1288** or **ISO 8336**, Category C.

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TABLE R602.3(6)
ALTERNATE WOOD BEARING WALL STUD SIZE, HEIGHT AND SPACING

STUD HEIGHT	SUPPORTING	STUD SPACING[a]	ULTIMATE DESIGN WIND SPEED					
			115 mph Maximum roof/floor span[c]		130 mph[b] Maximum roof/floor span[c]		140 mph[b] Maximum roof/floor span[c]	
			12 ft.	24 ft.	12 ft.	24 ft.	12 ft.	24 ft.
11 ft.	Roof Only	12 in.	2 × 4	2 × 4	2 × 4	2 × 4	2 × 4	2 × 4
		16 in.	2 × 4	2 × 4	2 × 4	2 × 6	2 × 4	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
	Roof and One Floor	12 in.	2 × 4	2 × 6	2 × 4	2 × 6	2 × 4	2 × 6
		16 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
12 ft.	Roof Only	12 in	2 × 4	2 × 4	2 × 4	2 × 6	2 × 4	2 × 6
		16 in.	2 × 4	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
	Roof and One Floor	12 in	2 × 4	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		16 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6
		24 in.	2 × 6	2 × 6	2 × 6	2 × 6	2 × 6	DR

For SI: 1 inch = 25.4mm, 1 foot = 304.8 mm, 1 mph = 0.447 m/s, 1 pound = 4.448 N.
DR = Design Required.

a. Wall studs not exceeding 16 inches on center shall be sheathed with minimum 1/2-inch gypsum board on the interior and 3/8-inch wood structural panel sheathing on the exterior. Wood structural panel sheathing shall be attached with 8d (2.5" x 0.131") nails not greater than 6 inches on center along panel edges and 12 inches on center at intermediate supports, and all panel joints shall occur over studs or blocking.
b. Where the ultimate design wind speed exceeds 115 mph, studs shall be attached to top and bottom plates with connectors having a minimum 300-pound lateral capacity.
c. The maximum span is applicable to both single- and multiple-span roof and floor conditions. The roof assembly shall not contain a habitable attic.

New table for alternate wood bearing stud requirements.

R602.3.1 Stud size, height and spacing. The size, height and spacing of studs shall be in accordance with Table R602.3(5).

Exceptions:

1. Utility grade studs shall not be spaced more than 16 inches (406 mm) on center, shall not support more than a roof and ceiling, and shall not exceed 8 feet (2438 mm) in height for exterior walls and load-bearing walls or 10 feet (3048 mm) for interior nonload-bearing walls.
2. Where ground snow loads are less than or equal to 25 pounds per square foot (1.2 kPa), and the ultimate design wind speed is less than or equal to 130 mph (58.1 m/s), 2-inch by 6-inch (38 mm by 140 mm) studs supporting a roof load with not more than 6 feet (1829 mm) of tributary length shall have a maximum height of 18 feet (5486 mm) where spaced at 16 inches (406 mm) on center, or 20 feet (6096 mm) where spaced at 12 inches ~~(304.8~~ (305 mm) on center. Studs shall be No. 2 grade lumber or better.
3. Exterior load-bearing studs not exceeding 12 feet (3658 mm) in height provided in accordance with Table R602.3(6). The minimum number of full-height studs adjacent to openings shall be in accordance with Section R602.7.5. The building shall be located in Exposure B, the roof live load shall not exceed 20 psf (0.96 kPa), and the ground snow load shall not exceed 30 psf (1.4 kPa). Studs and plates shall be No. 2 grade lumber or better.

New exception provided for stud height and spacing.

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	R602.6 Drilling and notching of studs. Drilling and notching of studs shall be in accordance with the following: 1. Notching. ~~Any~~ A stud in an exterior wall or bearing partition shall ~~be permitted to~~ not be cut or notched to a depth ~~not~~ exceeding 25 percent of its ~~width~~ depth. Studs in nonbearing partitions shall ~~be permitted to~~ not be notched to a depth ~~not to exceed~~ exceeding 40 percent of a single stud ~~width~~ depth. 2. ~~Drilling. Any stud shall be permitted to be bored or drilled, provided that the diameter of the resulting hole is not more than~~ Boring. The diameter of bored holes in studs shall not exceed 60 percent of the stud ~~width~~ depth, the edge of the hole ~~is~~ shall not ~~more~~ be less than $^5/_8$ inch (16 mm) ~~to~~ from the edge of the stud, and the hole ~~is~~ shall not be located in the same section as a cut or notch. ~~Studs~~ Where the diameter of a bored hole in a stud located in exterior walls or bearing partitions ~~drilled~~ is over 40 percent, ~~and up to 60 percent~~ such stud shall be doubled ~~with~~ and not more than two successive doubled studs shall be so bored. See **Figures R602.6(1)** and **R602.6(2)**. **Exception:** ~~Use of~~ Where approved, stud shoes ~~is permitted where they~~ are installed in accordance with the manufacturer's ~~recommendations~~ instructions.		Minor wordsmithing and updates, no major change.
	R602.6.1 Drilling and notching of top plate. ~~When~~ Where piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie not less than 0.054 inch thick (1.37 mm) (16 ga) and 1 1/2 inches (38 mm) wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d (0.148 inch diameter) nails having a minimum length of 1 1/2 inches (38 mm) at each side or equivalent. The metal tie must extend ~~a minimum of~~ not less than 6 inches past the opening. See Figure R602.6.1. **Exception**: ~~When~~ Where the entire side of the wall with the notch or cut is covered by wood structural panel sheathing.		Minor wordsmithing changes.

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TABLE R602.7(1)

GIRDER SPANS[a] AND HEADER SPANS[a] FOR EXTERIOR BEARING WALLS

(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir[b] and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf)[c]																	
		30						50						70					
		Building width[c] (feet)																	
		20		28		36		20		28		36		20		28		36	
		Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d
Roof-and-ceiling	1-2 x 6	4-6	1	3-10	1	3-5	1	3-9	1	3-3	1	2-10	2	—	—	—	—	—	—
	1-2 x 10	6-8	1	4-11	1	4-4	1	4-9	1	4-1	1	3-7	2	—	—	—	—	—	—
	1-2 x 12	6-11	1	5-11	2	5-3	2	5-9	2	4-8	2	3-8	2	—	—	—	—	—	—
	2-2 x 4	3-6	1	3-3	1	2-10	1	3-3	1	3-0	1	2-6	1	2-10	1	2-6	1	2-3	1
	2-2 x 6	5-5	1	4-8	1	4-3	1	4-8	1	4-1	1	3-8	2	4-3	1	3-8	2	3-3	2
	2-2 x 8	6-10	1	6-11	2	6-4	2	6-11	2	6-3	2	4-7	2	6-4	2	4-7	2	4-1	2
	2-2 x 10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5-7	2	6-6	2	5-7	2	5-0	2
	2-2 x 12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6	2	7-6	2	6-6	2	6-10	2
	3-2 x 6	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9	2	6-8	1	5-9	2	5-3	2
	3-2 x 10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7-0	2	8-2	2	7-0	2	6-4	2
	3-2 x 12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8-2	2	9-5	2	8-2	2	7-4	2
	4-2 x 6	9-2	1	8-4	1	7-8	1	8-4	1	7-5	1	6-8	1	7-8	1	6-8	1	6-11	2
	4-2 x 10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2	2	9-5	2	8-2	2	7-3	2
	4-2 x 12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5	2	10-11	2	9-5	2	8-5	2
Roof-ceiling and one-center-bearing floor	1-2 x 6	3-11	1	3-5	1	3-0	1	3-7	1	3-0	2	2-8	2	—	—	—	—	—	—
	1-2 x 10	5-0	2	4-4	2	3-10	2	4-6	2	3-11	2	3-4	2	—	—	—	—	—	—
	1-2 x 12	6-10	2	4-9	2	4-3	2	5-5	2	4-3	2	3-4	2	—	—	—	—	—	—
	2-2 x 4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2-2	1	2-7	1	2-3	1	2-0	1
	2-2 x 6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3-3	2	3-9	2	3-3	2	2-11	2
	2-2 x 8	5-9	2	5-0	2	4-6	2	5-3	2	4-6	2	4-1	2	4-9	2	4-3	2	3-9	2
	2-2 x 10	7-0	2	6-3	2	5-6	2	6-4	2	5-6	2	5-0	2	5-9	2	5-1	2	4-7	2
	2-2 x 12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5-9	2	6-8	2	5-10	2	5-3	2
	3-2 x 6	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5-1	2	5-11	2	5-3	2	4-8	2
	3-2 x 10	8-9	2	7-8	2	6-11	2	7-11	2	6-11	2	6-3	2	7-3	2	6-4	2	5-8	2
	3-2 x 12	10-2	2	8-11	2	8-0	2	9-3	2	8-0	2	7-3	2	8-5	2	7-4	2	6-7	2
	4-2 x 6	8-1	1	7-3	1	6-7	1	7-5	1	6-6	1	5-11	2	6-10	1	6-0	2	5-5	2
	4-2 x 10	10-1	1	8-10	2	8-0	2	9-1	2	8-0	2	7-3	2	8-4	2	7-4	2	6-7	2
	4-2 x 12	11-9	2	10-3	2	9-3	2	10-7	2	9-3	2	8-4	2	9-8	2	8-6	2	7-7	2
Roof-ceiling and clear-span floor	1-2 x 6	3-6	1	3-0	1	2-8	1	3-5	1	2-11	1	2-7	2	—	—	—	—	—	—
	1-2 x 10	4-6	1	3-10	1	3-3	1	4-4	1	3-9	1	3-1	2	—	—	—	—	—	—
	1-2 x 12	5-6	1	4-2	2	3-3	2	5-4	2	3-11	2	3-1	2	—	—	—	—	—	—
	2-2 x 4	2-8	1	2-4	1	2-1	1	2-7	1	2-3	1	2-0	1	2-5	1	2-1	1	1-10	1
	2-2 x 6	3-11	1	3-5	2	3-0	2	3-10	2	3-4	2	3-0	2	3-6	2	3-1	2	2-9	2
	2-2 x 8	5-0	2	4-4	2	3-10	2	4-10	2	4-2	2	3-9	2	4-6	2	3-11	2	3-6	2
	2-2 x 10	6-1	2	5-3	2	4-8	2	5-11	2	5-1	2	4-7	2	5-6	2	4-9	2	4-3	2
	2-2 x 12	7-1	2	6-1	2	5-5	2	6-10	2	5-11	2	5-4	2	6-4	2	5-6	2	5-0	2
	3-2 x 6	6-3	2	5-5	2	4-10	2	6-1	2	5-3	2	4-8	2	5-7	2	4-11	2	4-5	2
	3-2 x 10	7-7	2	6-7	2	5-11	2	7-5	2	6-5	2	5-8	2	6-9	2	6-0	2	5-4	2
	3-2 x 12	8-10	2	7-8	2	6-10	2	8-7	2	7-5	2	6-8	2	7-11	2	6-11	2	6-3	2
	4-2 x 6	7-2	1	6-3	2	5-7	2	7-0	1	6-1	2	5-5	2	6-6	1	5-8	2	5-1	2
	4-2 x 10	8-9	2	7-7	2	6-10	2	8-7	2	7-5	2	6-7	2	7-11	2	6-11	2	6-2	2
	4-2 x 12	10-2	2	8-10	2	7-11	2	9-11	2	8-7	2	7-8	2	9-2	2	8-0	2	7-2	2

Updates to base code table for bearing wall spans.

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GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf)[e] 30 — Building width[c] (feet) 12		24		36		50 — 12		24		36		70 — 12		24		36	
		Span	Nld	Span	Nld	Span	Nld	Span	Nld	Span	Nld	Span	Nld	Span	Nld	Span	Nld	Span	Nld
Roof and ceiling	1-2 × 6	4-0	1	3-1	2	2-7	2	3-5	1	2-8	2	2-3	2	3-0	2	2-4	2	2-0	2
	1-2 × 8	5-1	2	3-11	2	3-3	2	4-4	2	3-4	2	2-10	2	3-10	2	3-0	2	2-6	3
	1-2 × 10	6-0	2	4-8	2	3-11	2	5-2	2	4-0	2	3-4	3	4-7	2	3-6	3	3-0	3
	1-2 × 12	7-1	2	5-5	2	4-7	3	6-1	2	4-8	3	3-11	3	5-5	2	4-2	3	3-6	3
	2-2 × 4	4-0	1	3-1	1	2-7	1	3-5	1	2-7	1	2-2	1	3-0	1	2-4	1	2-0	1
	2-2 × 6	6-0	1	4-7	1	3-10	1	5-1	1	3-11	1	3-3	2	4-6	1	3-6	2	2-11	2
	2-2 × 8	7-7	1	5-9	1	4-10	2	6-5	1	5-0	2	4-2	2	5-9	1	4-5	2	3-9	2
	2-2 × 10	9-0	1	6-10	2	5-9	2	7-8	2	5-11	2	4-11	2	6-9	2	5-3	2	4-5	2
	2-2 × 12	10-7	2	8-1	2	6-10	2	9-0	2	6-11	2	5-10	2	8-0	2	6-2	2	5-2	3
	3-2 × 8	9-5	1	7-3	1	6-1	1	8-1	1	6-3	1	5-3	2	7-2	1	5-6	2	4-8	2
	3-2 × 10	11-3	1	8-7	1	7-3	2	9-7	1	7-4	2	6-2	2	8-6	1	6-7	2	5-6	2
	3-2 × 12	13-2	1	10-1	2	8-6	2	11-3	2	8-8	2	7-4	2	10-0	2	7-9	2	6-6	2
	4-2 × 8	10-11	1	8-4	1	7-0	1	9-4	1	7-2	1	6-0	1	8-3	1	6-4	1	5-4	2
	4-2 × 10	12-11	1	9-11	1	8-4	1	11-1	1	8-6	1	7-2	2	9-10	1	7-7	2	6-4	2
	4-2 × 12	15-3	1	11-8	1	9-10	2	13-8	1	10-8	2	8-5	2	11-7	1	8-11	2	7-6	2
Roof, ceiling and one center-bearing floor	1-2 × 6	3-3	1	2-7	2	2-2	2	3-0	2	2-4	2	2-0	2	2-9	2	2-2	2	1-10	2
	1-2 × 8	4-1	2	3-3	2	2-9	2	3-9	2	3-0	2	2-6	3	3-6	2	2-9	2	2-4	3
	1-2 × 10	4-11	2	3-10	2	3-3	3	4-6	2	3-6	3	3-0	3	4-1	2	3-3	3	2-9	3
	1-2 × 12	5-9	2	4-6	3	3-10	3	5-3	2	4-2	3	3-6	3	4-10	3	3-10	3	3-3	4
	2-2 × 4	3-3	1	2-6	1	2-2	1	3-0	1	2-4	1	2-0	1	2-8	1	2-2	1	1-10	1
	2-2 × 6	4-10	1	3-9	1	3-3	2	4-5	1	3-6	2	3-0	2	4-1	1	3-3	2	2-9	2
	2-2 × 8	6-1	1	4-10	2	4-1	2	5-7	2	4-5	2	3-9	2	5-2	2	4-1	2	3-6	2
	2-2 × 10	7-3	2	5-8	2	4-10	2	6-8	2	5-3	2	4-5	2	6-1	2	4-10	2	4-1	2
	2-2 × 12	8-6	2	6-8	2	5-8	2	7-10	2	6-2	2	5-3	3	7-2	2	5-8	2	4-10	3
	3-2 × 8	7-8	1	6-0	1	5-1	2	7-0	1	5-6	2	4-8	2	6-5	1	5-1	2	4-4	2
	3-2 × 10	9-1	1	7-2	2	6-1	2	8-4	1	6-7	2	5-7	2	7-8	2	6-1	2	5-2	2
	3-2 × 12	10-8	2	8-5	2	7-2	2	9-10	2	7-8	2	6-7	2	9-0	2	7-1	2	6-1	2
	4-2 × 8	8-10	1	6-11	1	5-11	1	8-1	1	6-4	1	5-5	2	7-5	1	5-11	1	5-0	2
	4-2 × 10	10-6	1	8-3	2	7-0	2	9-8	1	7-7	2	6-5	2	8-10	1	7-0	2	6-0	2
	4-2 × 12	12-4	1	9-8	2	8-3	2	11-4	2	8-11	2	7-7	2	10-4	2	8-3	2	7-0	2
Roof, ceiling and one clear-span floor	1-2 x 6	2-11	2	2-3	2	1-11	2	2-9	2	2-1	2	1-9	2	2-7	2	2-0	2	1-8	2
	1-2 × 8	3-9	2	2-11	2	2-5	3	3-6	2	2-8	2	2-3	3	3-3	2	2-6	3	2-2	3
	1-2 × 10	4-5	2	3-5	3	2-11	3	4-2	2	3-2	3	2-8	3	3-11	2	3-0	3	2-6	3
	1-2 × 12	5-2	2	4-0	3	3-4	3	4-10	3	3-9	3	3-2	4	4-7	3	3-6	3	3-0	4
	2-2 × 4	2-11	1	2-3	1	1-11	1	2-9	1	2-1	1	1-9	1	2-7	1	2-0	1	1-8	1
	2-2 × 6	4-4	1	3-4	2	2-11	2	4-1	1	3-2	2	2-8	2	3-10	1	3-0	2	2-6	2
	2-2 × 8	5-6	2	4-3	2	3-7	2	5-2	2	4-0	2	3-4	2	4-10	2	3-9	2	3-2	2
	2-2 × 10	6-7	2	5-0	2	4-2	2	6-1	2	4-9	2	4-0	2	5-9	2	4-5	2	3-9	3
	2-2 × 12	7-9	2	5-11	2	4-11	3	7-2	2	5-7	2	4-8	3	6-9	2	5-3	3	4-5	3
	3-2 × 8	6-11	1	5-3	2	4-5	2	6-5	1	5-0	2	4-2	2	6-1	1	4-8	2	4-0	2
	3-2 × 10	8-3	2	6-3	2	5-3	2	7-8	2	5-11	2	5-0	2	7-3	2	5-7	2	4-8	2
	3-2 × 12	9-8	2	7-5	2	6-2	2	9-0	2	7-0	2	5-11	2	8-6	2	6-7	2	5-6	3
	4-2 × 8	8-0	1	6-1	1	5-1	2	7-5	1	5-9	2	4-11	2	7-0	1	5-5	2	4-7	2
	4-2 × 10	9-6	1	7-3	2	6-1	2	8-10	1	6-11	2	5-9	2	8-4	1	6-5	2	5-5	2
	4-2 × 12	11-2	2	8-6	2	7-2	2	10-5	2	8-0	2	6-9	2	9-10	2	7-7	2	6-5	2

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GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) 30						50						70					
		Building width (feet) 20		28		36		20		28		36		20		28		36	
		Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ
Roof, ceiling and two center-bearing floors	2-2x4	2-7	1	2-3	1	2-0	1	2-6	1	2-2	1	1-11	1	2-4	1	2-0	1	1-9	1
	2-2x6	3-9	2	3-3	2	2-11	2	3-8	2	3-2	2	2-10	2	3-5	2	3-0	2	2-8	2
	2-2x8	4-9	2	4-2	2	3-9	2	4-7	2	4-0	2	3-8	2	4-4	2	3-9	2	3-5	2
	2-2x10	5-9	2	5-1	2	4-7	3	5-8	2	4-11	2	4-5	3	5-3	2	4-7	3	4-2	3
	2-2x12	6-8	2	5-10	3	5-3	3	6-6	2	5-9	3	5-2	3	6-1	3	5-4	3	4-10	3
	3-2x8	5-11	2	5-2	2	4-8	2	5-9	2	5-1	2	4-7	2	5-6	2	4-9	2	4-3	2
	3-2x10	7-3	2	6-4	2	5-8	2	7-1	2	6-3	2	5-7	2	6-7	2	5-9	2	5-3	2
	3-2x12	8-5	2	7-4	2	6-7	2	8-2	2	7-3	2	6-5	2	7-8	2	6-9	2	6-1	2
	4-2x8	6-10	1	6-0	2	5-5	2	6-8	1	5-10	2	5-3	2	6-3	2	5-6	2	4-11	2
	4-2x10	8-4	2	7-4	2	6-7	2	8-2	2	7-3	2	6-5	2	7-7	2	6-8	2	6-0	2
	4-2x12	9-8	2	8-6	2	7-8	2	9-5	2	8-3	2	7-5	2	8-10	2	7-9	2	7-0	2
Roof, ceiling and two clear-span floors	2-2x4	2-1	1	1-8	1	1-6	2	2-0	1	1-8	1	1-5	2	2-0	1	1-8	1	1-5	2
	2-2x6	3-1	2	2-8	2	2-4	2	3-0	2	2-7	2	2-3	2	2-11	2	2-7	2	2-3	2
	2-2x8	3-10	2	3-4	2	3-0	3	3-10	2	3-4	2	2-11	3	3-9	2	3-3	2	2-11	3
	2-2x10	4-9	2	4-1	3	3-8	3	4-8	2	4-0	3	3-7	3	4-7	3	4-0	3	3-6	3
	2-2x12	5-6	3	4-9	3	4-3	3	5-5	3	4-8	3	4-3	3	5-4	3	4-7	3	4-1	4
	3-2x8	4-10	2	4-2	2	3-9	2	4-9	2	4-1	2	3-8	2	4-8	2	4-1	2	3-8	2
	3-2x10	6-11	2	6-1	2	4-7	3	6-10	2	5-9	2	4-6	3	5-9	2	4-11	2	4-5	3
	3-2x12	6-10	2	5-11	3	5-4	3	6-9	2	5-10	3	5-3	3	6-8	2	5-9	3	5-2	3
	4-2x8	5-7	2	4-10	2	4-4	2	5-6	2	4-9	2	4-3	2	5-5	2	4-8	2	4-2	2
	4-2x10	6-10	2	6-11	2	5-3	2	6-9	2	5-10	2	5-2	2	6-7	2	5-9	2	5-1	2
	4-2x12	7-11	2	6-10	2	6-2	3	7-9	2	6-9	2	6-0	3	7-8	2	6-8	2	5-11	3

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GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) e: 30						50						70					
		Building width c (feet): 20		24		36		20		24		36		20		24		36	
		Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d	Span	NJ d
Roof, ceiling and two center-bearing floors	1-2 × 6	2-8	2	2-1	2	1-11	2	2-7	2	2-6	2	1-9	2	2-5	2	1-11	2	1-8	2
	1-2 × 8	3-5	2	2-8	2	2-4	3	3-3	2	2-7	2	2-2	3	3-1	2	2-5	3	2-1	3
	1-2 × 10	4-0	2	3-2	3	2-9	3	3-10	2	3-1	3	2-7	3	3-8	2	2-11	3	2-5	3
	1-2 × 12	4-9	3	3-9	3	3-2	4	4-6	3	3-7	3	3-1	4	4-3	3	3-5	3	2-11	4
	2-2 × 4	2-8	1	2-1	1	1-9	1	2-6	1	2-0	1	1-8	1	2-5	1	1-11	1	1-7	1
	2-2 × 6	4-0	1	3-2	2	2-8	2	3-9	1	3-0	2	2-7	2	3-7	1	2-10	2	2-5	2
	2-2 × 8	5-0	2	4-0	2	3-5	2	4-10	2	3-10	2	3-3	2	4-7	2	3-7	2	3-1	2
	2-2 × 10	6-0	2	4-9	2	4-0	2	5-8	2	4-6	2	3-10	3	5-5	2	4-3	2	3-8	3
	2-2 × 12	7-0	2	5-7	2	4-9	3	6-8	2	5-4	3	4-6	3	6-4	2	5-0	3	4-3	3
	3-2 × 8	6-4	1	5-0	2	4-3	2	6-0	1	4-9	2	4-1	2	5-8	2	4-6	2	3-10	2
	3-2 × 10	7-6	2	5-11	2	5-1	2	7-1	2	5-8	2	4-10	2	6-9	2	5-4	2	4-7	2
	3-2 × 12	8-10	2	7-0	2	5-11	2	8-5	2	6-8	2	5-8	3	8-0	2	6-4	2	5-4	3
	4-2 × 8	7-3	1	5-9	1	4-11	2	6-11	1	5-6	2	4-8	2	6-7	1	5-2	2	4-5	2
	4-2 × 10	8-8	1	6-10	2	5-10	2	8-3	2	6-6	2	5-7	2	7-10	2	6-2	2	5-3	2
	4-2 × 12	10-2	2	8-1	2	6-10	2	9-8	2	7-8	2	6-7	2	9-2	2	7-3	2	6-2	2
Roof, ceiling, and two clear-span floors	1-2 × 6	2-3	2	1-9	2	1-5	2	2-3	2	1-9	2	1-5	3	2-2	2	1-8	2	1-5	3
	1-2 × 8	2-10	2	2-2	3	1-10	3	2-10	2	2-2	3	1-10	3	2-9	2	2-1	3	1-10	3
	1-2 × 10	3-4	2	2-7	3	2-2	3	3-4	3	2-7	3	2-2	4	3-3	3	2-6	3	2-2	4
	1-2 × 12	4-0	3	3-0	3	2-7	4	4-0	3	3-0	4	2-7	4	3-10	3	3-0	4	2-6	4
	2-2 × 4	2-3	1	1-8	1	1-4	1	2-3	1	1-8	1	1-4	1	2-2	1	1-8	1	1-4	2
	2-2 × 6	3-4	1	2-6	2	2-2	2	3-4	2	2-6	2	2-2	2	3-3	2	2-6	2	2-1	2
	2-2 × 8	4-3	2	3-3	2	2-8	2	4-3	2	3-3	2	2-8	2	4-1	2	3-2	2	2-8	3
	2-2 × 10	5-0	2	3-10	2	3-2	3	5-0	2	3-10	2	3-2	3	4-10	2	3-9	3	3-2	3
	2-2 × 12	5-11	2	4-6	3	3-9	3	5-11	2	4-6	3	3-9	3	5-8	2	4-5	3	3-9	3
	3-2 × 8	5-3	1	4-0	2	3-5	2	5-3	2	4-0	2	3-5	2	5-1	2	3-11	2	3-4	2
	3-2 × 10	6-3	2	4-9	2	4-0	2	6-3	2	4-9	2	4-0	2	6-1	2	4-8	2	4-0	3
	3-2 × 12	7-5	2	5-8	2	4-9	3	7-5	2	5-8	2	4-9	3	7-2	2	5-6	3	4-8	3
	4-2 × 8	6-1	1	4-8	2	3-11	2	6-1	1	4-8	2	3-11	2	5-11	1	4-7	2	3-10	2
	4-2 × 10	7-3	2	5-6	2	4-8	2	7-3	2	5-6	2	4-8	2	7-0	2	5-5	2	4-7	2
	4-2 × 12	8-6	2	6-6	2	5-6	2	8-6	2	6-6	2	5-6	2	8-3	2	6-4	2	5-4	3

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

a. Spans are given in feet and inches.

b. ~~No. 1 or better grade lumber shall be used~~**Spans are based on minimum design properties** for ~~southern pine. Other tabulated values assume #2~~ **No. 2** grade ~~lumber~~ **lumber of Douglas fir-larch, hem-fir, Southern pine, and spruce-pine-fir.**

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Use 30 psf ground snow load for cases in which ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

f. Spans are calculated assuming the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R602.7(2)
GIRDER SPANS[a] AND HEADER SPANS[a] FOR INTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir[b] and required number of jack studs)

~~HEADERS AND GIRDERS SUPPORTING~~	~~SIZE~~	~~BUILDING Width[c] (feet)~~					
		~~20~~		~~28~~		~~36~~	
		~~Span~~	~~NJ[d]~~	~~Span~~	~~NJ[d]~~	~~Span~~	~~NJ[d]~~
~~One floor only~~	~~2-2 × 4~~	~~3-1~~	~~1~~	~~2-8~~	~~1~~	~~2-5~~	~~1~~
	~~2-2 × 6~~	~~4-6~~	~~1~~	~~3-11~~	~~1~~	~~3-6~~	~~1~~
	~~2-2 × 8~~	~~5-9~~	~~1~~	~~5-0~~	~~2~~	~~4-5~~	~~2~~
	~~2-2 × 10~~	~~7-0~~	~~2~~	~~6-1~~	~~2~~	~~5-5~~	~~2~~
	~~2-2 × 12~~	~~8-1~~	~~2~~	~~7-0~~	~~2~~	~~6-3~~	~~2~~
	~~3-2 × 8~~	~~7-2~~	~~1~~	~~6-3~~	~~1~~	~~5-7~~	~~2~~
	~~3-2 × 10~~	~~8-9~~	~~1~~	~~7-7~~	~~2~~	~~6-9~~	~~2~~
	~~3-2 × 12~~	~~10-3~~	~~2~~	~~8-10~~	~~2~~	~~7-10~~	~~2~~
	~~4-2 × 8~~	~~9-0~~	~~1~~	~~7-8~~	~~1~~	~~6-9~~	~~1~~
	~~4-2 × 10~~	~~10-1~~	~~1~~	~~8-9~~	~~1~~	~~7-10~~	~~2~~
	~~4-2 × 12~~	~~11-9~~	~~1~~	~~10-2~~	~~2~~	~~8-1~~	~~2~~
~~Two floors~~	~~2-2 × 4~~	~~2-2~~	~~1~~	~~1-10~~	~~1~~	~~1-7~~	~~1~~
	~~2-2 × 6~~	~~3-2~~	~~2~~	~~2-9~~	~~2~~	~~2-5~~	~~2~~
	~~2-2 × 8~~	~~4-1~~	~~2~~	~~3-6~~	~~2~~	~~3-2~~	~~2~~
	~~2-2 × 10~~	~~4-11~~	~~2~~	~~4-3~~	~~2~~	~~3-10~~	~~3~~
	~~2-2 × 12~~	~~5-9~~	~~2~~	~~5-0~~	~~3~~	~~4-5~~	~~3~~
	~~3-2 × 8~~	~~5-1~~	~~2~~	~~4-5~~	~~2~~	~~3-11~~	~~2~~
	~~3-2 × 10~~	~~6-2~~	~~2~~	~~5-4~~	~~2~~	~~4-10~~	~~2~~
	~~3-2 × 12~~	~~7-2~~	~~2~~	~~6-3~~	~~2~~	~~5-7~~	~~3~~
	~~4-2 × 8~~	~~6-1~~	~~1~~	~~5-3~~	~~2~~	~~4-8~~	~~2~~
	~~4-2 × 10~~	~~7-2~~	~~2~~	~~6-2~~	~~2~~	~~5-6~~	~~2~~
	~~4-2 × 12~~	~~8-4~~	~~2~~	~~7-2~~	~~2~~	~~6-5~~	~~2~~

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING Width[c] (feet)					
		12		24		36	
		Span[e]	NJ[d]	Span[e]	NJ[d]	Span[e]	NJ[d]
One floor only	2-2 × 4	4-1	1	2-10	1	2-4	1
	2-2 × 6	6-1	1	4-4	1	3-6	1
	2-2 × 8	7-9	1	5-5	1	4-5	2
	2-2 × 10	9-2	1	6-6	2	5-3	2
	2-2 × 12	10-9	1	7-7	2	6-3	2
	3-2 × 8	9-8	1	6-10	1	5-7	1
	3-2 × 10	11-5	1	8-1	1	6-7	2
	3-2 × 12	13-6	1	9-6	2	7-9	2
	4-2 × 8	11-2	1	7-11	1	6-5	1
	4-2 × 10	13-3	1	9-4	1	7-8	1
	4-2 × 12	15-7	1	11-0	1	9-0	2
Two floors	2-2 × 4	2-7	1	1-11	1	1-7	1
	2-2 × 6	3-11	1	2-11	2	2-5	2
	2-2 × 8	5-0	1	3-8	2	3-1	2
	2-2 × 10	5-11	2	4-4	2	3-7	2
	2-2 × 12	6-11	2	5-2	2	4-3	3
	3-2 × 8	6-3	1	4-7	2	3-10	2
	3-2 × 10	7-5	1	5-6	2	4-6	2
	3-2 × 12	8-8	2	6-5	2	5-4	2
	4-2 × 8	7-2	1	5-4	1	4-5	2
	4-2 × 10	8-6	1	6-4	2	5-3	2
	4-2 × 12	10-1	1	7-5	2	6-2	2

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

a. Spans are given in feet and inches.

b. ~~No. 1 or better grade lumber shall be used~~**Spans are based on minimum design properties** for ~~southern pine. Other tabulated values assume #2~~ **No. 2** grade ~~lumber~~ **lumber of Douglas fir-larch, hem-fir, Southern pine, and spruce-pine-fir.**

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Spans are calculated assuming the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.

Updates to base code table for bearing wall spans.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	TABLE R602.7.5 **MINIMUM NUMBER OF FULL HEIGHT STUDS** **AT EACH END OF HEADERS IN EXTERIOR WALLS** ~~HEADER SPAN (feet)~~ / ~~MAXIMUM STUD SPACING (inches) (per Table R602.3(5))~~: ~~16~~ / ~~24~~ ~~≤ 3'~~: ~~1~~ / ~~1~~ ~~4'~~: ~~2~~ / ~~1~~ ~~8'~~: ~~3~~ / ~~2~~ ~~12'~~: ~~5~~ / ~~3~~ ~~16'~~: ~~6~~ / ~~4~~ MAXIMUM HEADER SPAN (feet) / ULTIMATE DESIGN WIND SPEED AND EXPOSURE CATEGORY: ≤ 140 mph, Exposure B or ≤ 130 mph, Exposure C / ≤ 115 mph, Exposure B [b] 4: 1 / 1 6: 2 / 1 8: 2 / 1 10: 3 / 2 12: 3 / 2 14: 3 / 2 16: 4 / 2 18: 4 / 2 For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s. a. For header spans between those given, use the minimum number of full-height studs associated with the larger header span. b. The tabulated minimum number of full-height studs is applicable where jack studs are provided to support the header at each end in accordance with Table R602.7(1). Where a framing anchor is used to support the header in lieu of a jack stud in accordance with Note d of Table R602.7(1), the minimum number of full-height studs at each end of a header shall be in accordance with requirements for wind speed ≤ 140 mph, Exposure B.		Updated table for stud heights in exterior walls.
	R602.7.5 Supports for headers. Headers shall be supported on each end with one or more jack studs or with *approved* framing anchors in accordance with **Table R602.7(1)** or **R602.7(2)**. The full-height stud adjacent to each end of the header shall be end nailed to each end of the header ~~with four 16d nails (3.5 inches × 0.135 inches)~~in accordance with **Table R602.3(1)**. The minimum number of full-height studs at each end of a header shall be in accordance with **Table R602.7.5**.		Minor wordsmithing changes.
	R602.9 Cripple walls. Foundation cripple walls shall be framed of studs not smaller than the studding above. ~~When~~ Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional *story*. Exterior Cripple walls with a stud height less than 14 inches (356 mm) shall be continuously sheathed on one side with wood structural panels fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking. Cripple walls shall be supported on continuous foundations.		Minor wordsmithing changes.
	R602.10.1.2 ~~Offsets along a~~Location of braced wall ~~line~~ lines and permitted offsets. Each *braced wall line* shall be located such that no more than two-thirds of the required *braced wall panel* length is located to one side of the *braced wall line*. Braced wall panels shall be permitted to be offset up to 4 feet (1219 mm) from the designated *braced wall line*. Braced wall panels parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in **Figure R602.10.1.1**. Exterior walls parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in **Figure R602.10.1.1**.		Updates to base code section for braced wall panels.

Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a *braced wall line* through the interior of the building as shown in **Figure R602.10.1.1**.

TABLE R602.10.1.3
BRACED WALL LINE SPACING

APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA	
			Maximum Spacing	Exception to Maximum Spacing
Wind bracing	Ultimate design wind speed ~~100 mph to~~ < 140 mph	Detached, townhouse	60 feet	None
Seismic bracing	SDC A – C	Detached	Use wind bracing	
	SDC A – B	Townhouse	Use wind bracing	
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per **Table R602.10.3(3)** is adjusted in accordance with **Table R602.10.3(4)**.
	SDC D_0, D_1, D_2	Detached, townhouses, one- and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines shall not exceed 25 feet.
	SDC D_0, D_1, D_2	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per **Table R602.10.3(3)** is adjusted in accordance with **Table R602.10.3(4)**.

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, 1 mile per hour = 0.447 m/s.

R602.10.1.4 Angled walls. Any portion of a wall along a *braced wall line* shall be permitted to angle out of plane for a maximum diagonal length of 8 feet (2438 mm). Where the angled wall occurs at a corner, the length of the *braced wall line* shall be measured from the projected corner as shown in **Figure R602.10.1.4**. Where the diagonal length is greater than 8 feet (2438 mm), it shall be considered to be a separate *braced wall line* and shall be braced in accordance with **Section R602.10.1**.

Minor wordsmithing changes.

R602.10.1.4 Angled walls. Any portion of a wall along a *braced wall line* shall be permitted to angle out of plane for a maximum diagonal length of 8 feet (2438 mm). Where the angled wall occurs at a corner, the length of the *braced wall line* shall be measured from the projected corner as shown in Figure R602.10.1.4. Where the diagonal length is greater than 8 feet (2438 mm), it shall be considered to be a separate *braced wall line* and shall be braced in accordance with Section R602.10.1.

Minor wordsmithing changes.

R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in **Section R602.10.1.1**. The distance between adjacent edges of braced wall panels along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in **Figure R602.10.2.2**.

Exceptions:

New exceptions provided for braced wall panels.

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	1. Braced wall panels in *Seismic Design Categories* D_0, D_1 and D_2 shall comply with **Section R602.10.2.2.1**. 2. Braced wall panels with continuous sheathing in *Seismic Design Categories* A, B or C shall comply with **Section R602.10.7**.		
	R602.10.2.2.1 Location of braced wall panels in Seismic Design Categories D0 , D1 and D2 . Braced wall panels shall be located at each end of a braced wall line. **Exceptions:** 1. Braced wall panels constructed of Method WSP or BV-WSP and continuous sheathing methods as specified in Section R602.10.4 shall be permitted to begin not more than 10 feet (3048 mm) from each end of a *braced wall line* provided that each end complies with one of the following: ~~1.~~1.1. A minimum 24-inch-wide (610 mm) panel for Methods WSP, CS-WSP, CS-G and CS-PF is applied to each side of the building corner as shown in End Condition 4 of **Figure R602.10.7**. ~~2.~~1.2. The end of each *braced wall panel* closest to the end of the *braced wall line* shall have an 1,800-pound (8 kN) holddown device fastened to the stud at the edge of the *braced wall panel* closest to the corner and to the foundation or framing below as shown in End Condition 5 of **Figure R602.10.7**. 2. Braced wall panels constructed of Method PFH or ABW, or of Method BV-WSP where a hold-down is provided in accordance with **Table R602.10.6.5.4**, shall be permitted to begin not more than 10 feet (3048 mm) from each end of a *braced wall line*.		Updated exceptions for braced wall panels seismic design.
	TABLE R602.10.3(1) **BRACING REQUIREMENTS BASED ON WIND SPEED** For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s. NP = Not Permitted. a. Linear interpolation shall be permitted. b. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches. c. Where a three or more parallel braced wall lines ~~has parallel braced wall lines on one or both sides of differing dimensions~~are present and the distances between adjacent braced wall lines are different, the average dimension shall be permitted to be used for braced wall line spacing.		Updates to table and footnotes.

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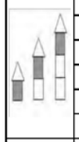
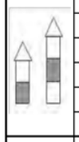
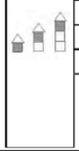
TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

• EXPOSURE CATEGORY B • 30-FOOT MEAN ROOF HEIGHT • 10-FOOT WALL HEIGHT • 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
< 95 mph		10	2.5	2.5	1.5	1.5
		20	4.5	4.5	2.5	2.5
		30	6.5	6.5	4.0	3.5
		40	8.5	8.5	5.0	4.0
		50	10.5	10.5	6.0	5.0
		60	12.5	12.5	7.0	6.0
		10	5.0	5.0	3.0	2.5
		20	8.5	8.5	5.0	4.5
		30	12.5	12.5	7.0	6.0
		40	16.0	16.0	9.5	8.0
		50	20.0	20.0	11.5	10.0
		60	23.5	23.5	13.5	11.5
		10	NP	7.0	4.0	3.5
		20	NP	13.0	7.5	6.5
		30	NP	18.5	10.5	9.0
		40	NP	24.0	13.5	11.5
		50	NP	29.5	17.0	14.5
		60	NP	35.0	20.0	17.0
		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0

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≤ 110		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.5	5.5
		30	16.5	16.5	9.5	8.0
		40	21.5	21.5	12.5	10.5
		50	26.5	26.5	15.5	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.5	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.5	15.5
		50	NP	39.5	22.5	19.0
		60	NP	46.5	26.5	23.0
≤ 115		10	3.5	3.5	2.0	2.0
		20	6.5	6.5	3.5	3.5
		30	9.5	9.5	5.5	4.5
		40	12.5	12.5	7.0	6.0
		50	15.0	15.0	9.0	7.5
		60	18.0	18.0	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0
		10	4.0	4.0	2.5	2.0
		20	7.0	7.0	4.0	3.5
		30	10.5	10.5	6.0	5.0
		40	13.5	13.5	8.0	6.5
		50	16.5	16.5	9.5	8.0

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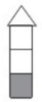
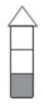
≤ 120		60	19.5	19.5	11.5	9.5
		10	7.5	7.5	4.5	3.5
		20	14.0	14.0	8.0	7.0
		30	20.0	20.0	11.5	9.5
		40	25.5	25.5	15.0	12.5
		50	31.5	31.5	18.0	15.5
		60	37.5	37.5	21.5	18.5
		10	NP	11.0	6.5	5.5
		20	NP	20.5	11.5	10.0
		30	NP	29.0	17.0	14.5
		40	NP	38.0	22.0	18.5
		50	NP	47.0	27.0	23.0
		60	NP	55.5	32.0	27.0
≤ 130		10	4.5	4.5	2.5	2.5
		20	8.5	8.5	5.0	4.0
		30	12.0	12.0	7.0	6.0
		40	15.5	15.5	9.0	7.5
		50	19.5	19.5	11.0	9.5
		60	23.0	23.0	13.0	11.0
		10	8.5	8.5	5.0	4.5
		20	16.0	16.0	9.5	8.0
		30	23.0	23.0	13.5	11.5
		40	30.0	30.0	17.5	15.0
		50	37.0	37.0	21.5	18.0
		60	44.0	44.0	25.0	21.5
		10	NP	13.0	7.5	6.5
		20	NP	24.0	13.5	11.5
		30	NP	34.5	19.5	17.0
		40	NP	44.5	25.5	22.0
		50	NP	55.0	31.5	26.5
		60	NP	65.0	37.5	31.5
		10	5.5	5.5	3.0	2.5
		20	10.0	10.0	5.5	5.0
		30	14.0	14.0	8.0	7.0
		40	18.0	18.0	10.5	9.0

< 140		50	22.5	22.5	13.0	11.0
		60	26.5	26.5	15.0	13.0
		10	10.0	10.0	6.0	5.0
		20	18.5	18.5	11.0	9.0
		30	27.0	27.0	15.5	13.0
		40	35.0	35.0	20.0	17.0
		50	43.0	43.0	24.5	21.0
		60	51.0	51.0	29.0	25.0
		10	NP	15.0	8.5	7.5
		20	NP	27.5	16.0	13.5
		30	NP	39.5	23.0	19.5
		40	NP	51.5	29.5	25.0
		50	NP	63.5	36.5	31.0
		60	NP	75.5	43.0	36.5

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

NP = Not Permitted.

a. Linear interpolation shall be permitted.
b. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with **Table R602.3(1)** for exterior sheathing or **Table R702.3.5** for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
c. Where three or more parallel braced wall lines are present and the distances between adjacent braced wall lines are different, the average dimension shall be permitted to be used for braced wall line spacing.

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TABLE R602.10.3(2)
WIND ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON	STORY/SUPPORTING	CONDITION	ADJUSTMENT FACTOR[a, b] [multiply length from Table R602.10.3(1) by this factor]	APPLICABLE METHODS
1	Exposure category[d]	One-story structure	B C D	1.00 1.20 1.50	All methods
		Two-story structure	B C D	1.00 1.30 1.60	
		Three-story structure	B C D	1.00 1.40 1.70	
2	Roof eave-to-ridge height	Roof only	≤ 5 feet 10 feet 15 feet 20 feet	0.70 1.00 1.30 1.60	
		Roof + 1 floor	≤ 5 feet 10 feet 15 feet 20 feet	0.85 1.00 1.15 1.30	
		Roof + 2 floors	≤ 5 feet 10 feet 15 feet 20 feet	0.90 1.00 1.10 Not permitted	
3	~~Wall~~**Story** height ~~adjustment~~**(Section R301.0)**	Any story	8 feet 9 feet 10 feet 11 feet 12 feet	0.90 0.95 1.00 1.05 1.10	
4	Number of braced wall lines (per plan direction)[c]	Any story	2 3 4 ≥ 5	1.00 1.30 1.45 1.60	
5	Additional 800-pound hold-down device	Top story only	Fastened to the end studs of each braced wall panel and to the foundation or framing below	0.80	DWB, WSP, SFB, PBS, PCP, HPS
6	Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.40	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
7	Gypsum board fastening	Any story	4 inches o.c. at panel edges, including top and bottom plates, and all horizontal joints blocked	0.7	GB
8	**Horizontal blocking**	**Any story**	**Horizontal block is omitted**	**2.0**	**WSP,CS-WSP**

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.48 N.
a. Linear interpolation shall be permitted.
b. The total adjustment factor is the product of all applicable adjustment factors.
c. The adjustment factor is permitted to be 1.0 when determining bracing amounts for intermediate braced wall lines provided the bracing amounts on adjacent braced wall lines are based on a spacing and number that neglects the intermediate braced wall line.
d. The same adjustment factor shall be applied to all braced wall lines on all floors of the structure, based on the worst-case exposure category.

Updates to wall bracing table.

TABLE R602.10

Update to table and footnotes.

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	a. Linear interpolation shall be permitted. b. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.3**2** of the *International Building Code*. c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table. d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches. e. Method**s PFG and** CS-SFB do~~es~~ not apply in Seismic Design Categories D_0, D_1 and D_2. **f. Where more than one bracing method is used, mixing methods shall be in accordance with Section R602.10.4.1.**		

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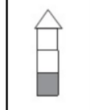
TABLE R602.10.3(3)
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

~~• SOIL CLASS D[b]~~ • WALL HEIGHT = 10 FEET • 10 PSF FLOOR DEAD LOAD • 15 PSF ROOF/CEILING DEAD LOAD • BRACED WALL LINE SPACING ≤25 FEET			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a, f, g]				
Seismic DesignCategory[b]	Story Location	Braced Wall Line Length (feet)[c]	Method LIB[d]	Method GB	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB[e]	Methods WSP, ABW[f], PFH[f] and PFG[e, f]	Methods CS-WSP, CS-G, CS-PF
C (townhouses only)		10	2.5	2.5	2.5	1.6	1.4
		20	5.0	5.0	5.0	3.2	2.7
		30	7.5	7.5	7.5	4.8	4.1
		40	10.0	10.0	10.0	6.4	5.4
		50	12.5	12.5	12.5	8.0	6.8
		10	NP	4.5	4.5	3.0	2.6
		20	NP	9.0	9.0	6.0	5.1
		30	NP	13.5	13.5	9.0	7.7
		40	NP	18.0	18.0	12.0	10.2
		50	NP	22.5	22.5	15.0	12.8
		10	NP	6.0	6.0	4.5	3.8
		20	NP	12.0	12.0	9.0	7.7
		30	NP	18.0	18.0	13.5	11.5
		40	NP	24.0	24.0	18.0	15.3
		50	NP	30.0	30.0	22.5	19.1
		10	NP	2.8	2.8	1.8	1.6
		20	NP	5.5	5.5	3.6	3.1
		30	NP	8.3	8.3	5.4	4.6
		40	NP	11.0	11.0	7.2	6.1
		50	NP	13.8	13.8	9.0	7.7

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D_0		10	NP	5.3	5.3	3.8	3.2
		20	NP	10.5	10.5	7.5	6.4
		30	NP	15.8	15.8	11.3	9.6
		40	NP	21.0	21.0	15.0	12.8
		50	NP	26.3	26.3	18.8	16.0
		10	NP	7.3	7.3	5.3	4.5
		20	NP	14.5	14.5	10.5	9.0
		30	NP	21.8	21.8	15.8	13.4
		40	NP	29.0	29.0	21.0	17.9
		50	NP	36.3	36.3	26.3	22.3
D_1		10	NP	3.0	3.0	2.0	1.7
		20	NP	6.0	6.0	4.0	3.4
		30	NP	9.0	9.0	6.0	5.1
		40	NP	12.0	12.0	8.0	6.8
		50	NP	15.0	15.0	10.0	8.5
		10	NP	6.0	6.0	4.5	3.8
		20	NP	12.0	12.0	9.0	7.7
		30	NP	18.0	18.0	13.5	11.5
		40	NP	24.0	24.0	18.0	15.3
		50	NP	30.0	30.0	22.5	19.1
		10	NP	8.5	8.5	6.0	5.1
		20	NP	17.0	17.0	12.0	10.2
		30	NP	25.5	25.5	18.0	15.3
		40	NP	34.0	34.0	24.0	20.4
		50	NP	42.5	42.5	30.0	25.5
		10	NP	4.0	4.0	2.5	2.1
		20	NP	8.0	8.0	5.0	4.3
		30	NP	12.0	12.0	7.5	6.4
		40	NP	16.0	16.0	10.0	8.5
		50	NP	20.0	20.0	12.5	10.6

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D_2[h]		10	NP	7.5	7.5	5.5	4.7
		20	NP	15.0	15.0	11.0	9.4
		30	NP	22.5	22.5	16.5	14.0
		40	NP	30.0	30.0	22.0	18.7
		50	NP	37.5	37.5	27.5	23.4
	Three-story dwelling	10	NP	NP	NP	NP	NP
		20	NP	NP	NP	NP	NP
		30	NP	NP	NP	NP	NP
		40	NP	NP	NP	NP	NP
		50	NP	NP	NP	NP	NP
	Cripple wall below one- or two-story dwelling	10	NP	NP	NP	7.5	6.4
		20	NP	NP	NP	15.0	12.8
		30	NP	NP	NP	22.5	19.1
		40	NP	NP	NP	30.0	25.5
		50	NP	NP	NP	37.5	31.9

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

NP = Not Permitted.

a. Linear interpolation shall be permitted.
b. ~~Wall bracing lengths are based on a soil site class "D."~~Interpolation of bracing length between the S_{ds} values associated with the seismic design categories shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.2 of the *International Building Code*.
c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.
d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with **Table R602.3(1)** for exterior sheathing or **Table R702.3.5** for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.
e. Methods PFG and CS-SFB do not apply in Seismic Design Categories D_0, D_1 and D_2.
f. Methods PFH, PFG and ABW are only permitted on a single story or a first of two stories.
~~f~~g. Where more than one bracing method is used, mixing methods shall be in accordance with **Section R602.10.4.1**.
h. One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories shall be designed in accordance with accepted engineering practice.

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TABLE R602.10.3(4)
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON~~:~~	STORY	CONDITION	ADJUSTMENT FACTOR[a, b] [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLE METHODS
1	Story height (Section 301.3)	Any story	≤ 10 feet > 10 feet and ≤ 12 feet	1.0 1.2	All methods
2	Braced wall line spacing, townhouses in SDC C	Any story	≤ 35 feet > 35 feet and ≤ 50 feet	1.0 1.43	
3	Braced wall line spacing, in SDC D_0, D_1, D_2[c]	Any story	> 25 feet and ≤ 30 feet > 30 feet and ≤ 35 feet	1.2 1.4	
4	Wall dead load	Any story	> 8 psf and < 15 psf < 8 psf	1.0 0.85	
5	Roof/ceiling dead load for wall supporting	1-, 2- or 3-story building	≤15 psf	1.0	
		2- or 3-story building	> 15 psf and ≤ 25 psf	1.1	
		1-story building or top story	> 15 psf and ≤ 25 psf	1.2	
6	Walls with stone or masonry veneer, townhouses in SDC C[d, e]		1.0		All methods
			1.5		
			1.5		
7	Walls with stone or masonry veneer, detached one- and two-family dwellings in SDC D_0 – D_2[d, f]	Any story	See Table R602.10.6.5		BV-WSP
8	Walls with stone or masonry veneer, detached one- and two-family dwellings in SDC D_0 – D_2[d, f]	First and second story of two-story dwelling	See Table R602.10.6.5	1.2	WPS, CS-WPS
~~8~~9	Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.5	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WPS, CS-WPS

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

a. Linear interpolation shall be permitted.
b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
c. The length-to-width ratio for the floor/roof *diaphragm* shall not exceed 3:1. ~~The top plate lap splice nailing shall be in accordance with Table R602.3(1), Item 13.~~
d. Applies to stone or masonry veneer exceeding the first story height.
e. The adjustment factor for stone or masonry veneer shall be applied to all *exterior braced wall lines* and *all braced wall lines* on the interior of the building, backing or perpendicular to and laterally supporte~~d~~ing veneered walls.
f. See Section R602.10.6.5 for requirements where stone or masonry veneer does not exceed the first-story height.

Updates to table and footnotes.

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TABLE R602.10.3(4)
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON	STORY[g]	CONDITION	ADJUSTMENT FACTOR[a, b] [Multiply length from Table R602.10.3(3) by this factor]	APPLICABLE METHODS
1	Story height (**Section 301.3**)	Any story	≤ 10 feet	1.0	All methods
			> 10 feet and ≤ 12 feet	1.2	
2	Braced wall line spacing, townhouses in SDC C	Any story	≤ 35 feet	1.0	
			> 35 feet and ≤ 50 feet	1.43	
3	Braced wall line spacing, in SDC D_0, D_1, D_2[c]	Any story	> 25 feet and ≤ 30 feet	1.2	
			> 30 feet and ≤ 35 feet	1.4	
4	Wall dead load	Any story	> 8 psf and < 15 psf	1.0	
			< 8psf	0.85	
5	Roof/ceiling dead load for wall supporting	1-, 2- or 3-story building	≤15 psf	1.0	
		2- or 3-story building	> 15 psf and ≤ 25 psf	1.1	
		1-story building or top story	> 15 psf and ≤ 25 psf	1.2	
6	Walls with stone or masonry veneer, townhouses in SDC C[d, e]		1.0		All methods
			1.5		
			1.5		

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7	Walls with stone or masonry veneer, detached one- and two-family dwellings in SDC $D_0 – D_2$ [d, f]	Any story	See ~~Table R602.10.6.5~~**Section R602.10.6.5.4**		BV-WSP
8	Walls with stone or masonry veneer, detached one- and two-family dwellings in SDC $D_0 – D_2$ [d, f]	First and second story of two-story dwelling	~~See Table R602.10.6.5.~~ Limited brick veneer on second story. See **Section R602.10.6.5.3**.	1.2	WSP, CS-WSP
9	Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.5	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
10	Horizontal blocking	Any story	Horizontal blocking omitted	2.0	WSP, PBS, CS-WSP

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

a. Linear interpolation shall be permitted.
b. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
c. The length-to-width ratio for the floor/roof diaphragm shall not exceed 3:1.
d. Applies to stone or masonry veneer exceeding the first story height.
e. The adjustment factor for stone or masonry veneer shall be applied to all exterior braced wall lines and all braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls.
f. See **Section R602.10.6.5** for requirements where stone or masonry veneer does not exceed the first-story height.
g. One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories shall be designed in accordance with accepted engineering practice.

R602.10.4 Construction methods for braced wall panels. Intermittent and continuously sheathed *braced wall panel*s shall be constructed in accordance with this section and the methods listed in **Table R602.10.4**.

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TABLE R602.10.4
BRACING METHODS

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	**LIB** Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16" stud spacing		Wood: 2-8d common nails or 3-8d (2 1/2" long x 0.113" dia.) nails	Wood: per stud and top and bottom plates
				Metal strap: per manufacturer	Metal: per manufacturer
	DWB Diagonal wood boards	3/4"(1" nominal) for maximum 24" stud spacing		2-8d (2 1/2" long × 0.113" dia.) nails or 2 - 1 3/4" long staples	Per stud
	WSP Wood structural panel (See Section R604)	3/8"		Exterior sheathing per Table R602.3(3)	6" edges 12" field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	BV-WSP[e] Wood structural panels with stone or masonry veneer (See Section R602.10.6.5)	7/16"	See Figure R602.10.6.5	8d common (2 1/2" × 0.131) nails	4" at panel edges 12" at intermediate supports 4" at braced wall panel end posts
	SFB Structural fiberboard sheathing	1/2" or 25/32" for maximum 16" stud spacing		1 1/2" long × 0.12" dia. (for 1/2" thick sheathing) 1 3/4" long × 0.12" dia. (for 25/32" thick sheathing) galvanized roofing nails ~~or 8d common (2 1/2" long × 0.131" dia.) nails~~	3" edges 6" field
	GB Gypsum board	1/2"		Nails or screws per Table R602.3(1) for exterior locations	For all braced wall panel locations: 7" edges (including top and bottom plates) 7" field
				Nails or screws per Table R702.3.5 for interior locations	
	PBS Particleboard sheathing (See Section R605)	3/8" or 1/2" for maximum 16" stud spacing		For 3/8", 6d common (2" long × 0.113" dia.) nails For 1/2", 8d common (2 1/2" long × 0.131" dia.) nails	3" edges 6" field
	PCP Portland cement plaster	See Section R703.6Z for maximum 16" stud spacing		1 1/2" long, 11 gage, 7/16" dia. head nails or 7/8" long, 16 gage staples	6" o.c. on all framing members
	HPS Hardboard panel siding	7/16" for maximum 16" stud spacing		0.092" dia., 0.225" dia. head nails with length to accommodate 1 1/2" penetration into studs	4" edges 8" field
	ABW Alternate braced wall	3/8"		See Section R602.10.6.1	See Section R602.10.6.1

Minor updates to table and footnotes.

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METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	**PFH** Portal frame with hold-downs	3/8"		See Section R602.10.6.2	See Section R602.10.6.2
	PFG Portal frame at garage	7/16"		See Section R602.10.6.3	See Section R602.10.6.3
Continuous Sheathing Methods	**CS-WSP** Continuously sheathed wood structural panel	3/8"		Exterior sheathing per Table R602.3(3)	6" edges 12" field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	CS-G[b, c] Continuously sheathed wood structural panel adjacent to garage openings	3/8"		See Method CS-WSP	See Method CS-WSP
	CS-PF Continuously sheathed portal frame	7/16"		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB[d] Continuously sheathed structural fiberboard	1/2" or 25/32" for maximum 16" stud spacing		1 1/2" long × 0.12" dia. (for 1/2" thick sheathing) 1 3/4" long × 0.12" dia. (for 25/32" thick sheathing) galvanized roofing nails ~~or 8d common (2 1/2" long × 0.131" dia.) nails~~	3" edges 6" field

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m^2, 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2, roof covering dead load shall not exceed 3 psf.

c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R602.~~6~~7(1). A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.

d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

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TABLE R602.10.4
BRACING METHODS

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
	LIB Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16″ stud spacing		Wood: 2-8d common nails or 3-8d ($2^1/_2$″ long × 0.113″ dia.) nails	Wood: per stud and top and bottom plates
				Metal strap: per manufacturer	Metal: per manufacturer
	DWB Diagonal wood boards	$^3/_4$″ (1″ nominal) for maximum 24″ stud spacing		2-8d ($2^1/_2$″ long × 0.113″ dia.) nails or 2-$1^3/_4$″ long staples	Per stud
	WSP Wood structural panel (See **Section R604**)	$^3/_8$″		Exterior sheathing per **Table R602.3(3)**	6″ edges 12″ field
				Interior sheathing per **Table R602.3(1)** or **R602.3(2)**	Varies by fastener
	BV-WSP[e] Wood structural panels with stone or masonry veneer (See **Section R602.10.6.5**)	$^7/_{16}$″	See ~~Figure R602.10.6.5~~**Figure R602.10.6.5.2**	8d common ($2^1/_2$″ × 0.131) nails	4″ at panel edges 12″ at intermediate supports 4″ at braced wall panel end posts

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Intermittent Bracing Methods	**SFB** Structural fiberboard sheathing	$^{1}/_{2}$" or $^{25}/_{32}$" for maximum 16" stud spacing		$1^{1}/_{2}$" long × 0.12" dia. (for $^{1}/_{2}$" thick sheathing) $1^{3}/_{4}$" long × 0.12" dia. (for $^{25}/_{32}$" thick sheathing) galvanized roofing nails	3" edges 6" field
	GB Gypsum board	$^{1}/_{2}$"		Nails or screws per **Table R602.3(1)** for exterior locations Nails or screws per **Table R702.3.5** for interior locations	For all braced wall panel locations: 7"edges (including top and bottom plates) 7" field
	PBS Particleboard sheathing (See **Section R605**)	$^{3}/_{8}$" or $^{1}/_{2}$" formaximum 16"stud spacing		For $^{3}/_{8}$", 6d common (2" long × 0.113" dia.) nails; For $^{1}/_{2}$", 8d common ($2^{1}/_{2}$" long × 0.131" dia.) nails	3" edges 6" field
	PCP Portland cement plaster	See **Section R703.6** for maximum 16" stud spacing		$1^{1}/_{2}$" long, 11 gage, 0.120" dia., $^{7}/_{16}$" dia. head nails or $^{7}/_{8}$" long, 16 gage staples	6" o.c. on all framing members
	HPS Hardboard panel siding	$^{7}/_{16}$" for maximum 16" stud spacing		0.092" dia., 0.225" dia. head nails with length to accommodate $1^{1}/_{2}$" penetration into studs	4" edges 8" field

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Continuous Sheathing Methods	**ABW** Alternate braced wall	$^3/_8$"		See **Section R602.10.6.1**	See **Section R602.10.6.1**
	PFH Portal frame with hold-downs	$^3/_8$"		See **Section R602.10.6.2**	See **Section R602.10.6.2**
	PFG Portal frame at garage	$^7/_{16}$"		See **Section R602.10.6.3**	See **Section R602.10.6.3**
	CS-WSP Continuously sheathed wood structural panel	$^3/_8$"		Exterior sheathing per **Table R602.3(3)**	6" edges 12" field
				Interior sheathing per **Table R602.3(1)** or **R602.3(2)**	Varies by fastener
	CS-G[b, c] Continuously sheathed wood structural panel adjacent to garage openings	$^3/_8$"		See Method CS-WSP	See Method CS-WSP
	CS-PF Continuously sheathed portal frame	$^7/_{16}$"		See **Section R602.10.6.4**	See **Section R602.10.6.4**

	CS-SFB[d] Continuously sheathed structural fiberboard	$^{1}/_{2}$" or $^{25}/_{32}$" for maximum 16" stud spacing		$1^{1}/_{2}$" long × 0.12" dia. (for $^{1}/_{2}$" thick sheathing) $1^{3}/_{4}$" long × 0.12" dia. (for $^{25}/_{32}$" thick sheathing) galvanized roofing nails	3" edges 6" field

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m^2, 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.
b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2, roof covering dead load shall not exceed 3 psf.
c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with **Table R602.7(1)**. A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.
d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.
e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

R602.10.4.1 Mixing methods. Mixing of bracing methods shall be permitted as follows:

1. Mixing intermittent bracing and continuous sheathing methods from story to story shall be permitted.
2. Mixing intermittent bracing methods from *braced wall line* to *braced wall line* within a story shall be permitted. In regions within Seismic Design Categories A, B and C where the ultimate design wind speed is less than or equal to 130 mph (58m/s), mixing of intermittent bracing and continuous sheathing methods from braced wall line to braced wall line within a story shall be permitted.
3. Mixing intermittent bracing methods along a *braced wall line* shall be permitted in Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C, provided that the length of required bracing in accordance with Table R602.10.3(1) or R602.10.3(3) is the highest value of all intermittent bracing methods used.
4. Mixing of continuous sheathing methods CS-WSP, CS-G and CS-PF along a *braced wall line* shall be permitted. Intermittent methods ABW, PFH and PFG shall be permitted to be used along a *braced wall line* with continuous sheathed methods, provided that the length of required bracing for that braced wall line is determined in accordance with Table R602.10.3(1) or R602.10.3(3) using the highest value of the bracing methods used.
5. In Seismic Design Categories A and B, and for detached one- and two-family dwellings in Seismic Design Category C, mixing of intermittent bracing methods along the interior portion of a *braced wall*

Minor updates to mixing method requirements.

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	line with continuous sheathing methods CS-WSP, CS-G and CS-PF along the exterior portion of the same braced wall line shall be permitted. The length of required bracing shall be the highest value of all intermittent bracing methods used in accordance with Table R602.10.3(1) or R602.10.3(3) as adjusted by Tables R602.10.3(2) and R602.10.3(4), respectively. The requirements of Section R602.10.7 shall apply to each end of the continuously sheathed portion of the braced wall line.		
	R602.10.4.3 Braced wall panel interior finish material. Braced wall panels shall have gypsum wall board installed on the side of the wall opposite the bracing material. Gypsum wall board shall be not less than 1/2 inch (12.7 mm) in thickness and be fastened with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum wall board. Spacing of fasteners at panel edges for gypsum wall board opposite Method LIB bracing shall not exceed 8 inches (203 mm). Interior finish material shall not be glued in Seismic Design Categories D0, D1 and D2. **Exceptions:** 1. Interior finish material is not required opposite wall panels that are braced in accordance with Methods GB, BV-WSP, ABW, PFH, PFG and CS-PF, unless otherwise required by Section R302.6. 2. An approved interior finish material with an in-plane shear resistance equivalent to gypsum board shall be permitted to be substituted, unless otherwise required by Section R302.6. 3. Except for Method LIB, gypsum wall board is permitted to be omitted provided that the required length of bracing in Tables R602.10.3(1) and R602.10.3(3) is multiplied by the appropriate adjustment factor in Tables R602.10.3(2) and R602.10.3(4), respectively, unless otherwise required by Section R302.6.		Minor wordsmithing update.
	R602.10.4.4 Panel joints. Vertical joints of panel sheathing shall occur over and be fastened to common studs. Horizontal joints of panel sheathing in *braced wall panels* shall occur over and be fastened to common blocking of a thickness of 1 1/2 inches (38 mm) or greater. **Exceptions:** **1.** For methods WSP and CS-WSP, blocking of horizontal joints is permitted to be omitted when adjustment factor No. 8 of Table R602.10.3(2) or No. 9 of Table R602.10.3(4) is applied. **2.** Vertical joints of panel sheathing shall be permitted to occur over double studs, where adjoining panel edges are attached to separate studs with the required panel edge fastening schedule, and the adjacent studs are attached		New base code section for vertical joints of panel sheathing.

together with two rows of 10d box nails [3 inches by 0.128 inch (76.2 mm by 3.25 mm)] at 10 inches o.c. (254 mm).

3. Blocking at horizontal joints shall not be required in wall segments that are not counted as *braced wall panels*.
4. Where Method GB panels are installed horizontally, blocking of horizontal joints is not required.

TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

METHOD (See Table R602.10.4)		MINIMUM LENGTH[a] (inches) Wall Height 8 feet	9 feet	10 feet	11 feet	12 feet	CONTRIBUTING LENGTH (inches)
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual[b]
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual
LIB		55	62	69	NP	NP	Actual[b]
ABW	SDC A, B and C, ultimate design wind speed < 140 mph	28	32	34	38	42	48
	SDC D_0, D_1 and D_2, ultimate design wind speed < 140 mph	32	32	34	NP	NP	
~~PFH~~	~~Supporting roof only~~	~~16~~	~~16~~	~~16~~	~~18~~[c]	~~20~~[c]	~~48~~
	~~Supporting one story and roof~~	~~24~~	~~24~~	~~24~~	~~27~~[c]	~~29~~[c]	~~48~~
~~PFG~~		~~24~~	~~27~~	~~30~~	~~33~~[d]	~~36~~[d]	~~1.5 × Actual~~[b]
CS-G		24	27	30	33	36	Actual[b]
~~CS-PF~~	~~SDC A, B and C~~	~~16~~	~~18~~	~~20~~	~~22~~[e]	~~24~~[e]	~~1.5 × Actual~~[b]
	~~SDC D_0, D_1 and D_2~~	~~16~~	~~18~~	~~20~~	~~22~~[e]	~~24~~[e]	~~Actual~~[b]
CS-WSP, CS-SFB	Adjacent clear opening height (inches)						
	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	46	43	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
	120	—	—	60	52	48	
	124	—	—	—	56	51	
	128	—	—	—	61	54	
	132	—	—	—	66	58	
	136	—	—	—	—	62	
	140	—	—	—	—	66	
	144	—	—	—	—	72	

METHOD (See Table R602.10.4)		Portal header height 8 feet	9 feet	10 feet	11 feet	12 feet	
PFH	Supporting roof only	16	16	16	Note c	Note c	48
	Supporting one story and roof	24	24	24	Note c	Note c	
PFG		24	27	30	Note d	Note d	1.5 × Actual[b]
CS-PF	SDC A,B and C	16	18	20	Note e	Note e	1.5 × Actual[b]
	SDC D_0, D_1 and D_2	16	18	20	Note e	Note e	Actual[b]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.
NP = Not Permitted.
a. Linear interpolation shall be permitted.
b. Use the actual length where it is greater than or equal to the minimum length.
c. Maximum header height for PFH is 10 feet in accordance with Figure R602.10.6.2, but wall height shall be permitted to be increased to 12 feet with pony wall.
d. Maximum ~~opening~~ header height for PFG is 10 feet in accordance with Figure R602.10.6.3, but wall height shall be permitted to be increased to 12 feet with pony wall.
e. Maximum ~~opening~~ header height for CS-PF is 10 feet in accordance with Figure R602.10.6.4, but wall height shall be permitted to be increased to 12 feet with pony wall.

Minor updates to table and footnotes.

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<table>
<tr>
<td></td>
<td>R602.10.6.4 Method CS-PF: Continuously sheathed portal frame. Continuously sheathed portal frame braced wall panels shall be constructed in accordance with Figure R602.10.6.4 and Table R602.10.6.4. ~~The number of continuously sheathed portal frame panels in a single braced wall line shall not exceed four.~~</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
<tr>
<td></td>
<td>
TABLE R602.10.6.4
TENSION STRAP CAPACITY FOR RESISTING WIND PRESSURES PERPENDICULAR TO METHODS PFH, PFG AND CS-PF BRACED WALL PANELS[a]
<table>
<tr><th rowspan="3">MINIMUM WALL STUD FRAMING NOMINAL SIZE AND GRADE</th><th rowspan="3">MAXIMUM PONY WALL HEIGHT (feet)</th><th rowspan="3">MAXIMUM TOTAL WALL HEIGHT (feet)</th><th rowspan="3">MAXIMUM OPENING WIDTH (feet)</th><th colspan="6">TENSION STRAP CAPACITY REQUIRED (pounds)[a]</th></tr>
<tr><th colspan="6">Ultimate Design Wind Speed V_{ult} (mph)</th></tr>
<tr><th>≤ 110</th><th>115</th><th>130</th><th>≤ 110</th><th>115</th><th>130</th></tr>
<tr><th></th><th></th><th></th><th></th><th colspan="3">Exposure B</th><th colspan="3">Exposure C</th></tr>
<tr><td rowspan="12">2 × 4 No. 2 Grade</td><td>0</td><td>10</td><td>18</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,050</td></tr>
<tr><td rowspan="3">1</td><td rowspan="3">10</td><td>9</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,000</td><td>1,750</td></tr>
<tr><td>16</td><td>1,000</td><td>1,025</td><td>2,050</td><td>2,075</td><td>2,500</td><td>3,950</td></tr>
<tr><td>18</td><td>1,000</td><td>1,275</td><td>2,375</td><td>2,400</td><td>2,850</td><td>DR</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">10</td><td>9</td><td>1,000</td><td>1,000</td><td>1,475</td><td>1,500</td><td>1,875</td><td>3,125</td></tr>
<tr><td>16</td><td>1,775</td><td>2,175</td><td>3,525</td><td>3,550</td><td>4,125</td><td>DR</td></tr>
<tr><td>18</td><td>2,075</td><td>2,500</td><td>3,950</td><td>3,975</td><td>DR</td><td>DR</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">12</td><td>9</td><td>1,150</td><td>1,500</td><td>2,650</td><td>2,675</td><td>3,175</td><td>DR</td></tr>
<tr><td>16</td><td>2,875</td><td>3,375</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
<tr><td>18</td><td>3,425</td><td>3,975</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">12</td><td>9</td><td>2,275</td><td>2,750</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
<tr><td>12</td><td>3,225</td><td>3,775</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
<tr><td rowspan="9">2 × 6 Stud Grade</td><td rowspan="3">2</td><td rowspan="3">12</td><td>9</td><td>1,000</td><td>1,000</td><td>1,700</td><td>1,700</td><td>2,025</td><td>3,050</td></tr>
<tr><td>16</td><td>1,825</td><td>2,150</td><td>3,225</td><td>3,225</td><td>3,675</td><td>DR</td></tr>
<tr><td>18</td><td>2,200</td><td>2,550</td><td>3,725</td><td>3,750</td><td>DR</td><td>DR</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">12</td><td>9</td><td>1,450</td><td>1,750</td><td>2,700</td><td>2,725</td><td>3,125</td><td>DR</td></tr>
<tr><td>16</td><td>2,050</td><td>2,400</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
<tr><td>18</td><td>3,350</td><td>3,800</td><td>DR</td><td>DR</td><td>DR</td><td>DR</td></tr>
</table>
For SI: 1 foot = 304.8 mm, 1 pound = 4.45 N, 1 mile per hour = 0.447 m/s.
DR = Design Required.
a. Straps shall be installed in accordance with manufacturer's recommendations.
</td>
<td></td>
<td>Minor updates to table.</td>
</tr>
<tr>
<td></td>
<td>R602.10.6.5 Wall bracing for dwellings with stone and masonry veneer inSeismic Design Categories D_0, D_1 and D_2. Townhouses in Seismic Design Categories D_0, D_1 and D_2 with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.
One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories and having stone or masonry veneer shall be designed in accordance with accepted engineering practice.
Where stone and masonry veneer are installed in accordance with Section R703.8, wall bracing on exterior braced wall lines and braced wall lines on the interior of the building, backing or perpendicular to and laterally supporting veneered walls shall comply with this section.
~~Where dwellings in Seismic Design Categories D_0, D_1 and D_2 have stone or masonry veneer installed in~~</td>
<td></td>
<td>Base code section updated for seismic design wall bracing.</td>
</tr>
</table>

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	~~accordance with **Section R703.8**, and the veneer does not exceed the first story height, wall bracing shall be in accordance with **Section R602.10.3**.~~ ~~Where detached one- or two-family dwellings in Seismic Design Categories D_0, D_1 and D_2 have stone or masonry veneer installed in accordance with **Section R703.8**, and the veneer exceeds the first *story height*, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and **Figure Figure R602.10.6.5.2**. Cripple walls shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.~~ ~~Where detached one- or two-family *dwellings* in Seismic Design Categories D_0, D_1 and D_2 have exterior veneer installed in accordance with **Section R703.8** and are braced in accordance with Method WSP or CS-WSP, veneer shall be permitted in the second story in accordance with Item 1 or 2, provided that the *dwelling* does not extend more than two stories above grade plane, the veneer does not exceed 5 inches (127 mm) in thickness, the height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation, and the total length of *braced wall panel* specified by **Table R602.10.3(3)** is multiplied by 1.2 for each first- and second-story *braced wall line*.~~ ~~1. The total area of the veneer on the second-story exterior walls shall be permitted to extend up to 25 percent of the occupied second floor area.~~ ~~2. The veneer on the second-story exterior walls shall be permitted to cover one side of the *dwelling*, including walls on bay windows and similar appurtenances within the one dwelling side.~~ ~~Townhouses in Seismic Design Categories D_0, D_1 and D_2 with stone or masonry veneer exceeding the first-story height shall be designed in accordance with accepted engineering practice.~~		
	R602.10.6.5.1 Veneer on first story only. Where dwellings in *Seismic Design Categories* D_0, D_1 and D_2 have stone or masonry veneer installed in accordance with **Section R703.8**~~,~~ and the veneer does not exceed the first story height, wall bracing shall be in accordance with **Section R602.10**, exclusive of **Section R602.10.6.5**.		New seismic design veneer requirements.
	R602.10.6.5.2 Veneer exceeding first-story height. Where detached one- or two-family dwellings in *Seismic Design Categories* D_0, D_1 and D_2 have stone or masonry veneer installed in accordance with **Section R703.8**, and the veneer exceeds the first-*story height*, wall bracing at exterior *braced wall lines* and *braced wall lines* on the interior of the building shall be constructed using Method BV-WSP in accordance with this section and **Figure R602.10.6.5.2**. Cripple walls		New seismic design veneer requirements.

	shall not be permitted, and required interior *braced wall lines* shall be supported on continuous foundations.		
	R602.10.6.5.3 Limited veneer exceeding first-story height. Where detached one- or two-family dwellings in *Seismic Design Categories* D_0, D_1 and D_2 have exterior veneer installed in accordance with **Section R703.8** and where brick veneer installed above the first story height meets the following limitations, bracing in accordance with Method WSP or CS-WSP shall be permitted provided that the total length of *braced wall panels* specified by **Table R602.10.3(3)** is multiplied by 1.2 for each first- and second-story *braced wall line*. 1. The dwelling does not extend more than two stories above *grade plane*. 2. The veneer does not exceed 5 inches (127 mm) in thickness. 3. The height of veneer on gable-end walls does not extend more than 8 feet (2438 mm) above the bearing wall top plate elevation. 4. Where veneer is installed on multiple walls above the first story, the total area of the veneer on the second-story exterior walls shall not exceed 25 percent of the occupied second floor area. 5. Where the veneer is installed on one entire second-story exterior wall, including walls on bay windows and similar appurtenances, brick veneer shall not be installed on any of the other walls on that floor.		New seismic design veneer requirements.
	~~R602.10.6.5.1~~**R602.10.6.5.4 Length of bracing.** The length of bracing along each *braced wall line* shall be the greater of that required by the ultimate design wind speed and *braced wall line* spacing in accordance with Table R602.10.3(1) as adjusted by the factors in Table R602.10.3(2) or the seismic design category and *braced wall line* length in accordance either with **Table R602.10.6.5.4** ~~R602.10.6.5~~ when using Method BV-WSP, or **Table R602.10.3(3)** as adjusted by the factors in **Table R602.10.3(4)** when using Method WSP or CS-WSP. Angled walls shall be permitted to be counted in accordance with Section R602.10.1.4, and *braced wall panel* location shall be in accordance with Section R602.10.2.2. Spacing between *braced wall lines* shall be in accordance with Table R602.10.1.3. The seismic adjustment factors in Table R602.10.3(4) shall not be applied to the length of bracing determined using Table R602.10.6.5, except that the bracing amount increase for braced wall line spacing greater than 25 feet (7620 mm) in accordance with Table R602.10.1.3 shall be		Minor updates to bracing requirements.

	required. The minimum total length of bracing in a braced wall line, after all adjustments have been taken, shall ~~not~~ be not less than 48 inches (1219 mm) total.		

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~~TABLE R602.10.6.5~~TABLE R602.10.6.5.4
METHOD BV-WSP WALL BRACING REQUIREMENTS[d]

SEISMIC DESIGN CATEGORY	STORY	BRACED WALL LINE LENGTH (FEET)					SINGLE-STORY HOLD-DOWN FORCE (pounds)[ab]	CUMULATIVE HOLD-DOWN FORCE (pounds)[bc]
		10	20	30	40	50		
		Minimum Total Length (feet) of Braced Wall Panels Required Along each Braced Wall Line						
D_0		4.0	7.0	10.5	14.0	17.5	NA	—
		4.0	7.0	10.5	14.0	17.5	1,900	—
		4.5	9.0	13.5	18.0	22.5	3,500	5,400
		6.0	12.0	18.0	24.0	30.0	3,500	8,900
D_1		4.5	9.0	13.5	18.0	22.5	2,100	—
		4.5	9.0	13.5	18.0	22.5	3,700	5,800
		6.0	12.0	18.0	24.0	30.0	3,700	9,500
D_2[a]		5.5	11.0	16.5	22.0	27.5	2,300	—
		5.5	11.0	16.5	22.0	27.5	3,900	6,200
	Three-story dwelling	NP	NP	NP	NP	NP	NA	NA

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.479 kPa, 1 pound-force = 4.448 N.

NP = Not Permitted.

NA = Not Applicable.

a. One- and two-family dwellings in Seismic Design Category D_2 exceeding two stories shall be designed in accordance with accepted engineering practices.

~~a.~~b. Hold-down force is minimum allowable stress design load for connector providing uplift tie from wall framing at end of braced wall panel at the noted story to wall framing at end of braced wall panel at the story below, or to foundation or foundation wall. Use single-story hold-down force where edges of braced wall panels do not align; a continuous load path to the foundation shall be maintained.

~~b.~~c. Where hold-down connectors from stories above align with stories below, use cumulative hold-down force to size middle- and bottom-story hold-down connectors.

d. Interpolation between braced wall lengths is permitted.

Minor updates to table and footnotes.

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	R602.10.8 Braced wall panel connections. *Braced wall panel*s shall be connected to floor framing or foundations as follows: 1. Where joists are perpendicular to a *braced wall panel* above or below, a rim joist, band joist or blocking shall be provided along the entire length of the *braced wall panel* in accordance with Figure R602.10.8(1). Fastening of top and bottom wall plates to framing, rim joist, band joist ~~and/or~~ or blocking shall be in accordance with Table R602.3(1). 2. Where joists are parallel to a *braced wall panel* above or below, a rim joist, end joist or other parallel framing member shall be provided directly above and below the *braced wall panel* in accordance with Figure R602.10.8(2). Where a parallel framing member cannot be located directly above and below the panel, full-depth blocking at 16-inch (406 mm) spacing shall be provided between the parallel framing members to each side of the *braced wall panel* in accordance with Figure R602.10.8(2). Fastening of blocking and wall plates shall be in accordance with Table R602.3(1) and Figure R602.10.8(2). 3. Connections of *braced wall panel*s to concrete or masonry shall be in accordance with Section R403.1.6.		Minor wordsmithing change.
	~~**R602.10.10 Panel joints.** Vertical joints of panel sheathing shall occur over, and be fastened to, common studs. Horizontal joints in braced wall panels shall occur over, and be fastened to, common blocking of a minimum 1 1/2 inch (38 mm) thickness.~~ ~~**Exceptions:**~~ ~~1. Vertical joints of panel sheathing shall be permitted to occur over double studs, where adjoining panel edges are attached to separate studs with the required panel edge fastening schedule, and the adjacent studs are attached together with two rows of 10d box nails [3 inches by 0.128 inch (76.2 mm by 3.25 mm)] at 10 inches o.c.(254 mm).~~ ~~2. Blocking at horizontal joints shall not be required in wall segments that are not counted as braced wall panels.~~ ~~3. Where the bracing length provided is not less than twice the minimum length required by Tables R602.10.3(1) and R602.10.3(3), blocking at horizontal joints shall not be required in braced wall panels constructed using Methods WSP, SFB, GB, PBS or HPS.~~ ~~4. Where Method GB panels are installed horizontally, blocking of horizontal joints is not required.~~		Base code section removed and relocated.

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	R602.10.11~~0~~ Cripple wall bracing.		Base code renumbering.
	R~~602.10.11.1~~602.10.10.1 Cripple wall bracing for Seismic Design Categories D0 and D1 and townhouses in Seismic Design Category C. In addition to the requirements in **Section R602.10.10**, cripple wall bracing shall be limited to methods WSP and CSWSP, and the distance between adjacent edges of *braced wall panel*s for cripple walls along a *braced wall line* shall be 14 feet (4267 mm) maximum. Where *braced wall lines* at interior walls are not supported on a continuous foundation below, the adjacent parallel cripple walls, where provided, shall be braced with Method WSP or Method CS-WSP in accordance with **Section R602.10.4**. The length of bracing required in accordance with **Table R602.10.3(3)** for the cripple walls shall be multiplied by 1.5. Where the cripple walls do not have sufficient length to provide the required bracing, the spacing of panel edge fasteners shall be reduced to 4 inches (102 mm) on center and the required bracing length adjusted by 0.7. If the required length can still not be provided, the cripple wall shall be designed in accordance with accepted engineering practice.		Base code renumbering and minor update to requirements.
	R~~602.10.11.2~~602.10.10.2 Cripple wall bracing for Seismic Design Category D2.		Base code renumbering.
	R~~602.10.11.3~~602.10.10 Redesignation of cripple walls.		Base code renumbering.
	R602.11.2 Stepped foundations in Seismic Design Categories D_0, D_1 and D_2. In all buildings located in Seismic Design Categories D_0, D_1 or D_2, where the height of a required *braced wall line* that extends from foundation to floor above varies more than 4 feet (1219 mm), the *braced wall line* shall be constructed in accordance with the following: 1. Where the lowest floor framing rests directly on a sill bolted to a foundation not less than 8 feet (2440 mm) in length along a line of bracing, the line shall be considered as braced. The double plate of the cripple stud wall beyond the segment of footing that extends to the lowest framed floor shall be spliced by extending the upper top plate not less than 4 feet (1219 mm) along the foundation. Anchor bolts shall be located not more than 1 foot and 3 feet (305 and 914 mm) from the step in the foundation. See Figure R602.11.2.		Base code renumbering.

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	2. Where cripple walls occur between the top of the foundation and the lowest floor framing, the bracing requirements of Sections R602.10.140, R602.10.1~~1~~0.1 and R602.10.1~~1~~0.2 shall apply. 3. Where only the bottom of the foundation is stepped and the lowest floor framing rests directly on a sill bolted to the foundations, the requirements of Sections R403.1.6 and R602.11.1 shall apply.		
	R602.12 Simplified wall bracing. Buildings meeting all of the following conditions ~~**listed below**~~ shall be permitted to be braced in accordance with this section as an ~~alternate~~ alternative to the requirements of Section R602.10. The entire building shall be braced in accordance with this section; the use of other bracing provisions of Section R602.10, except as specified herein, shall not be permitted. 1. There shall be not more than three stories above the top of a concrete or masonry foundation or basement wall. Permanent wood foundations shall not be permitted. 2. Floors shall not cantilever more than 24 inches (607 mm) beyond the foundation or bearing wall below. 3. Wall height shall not be greater than 10 feet (3048 mm). 4. The building shall have a roof eave-to-ridge height of 15 feet (4572 mm) or less. 5. Exterior walls shall have gypsum board with a minimum thickness of 1/2 inch (12.7 mm) installed on the interior side fastened in accordance with Table R702.3.5. 6. The structure shall be located where the ultimate design wind speed is less than or equal to 130 mph (58 m/s), and the exposure category is B or C. 7. The structure shall be located in Seismic Design Category A, B or C for detached one- and two-family dwellings or Seismic Design Category A or B for townhouses. 8. Cripple walls shall not be permitted in three-story buildings.		Minor wordsmithing changes.
	R602.12.6 Narrow panels. The bracing methods referenced in Section R602.10 and specified in Sections R602.12.6.1 through R602.12.6.3 shall be permitted ~~when~~ where using simplified wall bracing.		Minor wordsmithing changes.
	R602.12.6.2 Method CS-PF. *Braced wall panels* constructed as Method CS-PF in accordance with **Section R602.10.6.4** shall be permitted where all framed portions of all exterior walls are sheathed with *wood structural panels*. Each CS-PF panel shall equal 0.75 bracing units. ~~Not more than four CS-PF panels shall be permitted on all segments of walls parallel to each side of the circumscribed rectangle.~~ Segments of wall that include a Method CS-PF panel shall meet the requirements of **Section R602.10.4.2**.		Minor wordsmithing changes.
	R603.1.1 Applicability limits. The provisions of this section shall control the construction of exterior cold-formed steel wall framing and interior load-bearing cold-formed steel wall framing for buildings not more than 60 feet (18 288 mm) long perpendicular to the joist or truss span, not more than 40 feet		Updates to wind speed measurements.

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	(12 192 mm) wide parallel to the joist or truss span, and less than or equal to three stories above grade plane. Exterior walls installed in accordance with the provisions of this section shall be considered as load-bearing walls. Cold-formed steel walls constructed in accordance with the provisions of this section shall be limited to sites where the ultimate design wind speed is less than ~~139~~140 miles per hour (~~62~~63 m/s), Exposure Category B or C, and the ground snow load is less than or equal to 70 pounds per square foot (3.35 kPa).		
	R603.1.1.1 Alternate applications. Cold-formed steel wall framing for buildings exceeding the applicability limits of **Section R603.1.1** are permitted to be designed and constructed in accordance with **AISI S230**, subject to the limits therein.		New section for alternate applications of cold-formed steel.
	R603.1.2 In-line framing. Load-bearing cold-formed steel studs constructed in accordance with **Section R603** shall be located in-line with joists, trusses and rafters in accordance with ~~Figure R603.1.2 and the tolerances specified as follows:~~the tolerances specified in **AISI S240**, Section B1.2.3. ~~1. The maximum tolerance shall be 3/4 inch (19 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.~~ ~~2. Where the centerline of the horizontal framing member and bearing stiffener is located to one side of the centerline of the vertical framing member, the maximum tolerance shall be 1/8 inch (3 mm) between the web of the horizontal framing member and the edge of the vertical framing member.~~		Updates to code to reference AISI S240 for requirements.
	R603.2.1 Material. Load-bearing cold-formed steel framing members shall be cold formed to shape from structural-quality sheet steel complying with the requirements of ~~ASTM A1003: Structural Grades 33 Type H and 50 Type H~~**AISI S240**, Section A3.		Updates to code to reference AISI S240 for requirements.
	R603.2.2 Corrosion protection. Load-bearing cold-formed steel framing shall have a ~~metallic~~ protective coating complying with ~~ASTM A1003 and one of the following:~~ **AISI S240**, Section A4. ~~1. Not less than G 60 in accordance with ASTM A653.~~ ~~2. Not less than AZ 50 in accordance with ASTM A792.~~		Updates to code to reference AISI S240 for requirements.
	R603.2.3 Dimension, thickness and material grade. Load-bearing cold-formed steel wall framing members shall comply with ~~Figure R603.2.3(1) and with~~ the dimensional and thickness requirements specified in ~~Table R603.2.3. Additionally, C-shaped sections shall have a minimum flange width of 1 5/8 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be 1/2 inch (12.7 mm). Track sections shall comply with Figure R603.2.3(2) and shall have a minimum flange width of 1 1/4 inches (32 mm). Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified.~~ **AISI S230**, Section A4.3 and		Updates to code to reference AISI S230 for requirements.

	material grade requirements as specified in **AISI S230**, Section A4.4.		
	~~TABLE R603.2.3~~ ~~LOAD-BEARING COLD-FORMED STEEL STUD SIZES AND THICKNESSES~~ ~~MEMBER DESIGNATION[a] | WEB DEPTH(inches) | MINIMUM BASE STEEL THICKNESS mil (inches)~~ ~~350S162-t | 3.5 | 33 (0.0329), 43 (0.0428), 54 (0.0538)~~ ~~550S162-t | 5.5 | 33 (0.0329), 43 (0.0428), 54 (0.0538), 68 (0.0677)~~ ~~For SI: 1 inch = 25.4 mm; 1 mil = 0.0254 mm.~~ ~~a. The member designation is defined by the first number representing the member depth in hundredths of an inch, "S" representing a stud or joist member, the second number representing the flange width in hundredths of an inch, and the letter "t" shall be a number representing the minimum base metal thickness in mils.~~		Base code table removed.
	~~FIGURE R603.2.3(1)~~ ~~C-SHAPED SECTION~~		Base code figure removed.
	~~FIGURE R603.2.3(2)~~ ~~TRACK SECTION~~		Base code figure removed.
	R603.2.4 Identification. Load-bearing cold-formed steel framing members shall ~~have a legible label, stencil, stamp or embossment with the following information as a minimum:~~meet the product identification requirements of **AISI S240**, Section A5.5. ~~1. Manufacturer's identification.~~ ~~2. Minimum base steel thickness in inches (mm).~~ ~~3. Minimum coating designation.~~ ~~4. Minimum yield strength, in kips per square inch (ksi) (MPa).~~		Updates to code to reference AISI S240 for requirements.
	R603.2.5 Fastening. Screws for steel-to-steel connections shall be installed with a minimum edge distance and center-to-center spacing of 1/2 inch (12.7 mm), shall be self-drilling tapping and shall conform to ASTM C~~–~~1513. Structural sheathing shall be attached to cold-formed steel studs with minimum No. 8 self-drilling tapping screws that conform to ASTM C~~–~~1513. Screws for attaching structural sheathing to cold-formed steel wall framing shall have a minimum head diameter of 0.292 inch (7.4 mm) with countersunk heads and shall be installed with a minimum edge distance of 3/8 inch (9.5 mm). Gypsum board shall be attached to cold-formed steel wall framing with minimum No. 6 screws conforming to ASTM C~~-~~954 or ASTM C~~-~~1513 with a bugle-head style and shall be installed in accordance with Section R702. For connections, screws shall extend through the steel ~~a minimum of~~ not fewer than three exposed threads. Fasteners shall have rust-inhibitive coating		Minor wordsmithing changes.

	suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.		
	R603.2.6 Web holes, web hole reinforcing and web hole patching. Web holes~~, web hole reinforcing and web hole patching shall be in accordance with this section.~~ in wall studs shall comply with the conditions as prescribed in **AISI S230**, Section A4.5. Web holes not in conformance to the conditions as prescribed in **AISI S230**, Section A4.5 shall be reinforced in accordance with the provisions of **AISI S230**, Section A4.6 or patched in accordance with the provisions of **AISI S230**, Section A4.7.		Updates to section to reference AISI S230 for requirements.
	~~**R603.2.6.1 Web holes.** Web holes in wall studs and other structural members shall comply with all of the following conditions:~~ ~~1. Holes shall conform to **Figure R603.2.6.1**.~~ ~~2. Holes shall be permitted only along the centerline of the web of the framing member.~~ ~~3. Holes shall have a center-to-center spacing of not less than 24 inches (610 mm).~~ ~~4. Holes shall have a web hole width not greater than 0.5 times the member depth, or 1½ inches (38 mm).~~ ~~5. Holes shall have a web hole length not exceeding 4½ inches (114 mm).~~ ~~6. Holes shall have a minimum distance between the edge of the bearing surface and the edge of the web hole of not less than 10 inches (254 mm).~~ ~~Framing members with web holes not conforming to the above requirements shall be reinforced in accordance with **Section R603.2.6.2**, patched in accordance with **Section R603.2.6.3** or designed in accordance with accepted engineering practice.~~		Base code section removed.
	~~**FIGURE R603.2.6.1** **WALL STUD WEB HOLES**~~		Base code figure removed.
	~~**R603.2.6.2 Web hole reinforcing.** Web holes in gable endwall studs not conforming to the requirements of **Section R603.2.6.1** shall be permitted to be reinforced if the hole is located fully within the center 40 percent of the span and the depth and length of the hole does not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of **Section R603.2.6.1** for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8~~		Base code section removed.

	~~screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $^1/_2$ inch (12.7 mm).~~		
	~~**R603.2.6.3 Hole patching.** Web holes in wall studs and other structural members not conforming to the requirements in **Section R603.2.6.1** shall be permitted to be patched in accordance with either of the following methods:~~ ~~1. Framing members shall be replaced or designed in accordance with accepted engineering practice where web holes exceed the following size limits:~~ ~~1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.~~ ~~1.2. The length of the hole measured along the web exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.~~ ~~2. Web holes not exceeding the dimensional requirements in **Section R603.2.6.3**, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with **Figure R603.2.6.3**. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not more than 1 inch (25 mm) center-to-center along the edges of the patch with a minimum edge distance of $^1/_2$ inch (12.7 mm).~~		Base code section removed.
	~~**FIGURE R603.2.6.3** **WALL STUD WEB HOLE PATCH**~~		Base code figure removed.

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TABLE R603.3.1
WALL TO FOUNDATION OR FLOOR CONNECTION REQUIREMENTS[a,b]

FRAMING CONDITION	ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)					
	115 B	1260 B ~~or 110 C~~	< 1390 B or 115 C	≤ 140 B or 120 C	12630 C	< 13940 C
Wall bottom track to floor per Figure R603.3.1(1)	1-No. 8 screw at 12" o.c.	1-No. 8 screw at ~~12~~8" o.c.	2-No. 8 screws at ~~12~~8" o.c.	2-No. 8 screws at 6" o.c.	3-No. 8 screws at ~~12~~8" o.c.	3-No. 8 screws at ~~12~~6" o.c.
Wall bottom track to foundation per Figure R603.3.1(2)[d]	½" minimum diameter anchor bolt at 6' o.c.	½" minimum diameter anchor bolt at ~~4~~6' o.c.	½" minimum diameter anchor bolt at 4' o.c.	½" minimum diameter anchor bolt at 4' o.c.	½" minimum diameter anchor bolt at ~~4~~3'-4" o.c.	½" minimum diameter anchor bolt at ~~4~~2'-8" o.c.
Wall bottom track to wood sill per Figure R603.3.1(3)	Steel plate spaced at 4' o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at ~~3~~4' o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3' o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 3 o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at 2' o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails	Steel plate spaced at ~~2~~1'-4" o.c., with 4-No. 8 screws and 4-10d or 6-8d common nails
Wind uplift connector strength (lbs)[c,e] — Stud Spacing (inches) / Roof Span (feet)						
16 / 24	NR	NR	NR	NR	~~12~~4NR	~~20~~9NR
16 / 28	NR	NR	~~6~~2NR	NR	~~15~~1NR	~~24~~9339
16 / 32	NR	NR	~~7~~9NR	NR	~~17~~9NR	~~28~~9382
16 / 36	NR	NR	~~9~~4NR	NR	~~20~~6333	~~32~~9426
16 / 40	NR	~~6~~1NR	~~11~~7NR	NR	~~23~~8368	~~37~~4470
24 / 24	NR	NR	~~6~~0NR	NR	~~18~~6343	~~31~~4443
24 / 28	NR	NR	~~9~~3NR	NR	~~22~~7395	~~37~~4508
24 / 32	NR	NR	~~11~~7NR	330	~~26~~8447	~~43~~4573
24 / 36	NR	NR	~~14~~1NR	371	~~30~~9500	~~49~~4639
24 / 40	NR	NR	~~17~~6345	411	~~35~~9552	~~56~~2704

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm, 1 pound = 4.45 N.
a. Anchor bolts are to be located not more than 12 inches from corners or the termination of bottom tracks, such as, at door openings or corners. Bolts are to extend not less than 15 inches into masonry or 7 inches into concrete.
b. All screw sizes shown are minimum.
c. NR = Uplift connector not required.
d. Foundation anchor straps are permitted in place of anchor bolts, if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.
e. See Figure R603.3.1(4) for details.

Updates to foundation/floor connection table.

TABLE R603.3.1.1(1)
GABLE ENDWALL TO FLOOR CONNECTION REQUIREMENTS[a, b, c]

ULTIMATE WIND SPEED (mph)		WALL BOTTOM TRACK TO FLOOR JOIST OR TRACK CONNECTION		
Exposure Category		Stud height, *h* (feet)		
B	C	10 < *h* ≤ 14	14 < *h* ≤ 18	18 < *h* ≤ 22
115	—	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.
120	~~110~~ —	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.
≤1390	115	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.	2-No. 8 screws @ 12" o.c.
≤ 140	120	1-No. 8 screw @ 12" o.c.	1-No. 8 screw @ 12" o.c.	2-No. 8 screws @ 12" o.c.
—	~~126~~130	~~1~~2-No. 8 screws @ 12" o.c.	~~2~~1-No. 8 screw @ 8" o.c.	~~1~~2-No. 8 screws @ 8" o.c.
—	< ~~130~~140	2-No. 8 screws @ 12" o.c.	1-No. 8 screw @ 8" o.c.	2-No. 8 screws @ 8" o.c.

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm.
a. Refer to Table R603.3.1.1(2) for gable endwall bottom track to foundation connections.
b. Where attachment is not given, special design is required.
c. Stud height, *h*, is measured from wall bottom track to wall top track or brace connection height.

Updates to foundation/floor connection table.

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TABLE R603.3.1.1(2)
GABLE ENDWALL BOTTOM TRACK TO FOUNDATION CONNECTION REQUIREMENTS[a, b, c]
<table>
<tr><th colspan="2">ULTIMATE WIND SPEED (mph)</th><th colspan="3">MINIMUM SPACING FOR 1/2 -INCH-DIAMETER ANCHOR BOLTS[d]</th></tr>
<tr><th colspan="2">Exposure Category</th><th colspan="3">Stud height, h (feet)</th></tr>
<tr><th>B</th><th>C</th><th>10 < h ≤ 14</th><th>14 < h ≤ 18</th><th>18 < h ≤ 22</th></tr>
<tr><td>115</td><td>—</td><td>6'- 0" o.c.</td><td>~~6'- 7"~~ 6'- 0" o.c.</td><td>6'- 0" o.c.</td></tr>
<tr><td>120</td><td>—</td><td>6'- 0" o.c.</td><td>5'- 7" o.c.</td><td>6'- 0" o.c.</td></tr>
<tr><td>~~126~~30</td><td>~~110~~5</td><td>5'- ~~1~~0" o.c.</td><td>6'- 0" o.c.</td><td>6'- 0" o.c.</td></tr>
<tr><td>< ~~139~~40</td><td>~~115~~20</td><td>~~4'- 10"~~ 6'- 0" o.c.</td><td>5'- 6" o.c.</td><td>6'- 0" o.c.</td></tr>
<tr><td>—</td><td>~~126~~30</td><td>~~4'- 1"~~ 5'- 3" o.c.</td><td>6'- 0" o.c.</td><td>6'- 0" o.c.</td></tr>
<tr><td>—</td><td>< ~~139~~40</td><td>~~5'- 1"~~ 3'- 0" o.c.</td><td>~~6'- 0"~~ 3'- 0" o.c.</td><td>~~5'- 2"~~ 3'- 0" o.c.</td></tr>
</table>
For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm.
a. Refer to Table R603.3.1.1(1) for gable endwall bottom track to floor joist or track connection connections.
b. Where attachment is not given, special design is required.
c. Stud height, h, is measured from wall bottom track to wall top track or brace connection height.
d. Foundation anchor straps are permitted in place of anchor bolts if spaced as required to provide equivalent anchorage to the required anchor bolts and installed in accordance with manufacturer's requirements.
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<td>No Houston amendment.</td>
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R603.3.2 Minimum stud sizes. Cold-formed steel walls shall be constructed in accordance with Figure R603.3.1(1), R603.3.1(2) or R603.3.1(3), as applicable. Exterior wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(16). Interior load-bearing wall stud size and thickness shall be determined in accordance with the limits set forth in Tables R603.3.2(2) through R603.3.2(16) based ~~up~~on an ultimate design wind speed of 115 miles per hour (51 m/s), Exposure Category B, and the building width, stud spacing and ground snow load, as appropriate. Fastening requirements shall be in accordance with Section R603.2.5 and Table R603.3.2(1). Top and bottom tracks shall have the same minimum thickness as the wall studs.
Exterior wall studs shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(16), but not less than 33 mils (0.84 mm), where both of the following conditions exist:
1. Minimum of 1/2 -inch (12.7 mm) gypsum board is installed and fastened on the interior surface in accordance with Section R702.
2. Wood structural sheathing panels of minimum 7/16 -inch-thick (11.1 mm) oriented strand board or 15/32 -inch-thick (12 mm) plywood are installed and fastened in accordance with Section R603.9.1 and Table R603.3.2(1) on the outside surface.
Interior load-bearing walls shall be permitted to be reduced to the next thinner size, as shown in Tables R603.3.2(2) through R603.3.2(16), but not less than 33 mils (0.84 mm), where not less than 1/2 -inch (12.7 mm) gypsum board is installed and fastened in accordance with Section R702 on both sides of the wall. The tabulated stud thickness for load-bearing walls shall be used ~~when~~ where the attic load is 10 pounds per square foot (480 Pa) or less. A limited attic storage load of 20 pounds per square foot (960 Pa) shall be permitted provided that the next
</td>
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<td>Minor wordsmithing changes.</td>
</tr>
</table>

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higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(16).

For two-story buildings, the tabulated stud thickness for walls supporting one floor, roof and ceiling shall be used ~~when~~ where the second-floor live load is 30 pounds per square foot (1440 Pa). Second-floor live loads of 40 psf (1920 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(2) through R603.3.2(11).

For three-story buildings, the tabulated stud thickness for walls supporting one or two floors, roof and ceiling shall be used ~~when~~ where the third-floor live load is 30 pounds per square foot (1440 Pa). Third-floor live loads of 40 pounds per square foot (1920 Pa) shall be permitted provided that the next higher snow load column is used to select the stud size from Tables R603.3.2(12) through R603.3.2(16).

TABLE R603.3.2(2)
24-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	33	33	33	33	33	33	33	33	~~33~~ 43
12~~6~~0	~~110~~ —	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	33	33	33	33	43
~~<~~ 13~~9~~0	115	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	~~33~~ 43	43	43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	~~33~~ 43	~~43~~ 33	~~43~~ 33	~~43~~ 33	43
16	120	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	43	43	43	43	43	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	43	43	43	43
—	~~126~~1 30	350S162	16	33	33	33	33	33	33	33	33	43	43	43	43
			24	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
—	< ~~139~~1 40	350S 162	16	33	33	33	33	43	43	43	43	43	43	43	43
			24	43	43	43	~~43~~ 54	54	54	54	54	54	54	54	54
		550S 162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	~~33~~ 43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.
a. Deflection criterion: *L*/240.
b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021
~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

TABLE R603.3.2(3)
28-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
1260	~~110~~	350S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
~~<~~ 1390	115	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	~~43~~ 54	43	43	43	~~43~~ 54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	~~43~~ 33	~~43~~ 33	~~43~~ 33	43
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**43**
			24	**33**	**33**	**43**	**54**	**43**	**43**	**43**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
			24	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**	**43**	**43**	**43**	**43**
—	~~126~~ **130**	350S162	16	33	33	33	33	33	33	33	~~33~~ 43	43	43	43	43
			24	43	43	43	54	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	43	43	43	43	43	43	43	43
—	~~<~~ ~~139~~ **140**	350S 162	16	33	33	33	~~33~~ 43	43	43	43	43	43	43	43	43
			24	43	43	43	54	54	54	54	54	54	54	54	54
		550S 162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(4)
32-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	~~43~~54	~~33~~4 3	~~33~~ 43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
12~~6~~0	~~110~~—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	~~33~~43	43
~~<~~ 13~~9~~0	115	350S162	16	33	33	33	43	33	33	33	~~33~~43	33	33	33	43
			24	33	33	43	54	43	43	43	54	43	43	~~43~~54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	~~33~~4 3	43	33	33	33	43	~~43~~3 3	~~43~~ 33	~~43~~33	43
~~<~~ 140	120	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	43	33	33	33	33
			24	33	33	43	43	33	33	33	43	43	43	43	43
—	~~126~~130	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	43	54	~~43~~5 4	~~43~~5 4	~~43~~5 4	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	43	43	43	43	43	43	43	43
—	~~13~~140	350S162	16	33	33	33	43	43	43	43	43	43	43	43	43
			24	43	43	~~43~~5 4	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.
a. Deflection criterion: L/240.
b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

TABLE R603.3.2(5)
36-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	~~33~~4 3	43	~~43~~ 54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
12~~6~~0	~~110~~—	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	33	33	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
~~<~~ 13~~9~~0	115	350S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	33	33	43	54	43	43	43	43	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	~~43~~3 3	~~43~~3 3	43	43
~~<~~ 140	120	350S162	16	33	33	33	43	33	33	33	33	33	33	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	54
—	~~126~~130	350S162	16	33	33	33	43	33	33	33	43	43	43	43	43
			24	43	43	~~43~~5 4	54	~~43~~5 4	~~43~~5 4	~~43~~5 4	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	~~33~~ 43
			24	33	33	43	~~43~~54	43	43	43	43	43	43	43	~~43~~ 54
—	~~13~~140	350S162	16	33	33	33	43	43	43	43	43	43	43	43	~~43~~ 54
			24	43	43	54	54	54	54	54	54	54	54	54	~~54~~ 68
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	~~33~~ 43
			24	43	43	43	54	43	~~33~~4 3	43	43	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.
a. Deflection criterion: L/240.
b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(6)
40-FOOT-WIDE BUILDING SUPPORTING ROOF AND CEILING ONLY[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	43	33	33	33	43	33	33	~~33~~ 43	43
			24	33	33	43	54	33	~~33~~ 43	43	54	43	43	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	54	33	33	43	43	33	33	43	54
~~120~~	~~110~~ —	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	33	43	43	54	33	43	43	54	43	43	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	~~33~~ 43
			24	33	33	43	54	33	33	43	43	33	33	43	54
~~< 130~~	115	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	~~33~~ 43	43	~~43~~ 54	54	43	43	~~43~~ 54	54	43	~~43~~ 54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	33	43	54	33	33	43	~~43~~ 54	~~43~~ 33	~~43~~ 33	43	54
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**	**33**	**33**	**43**	**43**
			24	**43**	**43**	**54**	**54**	**43**	**43**	**54**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**43**
			24	**33**	**33**	**43**	**54**	**33**	**33**	**43**	**54**	**43**	**43**	**43**	**54**
—	~~126~~ **130**	350S162	16	33	33	~~33~~ 43	43	33	33	~~33~~ 43	43	43	43	43	~~43~~ 54
			24	43	43	54	54	43	43	54	54	54	54	54	~~54~~ 68
		550S162	16	33	33	33	43	33	33	33	~~33~~ 43	33	33	33	43
			24	33	33	43	54	33	33	43	43	33	33	43	54
—	< ~~139~~ **140**	350S162	16	33	33	43	43	43	43	43	43	43	43	43	54
			24	43	43	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: L/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(7)
24-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	33	33	43	43	~~33~~43	43	43	43	43	43	43	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
~~120~~	~~110~~ —	350S162	16	33	33	33	33	33	33	33	33	33	33	33	43
			24	~~33~~43	43	43	43	43	43	43	43	43	~~43~~54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	33	33	33	43
~~<~~ 130	115	350S162	16	33	33	33	43	33	33	33	~~33~~43	~~33~~43	~~33~~43	43	43
			24	43	43	43	~~43~~54	43	43	~~43~~54	~~43~~54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	33	43	33	33	33	43	~~43~~33	~~43~~33	43	43
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**43**	**43**	**43**	**43**	**43**	**43**
			24	**43**	**43**	**43**	**54**	**43**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**33**
			24	**33**	**33**	**43**	**43**	**33**	**33**	**33**	**43**	**43**	**43**	**43**	**43**
—	~~120~~130	350S162	16	33	33	33	43	~~33~~43	~~33~~43	~~33~~43	43	43	43	43	~~43~~54
			24	43	43	~~43~~54	54	~~43~~54	~~43~~54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	~~33~~43	43	43	43	43	43	43	43	43	43
—	~~130~~140	350S162	16	~~33~~43	~~33~~43	~~33~~43	43	43	43	43	43	~~43~~54	~~43~~54	~~43~~54	~~43~~54
			24	~~43~~54	~~43~~54	~~43~~54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	43	43	43	43	43	43	43	43	43	43	43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(8)
28-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	43	33	33	33	43	33	33	~~33~~ 43	43
			24	43	43	43	54	43	43	43	54	43	43	~~43~~ 54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
126~~0~~	~~110~~ —	350S162	16	33	33	33	43	33	33	33	43	33	33	43	43
			24	43	43	43	54	43	43	43	54	~~43~~ 54	~~43~~ 54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	33	33	43	43
< 139~~0~~	115	350S162	16	33	33	33	43	33	33	~~33~~ 43	43	43	43	43	43
			24	43	43	43	54	43	~~43~~ 54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	33
			24	33	33	43	43	33	33	43	43	43	43	43	43
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**33**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
			24	**43**	**43**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**
			24	**33**	**33**	**43**	**43**	**33**	**33**	**43**	**43**	**43**	**43**	**43**	**43**
—	~~126~~120	350S162	16	33	33	~~33~~43	43	33	33	43	43	43	43	43	43
			24	~~43~~54	~~43~~54	~~43~~54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	~~33~~ 43
			24	33	33	43	43	33	33	43	43	43	43	43	43
—	~~135~~ 140	350S162	16	~~33~~43	~~33~~43	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54
			24	~~43~~54	~~43~~54	54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	33	33	33	33	33	33	33	33	~~33~~ 43
			24	43	43	43	43	43	43	43	43	43	43	43	~~43~~ 54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(9)
32-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	33	43	33	33	33	43	33	~~33~~43	43	43
			24	43	43	43	54	43	43	43	54	~~43~~54	~~43~~54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	43
~~120~~	~~110~~ —	350S162	16	33	33	33	43	33	33	33	43	~~33~~43	43	43	43
			24	43	43	43	54	43	43	43	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	33	33	43	~~43~~54
< ~~139~~0	115	350S162	16	33	33	43	43	~~33~~43	~~33~~43	~~33~~43	43	43	43	43	43
			24	43	43	54	54	~~43~~54	~~43~~54	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	33	33	33	33	43
			24	33	43	43	54	33	33	43	43	43	43	43	54
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**
			24	**43**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**
			24	**33**	**43**	**43**	**54**	**33**	**43**	**43**	**43**	**43**	**43**	**43**	**54**
—	~~126~~130	350S162	16	~~33~~43	~~33~~43	43	43	43	43	43	43	43	~~43~~54	~~43~~54	~~43~~54
			24	~~43~~54	~~43~~54	54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	~~33~~43	33	33	33	43
			24	~~33~~43	43	43	54	43	43	43	~~43~~54	43	43	43	54
—	< ~~139~~140	350S162	16	43	43	43	43	43	43	43	~~43~~54	~~43~~54	~~43~~54	54	54
			24	54	54	54	54	54	54	54	54	54	54	54	~~54~~68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	~~43~~54	43	43	43	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(10)
36-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs			10-foot Studs				
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	43	43	33	33	43	43	~~33~~ 43	~~33~~ 43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
126~~0~~	~~110~~ —	350S162	16	33	33	43	43	33	33	43	43	43	43	43	43
			24	43	43	54	54	43	43	54	54	54	54	54	54
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
< 130~~0~~	115	350S162	16	33	33	43	43	~~33~~ 43	~~33~~ 43	43	43	43	43	43	54
			24	43	43	54	54	54	54	54	54	54	54	54	~~54~~ 68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
≤ 140	**120**	**350S162**	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**	**54**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**68**
		550S162	**16**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**	**33**	**33**	**33**	**43**
			24	**43**	**43**	**43**	**54**	**43**	**43**	**43**	**54**	**43**	**43**	**43**	**54**
—	126~~13~~0	350S162	16	~~33~~ 43	~~33~~ 43	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	43	54	43	43	43	54	43	43	43	54
—	< 135~~14~~0	350S162	16	43	43	43	~~43~~ 54	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54	54
			24	54	54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	33	43	33	33	33	43	33	33	~~33~~ 43	43
			24	43	43	43	54	43	43	43	54	43	43	~~43~~ 54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.
b. Design load assumptions:
   Second-floor dead load is 10 psf.
   Second-floor live load is 30 psf.
   Roof/ceiling dead load is 12 psf.
   Attic live load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(11)
40-FOOT-WIDE BUILDING SUPPORTING ONE FLOOR, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	54	43	43	54	54	54	54	54	~~54~~ 68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
~~120~~	~~110~~ —	350S162	16	33	33	43	43	33	33	43	43	43	43	43	54
			24	43	43	54	54	~~43~~ 54	~~43~~ 54	54	54	54	54	54	~~54~~ 68
		550S162	16	33	33	33	43	33	33	33	43	33	33	33	43
			24	43	43	54	54	43	43	43	54	43	43	43	54
~~< 1390~~	115	350S162	16	~~33~~43	~~33~~43	43	~~43~~54	43	43	43	43	43	43	~~43~~ 54	54
			24	~~43~~54	~~43~~54	54	54	54	54	54	54	54	54	54	68
		550S162	16	33	33	43	43	33	33	33	43	33	33	~~33~~ 43	43
			24	43	43	54	54	43	43	43	54	43	43	~~43~~ 54	54
< 140	**120**	**350S162**	**16**	**43**	**43**	**43**	**54**	**43**	**43**	**43**	**54**	**43**	**43**	**54**	**54**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**68**
		550S162	**16**	**33**	**33**	**43**	**43**	**33**	**33**	**33**	**43**	**33**	**33**	**43**	**43**
			24	**43**	**43**	**54**	**54**	**43**	**43**	**43**	**54**	**43**	**43**	**54**	**54**
—	~~126~~ 130	350S162	16	43	43	43	54	43	43	43	54	~~43~~54	~~43~~54	54	54
			24	54	54	54	~~54~~68	54	54	54	54	54	54	~~54~~ 68	68
		550S162	16	33	33	43	43	33	33	33	43	33	33	43	43
			24	43	43	54	54	43	43	43	54	43	43	54	54
—	~~130~~ 140	350S162	16	43	43	43	54	43	43	~~43~~54	54	54	54	54	54
			24	54	54	54	68	54	54	54	~~54~~68	54	54	~~54~~ 68	68
		550S162	16	33	33	43	43	33	33	~~33~~43	43	33	~~33~~ 43	43	43
			24	43	43	54	54	43	43	43	54	43	43	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Second-floor dead load is 10 psf.
Second-floor live load is 30 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R603.3.2(12)
24-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	43	43	43	43	33	33	33	43	43	43	43	43
			24	54	54	54	54	~~43~~54	~~43~~ 54	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
~~120~~	~~110~~ —	350S162	16	43	43	43	43	33	33	~~33~~ 43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
~~< 130~~ 140	115	350S162	16	43	43	43	43	43	43	43	43	43	43	~~43~~ 54	
			24	54	54	54	54	54	54	54	54	54	54	54	54
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
≤ 140	**120**	**350S162**	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**	**54**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
		550S162	**16**	**33**	**33**	**43**	**43**	**33**	**33**	**33**	**33**	**33**	**33**	**33**	**43**
			24	**43**	**43**	**54**	**54**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**
—	~~126~~ 130	350S162	16	43	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	
			24	54	54	54	54	54	54	54	54	54	~~54~~ 68	~~54~~ 68	
		550S162	16	33	33	43	43	33	33	33	33	33	33	33	43
			24	43	43	54	54	43	43	43	43	43	43	43	54
—	< ~~130~~ 140	350S162	16	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	54	54	54	54
			24	54	54	54	54	54	54	54	54	54	~~54~~ 68	68	
		550S162	16	33	33	43	43	33	33	33	33	33	~~33~~ 43	43	
			24	43	43	54	54	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
   Top- and middle-floor dead load is 10 psf.
   Top-floor live load is 30 psf.
   Middle-floor live load is 40 psf.
   Roof/ceiling dead load is 12 psf.
   Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(13)
28-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
1260	~~110~~—	350S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
< 1360	115	350S162	16	43	43	43	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	
			24	54	54	54	54	54	54	54	54	54	54	~~54~~ 68	
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
≤ 140	**120**	**350S162**	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**	**54**	**54**	**54**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**68**	**68**
		550S162	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
—	~~126~~130	350S162	16	43	43	43	43	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54
			24	54	54	54	54	54	54	54	~~54~~ 68	~~54~~ 68	~~54~~ 68	~~54~~ 68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	< ~~130~~140	350S162	16	43	43	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54	54	54
			24	54	54	54	54	54	54	54	~~54~~ 68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
   Top- and middle-floor dead load is 10 psf.
   Top-floor live load is 30 psf.
   Middle-floor live load is 40 psf.
   Roof/ceiling dead load is 12 psf.
   Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(14)
32-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
1260	~~110~~ —	350S162	16	43	43	43	54	43	43	43	43	43	43	43	54
			24	54	54	54	68	54	54	54	54	54	54	54	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
~~< 1390~~	115	350S162	16	43	43	43	54	43	43	43	43	~~43~~ 54	~~43~~ 54	54	54
			24	54	54	54	68	54	54	54	54	54	~~54~~ 68	~~54~~ 68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
≤ 140	**120**	**350S162**	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**54**	**54**	**54**	**54**	**54**
			24	**54**	**54**	**54**	**68**	**54**	**54**	**54**	**54**	**68**	**68**	**68**	**68**
		550S162	**16**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
—	~~126~~130	350S162	16	43	43	43	54	43	~~43~~ 54	~~43~~ 54	~~43~~ 54	54	54	54	54
			24	54	54	54	68	54	54	54	~~64~~ 68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	< ~~139~~140	350S162	16	43	43	~~43~~ 54	54	~~43~~ 54	~~43~~ 54	54	54	54	54	54	54
			24	54	54	54	68	54	~~64~~ 68	~~54~~ 68	~~54~~ 68	68	68	68	68
		550S162	16	43	43	43	43	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top- and middle-floor dead load is 10 psf.
Top-floor live load is 30 psf.
Middle-floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(15)
36-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
126~~0~~	~~110~~ —	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
~~<~~ 139~~0~~	115	350S162	16	54	54	54	54	43	43	43	54	54	54	54	54
			24	68	68	68	68	54	54	54	68	68	68	68	68
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
≤ 140	**120**	**350S162**	**16**	**54**	**54**	**54**	**54**	**43**	**43**	**54**	**54**	**54**	**54**	**54**	**54**
			24	**68**	**68**	**68**	**68**	**54**	**54**	**54**	**68**	**68**	**68**	**68**	**68**
		550S162	**16**	**43**	**43**	**43**	**54**	**43**	**43**	**43**	**43**	**43**	**43**	**43**	**43**
			24	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**	**54**
—	~~126~~**130**	350S162	16	54	54	54	54	~~43~~ **54**	~~43~~ **54**	54	54	54	54	54	54
			24	68	68	68	68	54	54	~~54~~ **68**	68	68	68	68	68
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54
—	~~139~~**140**	350S162	16	54	54	54	54	54	54	54	54	54	54	54	~~68~~**54**
			24	68	68	68	68	~~54~~ **68**	~~64~~ **68**	68	68	68	68	68	68
		550S162	16	43	43	43	54	43	43	43	43	43	43	43	43
			24	54	54	54	54	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top- and middle-floor dead load is 10 psf.
Top-floor live load is 30 psf.
Middle-floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2(16)
40-FOOT-WIDE BUILDING SUPPORTING TWO FLOORS, ROOF AND CEILING[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)											
				8-foot Studs				9-foot Studs				10-foot Studs			
				Ground Snow Load (psf)											
Exp. B	Exp. C			20	30	50	70	20	30	50	70	20	30	50	70
115	—	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54
1260	~~110~~ —	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54
< 1390	115	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54
≤ 140	120	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	~~126~~130	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	68	68
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54
—	< ~~139~~140	350S162	16	54	54	54	54	54	54	54	54	54	54	54	54
			24	68	68	68	68	68	68	68	68	68	68	~~—~~68	
		550S162	16	54	54	54	54	43	43	54	54	43	43	54	54
			24	54	54	54	68	54	54	54	54	54	54	54	54

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion: *L*/240.

b. Design load assumptions:
Top- and middle-floor dead load is 10 psf.
Top-floor live load is 30 psf.
Middle-floor live load is 40 psf.
Roof/ceiling dead load is 12 psf.
Attic live load is 10 psf.

c. Building width is in the direction of horizontal framing members supported by the wall studs.

d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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TABLE R603.3.2.1(1)
ALL BUILDING WIDTHS GABLE ENDWALLS 8, 9 OR 10 FEET IN HEIGHT[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)		
Exp. B	Exp. C			8-foot Studs	9-foot Studs	10-foot Studs
115	—	350S162	16	33	33	33
			24	33	33	33
		550S162	16	33	33	33
			24	33	33	33
1260	~~110~~ —	350S162	16	33	33	33
			24	33	33	43
		550S162	16	33	33	33
			24	33	33	33
~~<~~ 1390	115	350S162	16	33	33	33
			24	33	~~33~~43	43
		550S162	16	33	33	33
			24	33	33	33
≤ 140	**120**	**350S162**	**16**	**33**	**33**	**43**
			24	**33**	**43**	**54**
		550S162	**16**	**33**	**33**	**33**
			24	**33**	**33**	**33**
—	~~126~~130	350S162	16	33	33	43
			24	43	43	54
		550S162	16	33	33	33
			24	33	~~33~~43	~~33~~43
—	~~130~~140 <	350S162	16	33	43	43
			24	43	54	54
		550S162	16	33	33	33
			24	~~33~~43	~~33~~43	43

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion *L*/240.
b. Design load assumptions:
Ground snow load is 70 psf.
Roof/ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

TABLE R603.3.2.1(2)
ALL BUILDING WIDTHS GABLE ENDWALLS OVER 10 FEET IN HEIGHT[a, b, c, d]

ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)		MEMBER SIZE	STUD SPACING (inches)	MINIMUM STUD THICKNESS (mils)					
				Stud Height, *h* (feet)					
Exp. B	Exp. C			10 < *h* ≤ 12	12 < *h* ≤ 14	14 < *h* ≤ 16	16 < *h* ≤ 18	18 < *h* ≤ 20	20 < *h* ≤ 22
115	—	350S162	16	33	43	68	—97	—	—
			24	43	68	—	—	—	—
		550S162	16	33	33	33	43	~~54~~43	54
			24	33	43	43	54	68	97
1260	~~110~~—	350S162	16	43	54	—97	—	—	—
			24	54	—97	—	—	—	—
		550S162	16	33	33	43	~~54~~43	54	68
			24	33	43	54	54	—68	—97
~~<~~ 1390	115	350S162	16	43	~~68~~54	—97	—	—	—
			24	~~68~~54	—97	—	—	—	—
		550S162	16	33	~~43~~33	43	54	54	97
			24	43	~~54~~43	54	68	—97	—97
≤ 140	**120**	**350S162**	**16**	**43**	**68**	**—**	**—**	**—**	**—**
			24	**68**	**—**	**—**	**—**	**—**	**—**
		550S162	**16**	**33**	**43**	**43**	**54**	**68**	**97**
			24	**43**	**54**	**54**	**68**	**97**	**—**
—	~~126~~130	350S162	16	54	—97	—	—	—	—
			24	—97	—	—	—	—	—
		550S162	16	33	43	54	~~54~~68	—97	—
			24	43	54	54	—97	—	—
—	~~130~~140 <	350S162	16	54	—97	—	—	—	—
			24	—97	—	—	—	—	—
		550S162	16	43	~~54~~43	54	~~68~~97	—97	—
			24	54	54	68	—	—	—

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mil = 0.0254 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa, 1 ksi = 1,000 psi = 6.895 MPa.

a. Deflection criterion *L*/240.
b. Design load assumptions:
Ground snow load is 70 psf.
Roof/ceiling dead load is 12 psf.
Floor dead load is 10 psf.
Floor live load is 40 psf.
Attic dead load is 10 psf.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.

Updates to base code table.

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<table>
<tr>
<td></td>
<td>R603.3.5 Splicing. Steel studs and other structural members shall not be spliced. without an approved design. Tracks shall be spliced in accordance with Figure R603.3.5.</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td></td>
<td>R603.6 Headers. Headers shall be installed above all wall openings in exterior walls and interior load-bearing walls. Box beam headers and back-to-back headers each shall be formed from two equal sized C-shaped members in accordance with Figures R603.6(1) and R603.6(2), respectively, and Tables R603.6(1) through R603.6(6). L-shaped headers shall be permitted to be constructed in accordance with AISI S230. Alternately, headers shall be permitted to be designed and constructed in accordance with AISI S240~~100~~, ~~Section D4~~.</td>
<td></td>
<td>Update to reference standard.</td>
</tr>
<tr>
<td></td>
<td>
TABLE R603.7(2)
HEADER TO KING STUD CONNECTION REQUIREMENTS[a, b, c, d]
<table>
<tr><th rowspan="3">HEADER SPAN (feet)</th><th colspan="6">ULTIMATE WIND SPEED (mph), EXPOSURE CATEGORY</th></tr>
<tr><th rowspan="2">~~110, Exposure Category C or less than 139, Exposure Category~~ 115 B</th><th rowspan="2">120 B</th><th>113 B</th><th>≤140 B</th><th rowspan="2">~~Less than 139, Exposure Category~~ 130 C</th><th rowspan="2">≤140 C</th></tr>
<tr><th>115 C</th><th>120 C</th></tr>
<tr><td>≤ 4′</td><td>4-No. 8 screws</td><td>4-No. 8 screws</td><td>4-No. 8 screws</td><td>4-No. 8 screws</td><td>6-No. 8 screws</td><td>6-No. 8 screws</td></tr>
<tr><td>> 4′ to 8′</td><td>4-No. 8 screws</td><td>4-No. 8 screws</td><td>4-No. 8 screws</td><td>6-No. 8 screws</td><td>8-No. 8 screws</td><td>8-No. 8 screws</td></tr>
<tr><td>> 8′ to 12′</td><td>~~6~~4-No. 8 screws</td><td>4-No. 8 screws</td><td>6-No. 8 screws</td><td>8-No. 8 screws</td><td>10-No. 8 screws</td><td>12-No. 8 screws</td></tr>
<tr><td>> 12′ to 16′</td><td>~~8~~4-No. 8 screws</td><td>4-No. 8 screws</td><td>8-No. 8 screws</td><td>10-No. 8 screws</td><td>12-No. 8 screws</td><td>14-No. 8 screws</td></tr>
</table>
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound = 4.448 N.
a. All screw sizes shown are minimum.
b. For headers located on the first floor of a two-story building or the first or second floor of a three-story building, the total number of screws is permitted to be reduced by 2 screws, but the total number of screws shall be not ~~be~~ less than four.
c. For roof slopes of 6:12 or greater, the required number of screws shall be permitted to be reduced by half, but the total number of screws shall be not ~~be~~ less than four.
d. Screws can be replaced by an uplift connector that has a capacity of the number of screws multiplied by 164 pounds.
</td>
<td></td>
<td>Updates to base code table and footnotes.</td>
</tr>
<tr>
<td></td>
<td>
TABLE R603.8
HEAD AND SILL TRACK SPAN
<table>
<tr><th colspan="2" rowspan="3">ULTIMATE WIND SPEED AND EXPOSURE CATEGORY (mph)</th><th colspan="6">ALLOWABLE HEAD AND SILL TRACK SPAN[a, b, c] (feet-inches)</th></tr>
<tr><th colspan="6">TRACK DESIGNATION[d]</th></tr>
<tr><th>B</th><th>C</th><th>350T125-33</th><th>350T125-43</th><th>350T125-54</th><th>550T125-33</th><th>550T125-43</th><th>550T125-54</th></tr>
<tr><td>115</td><td>—</td><td>~~4′-10″~~5′-9″</td><td>~~5′-5″~~6′-9″</td><td>~~6′-0″~~9′-3″</td><td>~~5′-8″~~7′-3″</td><td>~~6′-3″~~9′-1″</td><td>~~6′-10″~~12′-5″</td></tr>
<tr><td>120</td><td>—</td><td>~~4′-6″~~5′-6″</td><td>~~5′-1″~~6′-6″</td><td>~~5′-8″~~8′-11″</td><td>~~5′-4″~~7′-0″</td><td>~~5′-11″~~8′-9″</td><td>~~6′-5″~~11′-11″</td></tr>
<tr><td>130</td><td>115</td><td>~~4′-2″~~4′-10″</td><td>~~4~~5′-9″</td><td>~~5′-4″~~7′-10″</td><td>~~5′-1″~~6′-2″</td><td>~~5′-7″~~7′-8″</td><td>~~6′-1″~~10′-6″</td></tr>
<tr><td>≤ 140</td><td>120</td><td>4′-8″</td><td>5′-6″</td><td>7′-6″</td><td>5′-11″</td><td>7′-4″</td><td>10′-1″</td></tr>
<tr><td>—</td><td>130</td><td>~~3′-11″~~4′-3″</td><td>~~4′-6″~~5′-1″</td><td>~~5′-0″~~6′-11″</td><td>~~4′-10″~~5′-6″</td><td>~~5′-4″~~6′-9″</td><td>~~5′-10″~~9′-4″</td></tr>
<tr><td>—</td><td>< 140</td><td>~~3′-8″~~4′-0″</td><td>4′-~~2~~9″</td><td>~~4′-9″~~6′-5″</td><td>~~4′-1″~~5′-1″</td><td>~~5′-1″~~6′-4″</td><td>~~5′-7″~~8′-8″</td></tr>
</table>
For SI: 1 mil = 0.0254 mm, 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 ksi = 1,000 psi = 6.895 MPa.
a. Deflection limit: L/240.
b. Head and sill track spans are based on components and cladding wind pressures and 48-inch tributary span.
c. For openings less than 4 feet in height that have both a head track and sill track, the spans are permitted to be multiplied by 1.75. For openings less than or equal to 6 feet in height that have both a head track and a sill track, the spans are permitted to be multiplied by a factor of 1.5.
d. Minimum Grade 33 ksi steel shall be used for 33 mil and 43 mil thicknesses. Minimum Grade 50 ksi steel shall be used for 54 and 68 mil thicknesses.
</td>
<td></td>
<td>Updates to base code table and footnotes.</td>
</tr>
</table>

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<table>
<tr>
<td></td>
<td>
TABLE R603.9.2(1)
MINIMUM PERCENTAGE OF FULL-HEIGHT STRUCTURAL SHEATHING ON EXTERIOR WALLS[a, b]
<table>
<tr><th rowspan="2">WALL SUPPORTING</th><th rowspan="2">ROOF SLOPE</th><th colspan="6">ULTIMATE WIND SPEED AND EXPOSURE (mph)</th></tr>
<tr><th>115 B</th><th>120 B</th><th>12630 B
1105 C</th><th>< 13940 B
11520 C</th><th>< 12630 C</th><th>< 13940 C</th></tr>
<tr><td rowspan="4">Roof and ceiling only (one story or top floor of two- or three-story building).</td><td>3:12</td><td>9</td><td>11</td><td>911</td><td>123</td><td>167</td><td>20</td></tr>
<tr><td>6:12</td><td>13</td><td>15</td><td>157</td><td>202</td><td>268</td><td>35</td></tr>
<tr><td>9:12</td><td>23</td><td>27</td><td>259</td><td>303</td><td>503</td><td>589</td></tr>
<tr><td>12:12</td><td>332</td><td>39</td><td>3540</td><td>404</td><td>6670</td><td>756</td></tr>
<tr><td rowspan="4">One story, roof and ceiling (first floor of a two-story building or second floor of a three-story building).</td><td>3:12</td><td>276</td><td>32</td><td>304</td><td>359</td><td>503</td><td>667</td></tr>
<tr><td>6:12</td><td>287</td><td>33</td><td>304</td><td>404</td><td>5861</td><td>745</td></tr>
<tr><td>9:12</td><td>38</td><td>45</td><td>406</td><td>5561</td><td>748</td><td>9192</td></tr>
<tr><td>12:12</td><td>453</td><td>53</td><td>507</td><td>6572</td><td>1006</td><td>116116</td></tr>
<tr><td rowspan="4">Two stories, roof and ceiling (first floor of a three-story building).</td><td>3:12</td><td>453</td><td>53</td><td>517</td><td>5864</td><td>849</td><td>1123</td></tr>
<tr><td>6:12</td><td>461</td><td>51</td><td>4551</td><td>607</td><td>905</td><td>1134</td></tr>
<tr><td>9:12</td><td>53</td><td>63</td><td>5563</td><td>809</td><td>98104</td><td>1246</td></tr>
<tr><td>12:12</td><td>574</td><td>67</td><td>6574</td><td>90100</td><td>134142</td><td>1557</td></tr>
</table>
For SI: 1 mph = 0.447 m/s.
a. Linear interpolation is permitted.
b. For hip-roofed homes the minimum percentage of full-height sheathing, based upon wind, is permitted to be multiplied by a factor of 0.95 for roof slopes not exceeding 7:12 and a factor of 0.9 for roof slopes greater than 7:12.
</td>
<td></td>
<td>Updates to base code table and footnotes.</td>
</tr>
<tr>
<td></td>
<td>R603.9.2.2 Full-height sheathing in lowest story. In the lowest story of a dwelling, multiplying the percentage of full-height sheathing required in Table R603.9.2(1) by 0.6 shall be permitted ~~provided~~ where hold-down anchors are provided in accordance with Section R603.9.4.2.</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td></td>
<td>R603.9.4.1 Ultimate design wind speeds greater than 12~~6~~30 mph. Where ultimate design wind speeds exceed 12~~6~~30 miles per hour (5~~6~~8 m/s), Exposure Category C walls shall be provided with direct uplift connections in accordance with AISI S230, Section E13.3, and AISI S230, Section F~~7~~8.2, as required for 13940 miles per hour (62~~3~~ m/s), Exposure Category C.</td>
<td></td>
<td>Updates to wind design speeds.</td>
</tr>
<tr>
<td></td>
<td>SECTION R604
WOOD STRUCTURAL PANELS
R604.1 Identification and grade. Wood structural panels shall conform to DOC PS 1, DOC PS 2 or ANSI/APA PRP 210, CSA O~~437~~325 or CSA O~~325~~437. Panels shall be identified by a grade mark or certificate of inspection issued by an approved agency.</td>
<td></td>
<td>Updates to reference standard.</td>
</tr>
<tr>
<td></td>
<td>SECTION R606
GENERAL MASONRY CONSTRUCTION
R606.1 General. Masonry construction shall be designed and constructed in accordance with the provisions of this section, ~~TMS 403 or in accordance with the provisions of TMS 402/ACI 530/ASCE 5.~~TMS 402, TMS 403, or TMS 404.</td>
<td></td>
<td>Updates to reference standard.</td>
</tr>
<tr>
<td></td>
<td>R606.1.1 Professional registration not required. ~~When~~ Where the empirical design provisions of Appendix A of TMS ~~402/ACI 530/ASCE 5,~~ 402, the provisions of TMS 403, or the provisions of this section are used to design masonry, 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.</td>
<td></td>
<td>Minor wordsmithing changes and update to reference standard.</td>
</tr>
</table>

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	R606.2.1 Concrete masonry units. Concrete masonry units shall conform to the following standards: ASTM ~~C 55~~ C55 for concrete brick; ASTM ~~C 73~~ C73 for calcium silicate face brick; ASTM ~~C 90~~ C90 for load-bearing concrete masonry units; ASTM ~~C 744~~ C744 for prefaced concrete and calcium silicate masonry units; or ASTM ~~C 1634~~ C1634 for concrete facing brick.		Updates to reference standard.
	R606.2.2 Clay or shale masonry units. Clay or shale masonry units shall conform to the following standards: ASTM ~~C 34~~ C34 for structural clay *load-bearing wall* tile; ASTM ~~C 56~~ C56 for structural clay nonload-bearing wall tile; ASTM ~~C 62~~ C62 for building brick (solid masonry units made from clay or shale); ASTM ~~C 1088~~ C126 for ~~solid units of thin veneer brick; ASTM C 126 for~~ ceramic-glazed structural clay facing tile, facing brick and solid masonry units; ASTM ~~C 212~~ C212 for structural clay facing tile; ASTM ~~C 216~~ C216 for facing brick (solid masonry units made from clay or shale); ASTM C652 for hollow brick (hollow masonry units made from clay or shale); ASTM C1088 for solid units of thin veneer brick; or ASTM C1405 for glazed brick (single-fired solid brick units). **Exception:** Structural clay tile for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet the compressive strength specifications. The fire-resistance rating shall be determined in accordance with ASTM ~~E 119~~ **E119** or UL 263 and shall comply with the requirements of Section R302.		Updates to reference standard.
	R606.2.3 AAC masonry. AAC masonry units shall conform to ASTM ~~C 1386~~ C1691 and ASTM C1693 for the strength class specified.		Updates to reference standard.
	R606.2.4 Stone masonry units. Stone masonry units shall conform to the following standards: ASTM ~~C 503~~ C503 for marble building stone (exterior); ASTM ~~C 568~~ C568 for limestone building stone; ASTM ~~C 615~~ C615 for granite building stone; ASTM ~~C 616~~ C616 for sandstone building stone; or ASTM ~~C 629~~ C629 for slate building stone.		Updates to reference standard.
	R606.2.5 Architectural cast stone. Architectural cast stone shall conform to ASTM ~~**C 1364.**~~ **C1364.**		Updates to reference standard.
	R606.2.6 Adhered manufactured stone masonry veneer units Adhered manufactured stone masonry veneer units shall conform to ASTM C1670.		New base code section for veneer units.

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<table>
<tr>
<td></td>
<td>R~~606.2.6~~606.2.7 Second hand units</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
<tr>
<td></td>
<td>R~~606.2.7~~606.2.8 Mortar Except for mortars listed in Sections R606.2.8, R606.2.9 and R606.2.10, mortar for use in masonry construction shall meet the proportion specifications of Table R606.2.~~7~~606.2.8 or the property specifications of ASTM ~~C 270~~C270. The type of mortar shall be in accordance with Sections R606.2.7.1, R606.2.7.2 and R606.2.7.3.</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
<tr>
<td></td>
<td>
TABLE R606.2.~~7~~ 8
MORTAR PROPORTIONS[a,b]
<table>
<tr><th></th><th></th><th colspan="7">PROPORTIONS BY VOLUME (cementitious materials)</th><th></th></tr>
<tr><th rowspan="2">MORTAR</th><th rowspan="2">TYPE</th><th rowspan="2">Portland cement or blended cement</th><th colspan="3">Mortar cement</th><th colspan="3">Masonry cement</th><th rowspan="2">Hydrated lime[c] or lime putty</th><th rowspan="2">Aggregate ratio (measured in damp, loose conditions)</th></tr>
<tr><th>M</th><th>S</th><th>N</th><th>M</th><th>S</th><th>N</th></tr>
<tr><td rowspan="4">Cement-lime</td><td>M</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>1/4</td><td rowspan="13">Not less than 2 1/4 and not more than 3 times the sum of separate volumes of lime, if used, and cement</td></tr>
<tr><td>S</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>over 1/4 to 1/2</td></tr>
<tr><td>N</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>over 1/2 to 1 1/4</td></tr>
<tr><td>O</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td><td>over 1 1/4 to 2 1/2</td></tr>
<tr><td rowspan="5">Mortar cement</td><td>M</td><td>1</td><td>—</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td><td rowspan="5">—</td></tr>
<tr><td>M</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>S</td><td>1/2</td><td>—</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>S</td><td>—</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>N</td><td>—</td><td>—</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>O</td><td>—</td><td>—</td><td>—</td><td>1</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td rowspan="5">Masonry cement</td><td>M</td><td>1</td><td></td><td></td><td></td><td>—</td><td>—</td><td>1</td><td rowspan="5">—</td></tr>
<tr><td>M</td><td>—</td><td></td><td></td><td></td><td>1</td><td>—</td><td>—</td></tr>
<tr><td>S</td><td>1/2</td><td></td><td></td><td></td><td>—</td><td>—</td><td>1</td></tr>
<tr><td>S</td><td>—</td><td></td><td></td><td></td><td>—</td><td>1</td><td>—</td></tr>
<tr><td>N</td><td>—</td><td></td><td></td><td></td><td>—</td><td>—</td><td>1</td></tr>
<tr><td>O</td><td>—</td><td></td><td></td><td></td><td>—</td><td>—</td><td>1</td></tr>
</table>
For SI: 1 cubic foot = 0.0283 m^3, 1 pound = 0.454 kg.
a. For the purpose of these specifications, the weight of 1 cubic foot of the respective materials shall be considered to be as follows:
Portland ~~C~~cement 94 pounds | Masonry ~~C~~cement Weight printed on bag
Mortar C~~c~~ement Weight printed on bag | Hydrated ~~L~~lime 40 pounds
Lime ~~P~~putty (Quicklime) 80 pounds | Sand, damp and loose 80 pounds of dry sand
b. Two air-entraining materials shall not be combined in mortar.
c. Hydrated lime conforming to the requirements of ASTM ~~C 207~~C207.
</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
<tr>
<td></td>
<td>R~~606.2.7~~606.2.8.1 Foundation walls.</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
<tr>
<td></td>
<td>R~~606.2.7~~606.2.8.2 Masonry in Seismic Design Categories A, B and C.</td>
<td></td>
<td>Base code renumbering.</td>
</tr>
</table>

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	R~~606.2.7~~606.2.8.3 Masonry in Seismic Design Categories D0, D1 and D2.		Base code renumbering.
	R~~606.2.8~~606.2.9 Surface-bonding mortar.		Base code renumbering.
	R~~606.2.9~~606.2.10 Mortar for AAC masonry. Thin-bed mortar for AAC masonry shall comply with Article 2.1 C.1 of TMS 602~~**/ACI 530.1/ASCE 6**~~. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1 C.2 of TMS 602~~**/ACI 530.1/ASCE 6**~~.		Base code renumbering.
	R~~606.2.10~~606.2.11 Mortar for adhered masonry veneer. Mortar for use with adhered masonry veneer shall conform to ASTM ~~C 270~~**C270** Type S or Type N or shall comply with ANSI A118.4 for latex-modified ~~p~~**P**ortland cement mortar		Base code renumbering.
	R~~606.2.11~~606.2.12 Grout. Grout shall consist of cementitious material and aggregate in accordance with ASTM ~~C 476~~**C476** or the proportion specifications of Table R606.2.1~~1~~**2**. Type M or Type S mortar to which sufficient water has been added to produce pouring consistency shall be permitted to be used as grout.		Base code renumbering.
	R~~606.2.12~~606.2.13 Metal reinforcement and accessories. Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602~~**/ACI 530.1/ASCE 6**~~.		Base code renumbering.
	TABLE R606.3.4.1 **MINIMUM CORROSION PROTECTION** **MASONRY METAL ACCESSORY** / **STANDARD** Joint reinforcement, interior walls — ASTM ~~A 641~~**A641**, Class 1 Wire ties or anchors in exterior walls completely embedded in mortar or grout — ASTM ~~A 641~~**A641**, Class 3 Wire ties or anchors in exterior walls not completely embedded in mortar or grout — ASTM ~~A 153~~**A153**, Class B-2 Joint reinforcement in exterior walls or interior walls exposed to moist environment — ASTM ~~A 153~~**A153**,, Class B-2 Sheet metal ties or anchors exposed to weather — ASTM ~~A 153~~**A153**,, Class B-2 Sheet metal ties or anchors completely embedded in mortar or grout — ASTM ~~A 653~~**A653**, Coating Designation G60 Stainless steel hardware for any exposure — ASTM ~~A 167~~**A167**, Type 304		Minor wordsmithing changes to table.
	R606.3.5.1 Grout placement. Grout shall be a plastic mix suitable for pumping without segregation of the constituents and shall be mixed thoroughly. Grout shall be placed by pumping or by an approved alternate method and shall be placed before any initial set occurs and not more than 1 1/2 hours after water has been added. Grout shall be consolidated by puddling or mechanical vibrating during placing and reconsolidated after excess moisture has been absorbed but before plasticity is lost. Grout shall not be pumped through aluminum pipes.		Minor wordsmithing changes.

	Maximum pour heights and the minimum dimensions of spaces provided for grout placement shall conform to Table R606.3.5.1. Grout shall be poured in lifts ~~of 8-foot (2438 mm) maximum height~~ with a maximum height of 8 feet (2438 mm). Where a total grout pour exceeds 8 feet (2438 mm) in height, the grout shall be placed in lifts not exceeding 64 inches (1626 mm) and special inspection during grouting shall be required. If the work is stopped for 1 hour or longer, the horizontal construction joints shall be formed by stopping all tiers at the same elevation and with the grout 1 inch (25 mm) below the top.		
	R606.5.2 Corbel projection. The maximum projection of one unit shall not exceed one-half the height of the unit or one-third the thickness at right angles to the wall. The maximum corbeled projection beyond the face of the wall shall not exceed: 1. One-half of the wall thickness for multiple wythe walls bonded by mortar or grout and wall ties or masonry headers. 2. One-half the wythe thickness for single wythe walls, masonry-bonded hollow walls, multiple wythe walls with open collar joints and veneer walls.		Minor wordsmithing changes.
	R606.6.4.1.2 Metal reinforcement. Interior ~~nonload-bearing~~ nonload-bearing walls shall be anchored at their intersections, at vertical intervals of not more than 16 inches (406 mm) with joint reinforcement of not less than 9 gage [0.148 inch ~~(4mm)],~~(4 mm)], or 1/4 -inch (6 mm) galvanized mesh hardware cloth. Intersecting masonry walls, other than interior ~~nonloadbearing~~ nonload-bearing walls, shall be anchored at vertical intervals of not more than 8 inches (203 mm) with joint reinforcement of not less than 9 gage (4 mm) and shall extend not less than 30 inches (762 mm) in each direction at the intersection. Other metal ties, joint reinforcement or anchors, if used, shall be spaced to provide equivalent area of anchorage to that required by this section.		Minor wordsmithing changes.
	R606.8 Chases. Chases and recesses in masonry walls shall not be deeper than one-third the wall ~~thickness, and the~~ thickness. The maximum length of a horizontal chase or horizontal projection shall not exceed 4 feet (1219 ~~mm),~~mm) and shall have not less than 8 inches (203 mm) of masonry in back of the chases and recesses and between adjacent chases or recesses and the jambs of openings. Chases and recesses in masonry walls shall be designed and constructed so as not to reduce the required strength or required fire resistance of the wall and ~~in no case~~ shall ~~a chase or recess~~ not be permitted within the required area of a pier. Masonry directly above chases or recesses wider than 12 inches (305 mm) shall be supported on noncombustible lintels.		Minor wordsmithing changes.

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	R606.12.1 General. Masonry structures and masonry elements shall comply with the requirements of Sections R606.12.2 through R606.12.4 based on the seismic design category established in Table R301.2~~(1)~~**(2)** Masonry structures and masonry elements shall comply with the requirements of Section R606.12 and Figures R606.11(1), R606.11(2) and R606.11(3) or shall be designed in accordance with TMS ~~402/ACI 530/ASCE 5~~ **402** or TMS 403.		Minor wordsmithing changes.
	R606.12.2.2.1 Load-bearing frames or columns. Elements not part of the lateral force-resisting system shall be analyzed to determine their effect on the response of the system. The frames or columns shall be adequate for vertical ~~load carrying~~ **load-carrying** capacity and induced moment caused by the design *story* drift.		Minor wordsmithing changes.
	R606.12.2.3.1 Connections to masonry shear walls. Connectors shall be provided to transfer forces between masonry walls and horizontal elements in accordance with the requirements of Section 4.1.4 of TMS 402~~**/ACI 530/ASCE 5**~~. Connectors shall be designed to transfer horizontal design forces acting either perpendicular or parallel to the wall, but not less than 200 pounds per linear foot (2919 N/m) of wall. The maximum spacing between connectors shall be 4 feet (1219 mm). Such anchorage mechanisms shall not induce tension stresses perpendicular to grain in ledgers or nailers.		Removed reference standards.
	R606.12.2.3.2 Connections to masonry columns. Connectors shall be provided to transfer forces between masonry columns and horizontal elements in accordance with the requirements of Section 4.1.4 of TMS 402~~/ACI 530/ASCE 5~~. Where anchor bolts are used to connect horizontal elements to the tops of columns, the bolts shall be placed within lateral ties. Lateral ties shall enclose both the vertical bars in the column and the anchor bolts. There shall be not less than two No. 4 lateral ties provided in the top 5 inches (127 mm) of the column.		Removed reference standards.
	R606.13 Multiple-wythe masonry. The facing and backing of multiple-wythe masonry walls shall be bonded in accordance with Section R606.13.1, R606.13.2 or R606.13.3. In cavity walls, neither the facing nor the backing shall be less than 3 inches (76 mm) nominal in thickness and the cavity shall be not more than 4 inches (102 mm) nominal in width. The backing shall ~~be~~ **be** not ~~be~~ less than ~~as thick as~~**the thickness of** the facing. **Exception:** Cavities shall be permitted to exceed the 4-inch (102 mm) nominal dimension provided **that** tie size and tie spacing have been established by calculation.		Minor wordsmithing changes.

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	R607.4.4 Curved panels. The width of curved panels shall conform to the requirements of Sections R607.4.1, R607.4.2 and R607.4.3, except additional structural supports shall be provided at locations where a curved section joins a straight section, and at inflection points in multicurved ~~d~~ walls.		Minor wordsmithing changes.
	R607.5.2 Lateral support. Glass unit masonry panels shall be laterally supported along the top and sides of the panel. Lateral supports for glass unit masonry panels shall be designed to resist not less than 200 pounds per lineal feet (2918 N/m) of panel, or the actual applied loads, whichever is greater. Except for ~~single unit~~ single-unit panels, lateral support shall be provided by panel anchors along the top and sides spaced not greater than 16 inches (406 mm) on center or by channel-type restraints. ~~Single unit~~ Single-unit panels shall be supported by channel-type restraints. **Exceptions:** 1. Lateral support is not required at the top of panels that are one unit wide. 2. Lateral support is not required at the sides of panels that are one unit high.		Minor wordsmithing changes.
	R607.6 Sills. Before the bedding of glass units, the sill area shall be covered with a ~~water base~~ water-base asphaltic emulsion coating. The coating shall be not less than 1/8 inch (3 mm) thick.		Minor wordsmithing changes.
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.~~	**SECTION R608** **EXTERIOR CONCRETE WALL CONSTRUCTION** **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** or **ACI 332**. Where **PCA 100**, **ACI 318**, **ACI 332** 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.	**SECTION R608** **EXTERIOR CONCRETE WALL CONSTRUCTION** **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, ACI 318 or ACI 332. ~~Where PCA 100, ACI 318, ACI 332 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.~~	No change to Houston amendment.

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TABLE R608.3
DIMENSIONAL REQUIREMENTS FOR WALLS [a, b]

WALL TYPE AND NOMINAL THICKNESS	MAXIMUM WALL WEIGHT [cb] (psf)	MINIMUM WIDTH, W, OF VERTICAL CORES (inches)	MINIMUM THICKNESS, T, OF VERTICAL CORES (inches)	MAXIMUM SPACING OF VERTICAL CORES (inches)	MAXIMUM SPACING OF HORIZONTAL CORES (inches)	MINIMUM WEB THICKNESS (inches)
4" Flat [dc]	50	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
6" Flat [dc]	75	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
8" Flat [dc]	100	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
10" Flat [dc]	125	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~	~~N/A~~
6" Waffle-grid	56	8 [ed]	5.5 [ed]	12	16	2
8" Waffle-grid	76	8 [fe]	8 [fe]	12	16	2
6" Screen-grid	53	6.25 [gf]	6.25 [gf]	12	12	~~N/A~~

For SI: 1 inch = 25.4 mm; 1 pound per square foot = 0.0479 kPa, 1 pound per cubic foot = 2402.77 kg/m^3, 1 square inch = 645.16 mm^2, 1 inch^4 = 42 cm^4.

a. Width "W," thickness "T," spacing and web thickness, refer to Figures R608.3(2) and R608.3(3).

~~b. N/A indicates not applicable.~~

~~c~~b. Wall weight is based on a unit weight of concrete of 150 pcf. For flat walls the weight is based on the nominal thickness. The tabulated values do not include any allowance for interior and exterior finishes.

~~d~~c. Nominal wall thickness. The actual as-built thickness of a flat wall shall not be more than $^1/_2$ inch less or more than $^1/_4$ inch more than the nominal dimension indicated.

~~e~~d. Vertical core is assumed to be elliptical-shaped. Another shape core is permitted provided the minimum thickness is 5 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 65 inch^4, and the area, *A*, is not less than 31.25 square inches. The width used to calculate *A* and *I* shall not exceed 8 inches.

~~f~~e. Vertical core is assumed to be circular. Another shape core is permitted provided the minimum thickness is 7 inches, the moment of inertia, *I*, about the centerline of the wall (ignoring the web) is not less than 200 inch^4, and the area, *A*, is not less than 49 square inches. The width used to calculate *A* and *I* shall not exceed 8 inches.

~~g~~f. Vertical core is assumed to be circular. Another shape core is permitted provided the minimum thickness is 5.5 inches, the moment of inertia, *I*, about the centerline of the wall is not less than 76 inch^4, and the area, *A*, is not less than 30.25 square inches. The width used to calculate *A* and *I* shall not exceed 6.25 inches.

Minor changes to table and footnotes.

R608.5.1 Concrete and materials for concrete. Materials used in concrete, and the concrete itself, shall conform to requirements of this section, **PCA 100**, ~~or~~ **ACI 318** or **ACI 332**.

New reference standard added to base code.

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TABLE R608.5.4(1)
LAP SPLICE AND TENSION DEVELOPMENT LENGTHS

	BAR SIZE NO.	YIELD STRENGTH OF STEEL, f_y - psi (MPa)	
		40,000 (280)	60,000 (420)
		Splice length or tension development length (inches)	
Lap splice length-tension	4	20	30
	5	25	38
	6	30	45
Tension development length for straight bar	4	15	23
	5	19	28
	6	23	34
Tension development length for:	4	6	9
a. ~~90~~-degree and 180-degree standard hooks with not less than $2\frac{1}{2}$ inches of side cover perpendicular to plane of hook, and	5	7	11
b. ~~90~~-degree standard hooks with not less than 2 inches of cover on the bar extension beyond the hook.	6	8	13
Tension development length for bar with 90-degree or 180-degree standard hook having less cover than required ~~above~~ **in Items a and b.**	4	8	12
	5	10	15
	6	12	18

For SI: 1 inch = 25.4 mm, **1 degree = 0.0175 rad, 1 pound per square inch = 6.895 kPa**

Minor changes to table.

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TABLE R608.5.4(2)
MAXIMUM SPACING FOR ALTERNATIVE BAR SIZE AND~~/OR~~ ALTERNATIVE GRADE OF STEEL [a, b, c]

BAR SPACING FROM APPLICABLE TABLE IN SECTION R608.6 (inches)	BAR SIZE FROM APPLICABLE TABLE IN SECTION R608.6														
	#4					#5					#6				
	Alternate bar size and~~/or~~ alternate grade of steel desired														
	Grade 60		Grade 40			Grade 60		Grade 40			Grade 60		Grade 40		
	#5	#6	#4	#5	#6	#4	#6	#4	#5	#6	#4	#5	#4	#5	#6
	Maximum spacing for alternate bar size and~~/or~~ alternate grade of steel (inches)														
8	12	18	5	8	12	5	11	3	5	8	4	6	2	4	5
9	14	20	6	9	13	6	13	4	6	9	4	6	3	4	6
10	16	22	7	10	15	6	14	4	7	9	5	7	3	5	7
11	17	24	7	11	16	7	16	5	7	10	5	8	3	5	7
12	19	26	8	12	18	8	17	5	8	11	5	8	4	6	8
13	20	29	9	13	19	8	18	6	9	12	6	9	4	6	9
14	22	31	9	14	21	9	20	6	9	13	6	10	4	7	9
15	23	33	10	16	22	10	21	6	10	14	7	11	5	7	10
16	25	35	11	17	23	10	23	7	11	15	7	11	5	8	11
17	26	37	11	18	25	11	24	7	11	16	8	12	5	8	11
18	28	40	12	19	26	12	26	8	12	17	8	13	5	8	12
19	29	42	13	20	28	12	27	8	13	18	9	13	6	9	13
20	31	44	13	21	29	13	28	9	13	19	9	14	6	9	13
21	33	46	14	22	31	14	30	9	14	20	10	15	6	10	14
22	34	48	15	23	32	14	31	9	15	21	10	16	7	10	15
23	36	48	15	24	34	15	33	10	15	22	10	16	7	11	15
24	37	48	16	25	35	15	34	10	16	23	11	17	7	11	16
25	39	48	17	26	37	16	35	11	17	24	11	18	8	12	17
26	40	48	17	27	38	17	37	11	17	25	12	18	8	12	17
27	42	48	18	28	40	17	38	12	18	26	12	19	8	13	18
28	43	48	19	29	41	18	40	12	19	26	13	20	8	13	19
29	45	48	19	30	43	19	41	12	19	27	13	20	9	14	19
30	47	48	20	31	44	19	43	13	20	28	14	21	9	14	20
31	48	48	21	32	45	20	44	13	21	29	14	22	9	15	21
32	48	48	21	33	47	21	45	14	21	30	15	23	10	15	21
33	48	48	22	34	48	21	47	14	22	31	15	23	10	16	22
34	48	48	23	35	48	22	48	15	23	32	15	24	10	16	23
35	48	48	23	36	48	23	48	15	23	33	16	25	11	16	23
36	48	48	24	37	48	23	48	15	24	34	16	25	11	17	24
37	48	48	25	38	48	24	48	16	25	35	17	26	11	17	25
38	48	48	25	39	48	25	48	16	25	36	17	27	12	18	25
39	48	48	26	40	48	25	48	17	26	37	18	27	12	18	26
40	48	48	27	41	48	26	48	17	27	38	18	28	12	19	27
41	48	48	27	42	48	26	48	18	27	39	19	29	12	19	27
42	48	48	28	43	48	27	48	18	28	40	19	30	13	20	28
43	48	48	29	44	48	28	48	18	29	41	20	30	13	20	29
44	48	48	29	45	48	28	48	19	29	42	20	31	13	21	29
45	48	48	30	47	48	29	48	19	30	43	20	32	14	21	30
46	48	48	31	48	48	30	48	20	31	44	21	32	14	22	31
47	48	48	31	48	48	30	48	20	31	44	21	33	14	22	31
48	48	48	32	48	48	31	48	21	32	45	22	34	15	23	32

Minor changes to base code table.

R608.5.4.7 Alternate grade of reinforcement and spacing. Where tables in Sections R404.1.3 and R608.6 specify vertical wall reinforcement based on minimum bar size and maximum spacing, which are based on Grade 60 (420 MPa) steel reinforcement, different size bars or bars made from a different grade of steel are permitted provided an equivalent area of steel per linear foot of wall is provided. Use of Table R608.5.4(2) is permitted to determine the maximum bar spacing for different bar sizes than specified in the tables and~~/or~~ bars made from a different grade of steel. Bars shall not be spaced less than one-half the wall thickness, or more than 48 inches (1219 mm) on center.

Minor wordsmithing changes.

	R608.5.5 Construction joints in walls. Construction joints shall be made and located to not impair the strength of the wall. Construction joints in plain concrete walls, including walls required to have not less than No. 4 bars at 48 inches (1219 mm) on center by Section R608.6, shall be located at points of lateral support, and not less than one No. 4 bar shall extend across the construction joint at a spacing not to exceed 24 inches (610 mm) on center. Construction joint reinforcement shall have not less than 12 inches (305 mm) of embedment on both sides of the joint. Construction joints in reinforced concrete walls shall be located in the middle third of the span between lateral supports, or located and constructed as required for joints in plain concrete walls. **Exception:** Vertical wall reinforcement required by this code is permitted to be used in lieu of construction joint reinforcement, provided the spacing does not exceed 24 inches (610 mm), or the combination of wall reinforcement and No. 4 bars described in Section R608.5.5 does not exceed 24 inches (610 mm).		Minor wordsmithing changes.
	TABLE R608.7(3) **REDUCTION FACTOR, R2, FOR FLOOR-TO-CEILING WALL HEIGHTS LESS THAN 10 FEET[a, b]** For SI: 1 foot = 304.8 mm. a. See Section R608.7.1.1 and Note d to Table R608.7(1A) for application of reduction factors in this table. b. For intermediate values of endwall length, and/~~or~~ roof slope, use the next higher value, or determine by interpolation. c. Tabulated values in Table R608.7(1A) and (1C) for "one story or top story of two story" are based on a floor-to-ceiling height of 10 feet. Tabulated values in Table R608.7(1B) and (1C) for "first story of two story" are based on floor-to-ceiling heights of 10 feet each for the first and second story. For floor-to-ceiling heights between those shown in this table and those assumed in Table R608.7(1A), (1B) or (1C), use the solid wall lengths in Table R608.7(1A), (1B) or (1C), or determine the reduction factor by interpolating between 1.0 and the factor shown in this table.		Minor wordsmithing changes.
	R608.7.2.2.2 Vertical reinforcement. Vertical reinforcement applicable to the reduction factor(s) for design strength, *R3*, from Table R608.7(4) that is used, shall be located at each end of each solid wall segment in accordance with the applicable detail in Figure R608.7(2). The No. 4 vertical bar required on each side of an opening by Section R608.8.1.2 is permitted to be used as reinforcement at the ends of solid wall segments where installed in accordance with the applicable detail in Figure R608.7(2). There shall be not less than two No. 4 bars at each end of solid wall segments located as required by the applicable detail in Figure R608.7(2). One of the bars at each end of solid wall segments shall be deemed to meet the requirements for vertical wall reinforcement required by Section R608.6. The vertical wall reinforcement at each end of each solid wall segment shall be developed below the bottom of the adjacent wall opening [see Figure R608.7(3)] by one of the following methods: 1. Where the wall height below the bottom of the adjacent opening is equal to or greater than 22 inches (559 mm) for No. 4 or 28 inches (711 mm) for No. 5 vertical wall reinforcement,		Minor wordsmithing changes.

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reinforcement around openings in accordance with Section R608.8.1 shall be sufficient.

2. Where the wall height below the bottom of the adjacent opening is less than required by Item 1 ~~above~~, the vertical wall reinforcement adjacent to the opening shall extend into the footing far enough to develop the bar in tension in accordance with Section R608.5.4.4 and Figure R608.5.4(2), or shall be lap-spliced with a dowel that is embedded in the footing far enough to develop the dowel-bar in tension.

TABLE R608.8(6)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH-THICK WAFFLE-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, o]
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR SPAN 32 FEET

For SI: 1 inch = 25.4 mm, 1 ~~foot = 304.8 mm,~~ 1 pound per square ~~foot~~ inch = ~~0.0479~~ 6.895 kPa, 1 pound per square foot = ~~304.8 mm,~~ 0.0479 kPa, Grade 40 = 280 MPa, Grade 60 = 420 MPa.

a. Where lintels are formed with waffle-grid forms, form material shall be removed, if necessary, to create top and bottom flanges of the lintel that are not less than 3 inches in depth (in the vertical direction), are not less than 5 inches in width for 6-inch-nominal waffle-grid forms and not less than 7 inches in width for 8-inch-nominal waffle-grid forms. See Figure R608.8(3). Flat form lintels shall be permitted in place of waffle-grid lintels. See Tables R608.8(2) through R608.8(5).
b. See Table R608.3 for tolerances permitted from nominal thicknesses and minimum dimensions and spacing of cores.
c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Notes l and n. Table values are based on uniform loading. See Section R608.8.2 for lintels supporting concentrated loads.
d. Deflection criterion is *L*/240, where *L* is the clear span of the lintel in inches, or ~~1~~ 1/2 ~~inch,~~ 1/2 inch, whichever is less.
e. Linear interpolation is permitted between ground snow loads.
f. DR indicates design required. STL – indicates stirrups required throughout lintel.
g. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.
h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.
i. Lintels less than 24 inches in depth with stirrups shall be formed from ~~flat-walls~~ flat-wall forms [see Tables R608.8(2) through R608.8(5)], or, if necessary, form material shall be removed from waffle-grid forms so as to provide the required cover for stirrups. Allowable spans for lintels formed with flat-wall forms shall be determined from Tables R608.8(2) through R608.8(5).
j. Where stirrups are required for ~~24 inch deep~~ 24-inch-deep lintels, the spacing shall not exceed 12 inches on center.
k. Allowable clear span without stirrups applicable to all lintels of the same depth, *D*. Top and bottom reinforcement for lintels without stirrups shall be not less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than *d*/2.
l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.
m. Center distance, *A*, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.
n. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, *A*, shall be permitted to be multiplied by 1.10.
o. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R608.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.

Minor wordsmithing changes.

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TABLE R608.8(7)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 8-INCH-THICK WAFFLE-GRID [a, b, c, d, e, f, o]
LINTELS IN LOAD-BEARING WALLS
MAXIMUM ROOF CLEAR SPAN 40 FEET AND MAXIMUM FLOOR CLEAR SPAN 32 FEET

LINTEL DEPTH, D [g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH [h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R608.8(1)							
			1	2		3		4		5
				Maximum ground snow load (psf)						
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)							
8 [i]	Span without stirrups [k, l]		2-6	2-9	2-0	2-1	2-0	2-0	2-0	2-0	2-0
	1-#4	40,000	4-5	4-9	3-7	3-9	3-4	3-0	2-10	2-3	2-2
		60,000	5-6	6-2	4-0	4-3	3-7	3-1	2-10	2-3	2-2
	1-#5	40,000	5-6	6-2	4-0	4-3	3-7	3-1	2-10	2-3	2-2
	Center distance A [m, n]		0-9	0-10	0-6	0-6	0-5	0-4	0-4	ST L	ST L
12 [i]	Span without stirrups [k, l]		2-10	3-1	2-6	2-7	2-5	2-3	2-2	2-0	2-0
	1-#4	40,000	5-7	6-1	4-8	4-10	4-4	3-11	3-8	3-0	2-11
		60,000	6-9	7-5	5-8	5-11	5-4	4-9	4-5	3-8	3-7
	1-#5	40,000	6-11	7-7	5-10	6-0	5-5	4-10	4-6	3-9	3-7
		60,000	8-8	10-1	6-7	7-0	5-11	5-2	4-8	3-9	3-7
	2-#4 1-#6	40,000	8-8	9-10	6-7	7-0	5-11	5-2	4-8	3-9	3-7
		60,000	8-8	10-1	6-7	7-0	5-11	5-2	4-8	3-9	3-7
	Center distance A [m, n]		1-2	1-5	0-10	0-11	0-9	0-7	0-6	ST L	ST L
16 [i]	Span without stirrups [k, l]		3-10	4-3	3-6	3-7	3-4	3-2	3-0	2-10	2-9
	1-#4	40,000	6-5	7-2	5-6	5-9	5-2	4-8	4-4	3-7	3-6
		60,000	7-9	8-9	6-9	7-0	6-3	5-8	5-3	4-4	4-3
	1-#5	40,000	7-11	8-11	6-10	7-1	6-5	5-9	5-4	4-5	4-4
		60,000	9-8	10-11	8-4	8-8	7-10	7-0	6-6	5-2	5-1
	2-#4 1-#6	40,000	9-0	10-1	7-9	8-0	7-3	6-6	6-1	5-0	4-11
		60,000	11-5	13-10	9-2	9-8	8-3	7-2	6-6	5-2	5-1
	Center distance A [m, n]		1-6	1-11	1-2	1-3	1-0	0-10	0-8	ST L	ST L
20 [i]	Span without stirrups [k, l]		4-10	5-5	4-5	4-7	4-3	4-0	3-11	3-7	3-7
	1-#4	40,000	7-0	8-1	6-3	6-5	5-10	5-3	4-11	4-1	3-11
		60,000	8-7	9-10	7-7	7-10	7-1	6-5	6-0	4-11	4-10
	1-#5	40,000	8-9	10-1	7-9	8-0	7-3	6-6	6-1	5-1	4-11
		60,000	10-8	12-3	9-6	9-10	8-10	8-0	7-5	6-2	6-0
	2-#4 1-#6	40,000	9-10	11-4	8-9	9-1	8-2	7-4	6-10	5-8	5-7
		60,000	12-0	13-10	10-8	11-0	9-11	9-0	8-4	6-8	6-6
	2-#5	40,000	12-3	14-1	10-10	11-3	10-2	8-11	8-1	6-6	6-4
		60,000	14-0	17-6	11-8	12-3	10-6	9-1	8-4	6-8	6-6
	Center distance A [m, n]		1-10	2-5	1-5	1-7	1-3	1-0	0-11	ST L	ST L

Minor wordsmithing changes.

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LINTEL DEPTH, D[g] (inches)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	STEEL YIELD STRENGTH[h], f_y (psi)	DESIGN LOADING CONDITION DETERMINED FROM TABLE R608.8(1)								
			1	2		3		4		5	
				Maximum ground snow load (psf)							
				30	70	30	70	30	70	30	70
			Maximum clear span of lintel (feet - inches)								
24[j]	Span without stirrups[k, l]		5-9	6-7	5-5	5-6	5-2	4-11	4-9	4-5	4-4
	1-#4	40,000	7-6	8-10	6-10	7-1	6-5	5-9	5-5	4-6	4-4
		60,000	9-2	10-9	8-4	8-8	7-10	7-1	6-7	5-6	5-4
	1-#5	40,000	9-5	11-0	8-6	8-10	8-0	7-2	6-8	5-7	5-5
		60,000	11-5	13-5	10-5	10-9	9-9	8-9	8-2	6-10	6-8
	2-#4 1-#6	40,000	10-7	12-5	9-8	10-0	9-0	8-1	7-7	6-3	6-2
		60,000	12-11	15-2	11-9	12-2	11-0	9-11	9-3	7-8	7-6
	2-#5	40,000	13-2	15-6	12-0	12-5	11-2	9-11	9-2	7-5	7-3
		60,000	16-3	21-0	14-1	14-10	12-9	11-1	10-1	8-1	7-11
	2-#6	40,000	14-4	18-5	12-6	13-2	11-5	9-11	9-2	7-5	7-3
	Center distance A[m, n]		2-1	2-11	1-9	1-10	1-6	1-3	1-1	STL	STL

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square ~~foot~~ inch = ~~0.0479~~ 6.895 kPa, 1 pound per square foot = ~~304.8 mm,~~ 0.0479 kPa, Grade 40 = 280 MPa, Grade 60 = 420 MPa.

a. Where lintels are formed with waffle-grid forms, form material shall be removed, if necessary, to create top and bottom flanges of the lintel that are not less than 3 inches in depth (in the vertical direction), are not less than 5 inches in width for 6-inch-nominal waffle-grid forms and not less than 7 inches in width for 8-inch-nominal waffle-grid forms. See Figure R608.8(3). ~~Flat form~~ Flat-form lintels shall be permitted in lieu of waffle-grid lintels. See Tables R608.8(2) through R608.8(5).

b. See Table R608.3 for tolerances permitted from nominal thicknesses and minimum dimensions and spacing of cores.

c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Notes l and n. Table values are based on uniform loading. See Section R608.8.2 for lintels supporting concentrated loads.

d. Deflection criterion is $L/240$, where L is the clear span of the lintel in inches, or $\frac{4}{2}$ ~~inch,~~ 1/2 inch, whichever is less.

e. Linear interpolation is permitted between ground snow loads.

f. ~~DR~~ f. STL indicates ~~design required. STL -~~ stirrups required throughout lintel.

g. Lintel depth, D, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel.

h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement.

i. Lintels less than 24 inches in depth with stirrups shall be formed from ~~flat walls~~ flat-wall forms [see Tables R608.8(2) through R608.8(5)], or, if necessary, form material shall be removed from waffle-grid forms so as to provide the required cover for stirrups. Allowable spans for lintels formed with flat-wall forms shall be determined from Tables R608.8(2) through R608.8(5).

j. Where stirrups are required for ~~24 inch deep~~ 24-inch-deep lintels, the spacing shall not exceed 12 inches on center.

k. Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for lintels without stirrups shall be not less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than $d/2$.

l. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased.

m. Center distance, A, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths.

n. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, A, shall be permitted to be multiplied by 1.10.

o. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R608.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.

TABLE R608.8(8)
MAXIMUM ALLOWABLE CLEAR SPANS FOR 6-INCH-THICK SCREEN-GRID LINTELS IN LOAD-BEARING WALLS[a, b, c, d, e, f, p]
ROOF CLEAR SPAN 40 FEET AND FLOOR CLEAR SPAN 32 FEET

Minor wordsmithing changes.

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	For SI: 1 inch = 25.4 mm, 1 ~~foot = 304.8 mm, 1~~ pound per square ~~foot~~ inch = ~~0.0479~~ 6.895 kPa, 1 pound per square foot = ~~304.8 mm, 0.0479 kPa~~. Grade 40 = 280 MPa, Grade 60 = 420 MPa. a. Where lintels are formed with screen-grid forms, form material shall be removed if necessary to create top and bottom flanges of the lintel that are not less than 5 inches in width and not less than 2.5 inches in depth (in the vertical direction). See Figure R608.8(4). ~~Flat form~~ Flat-form lintels shall be permitted in lieu of screen-grid lintels. See Tables R608.8(2) through R608.8(5). b. See Table R608.3 for tolerances permitted from nominal thickness and minimum dimensions and spacings of cores. c. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Notes m and o. Table values are based on uniform loading. See Section R608.7.2.1 for lintels supporting concentrated loads. d. Deflection criterion is *L*/240, where *L* is the clear span of the lintel in inches, or ~~1/2 inch,~~ 1/2 inch, whichever is less. e. Linear interpolation is permitted between ground snow loads. f. DR indicates design required. STL indicates stirrups required throughout lintel. g. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel. h. Stirrups shall be fabricated from reinforcing bars with the same yield strength as that used for the main longitudinal reinforcement. i. Stirrups are not required for lintels less than 24 inches in depth fabricated from screen-grid forms. Top and bottom reinforcement shall consist of a No. 4 bar having a yield strength of 40,000 psi or 60,000 psi. j. Lintels between 12 and 24 inches in depth with stirrups shall be formed from flat-wall forms [see Tables R608.8(2) through R608.8(5)], or form material shall be removed from screen-grid forms to provide a concrete section comparable to that required for a flat wall. Allowable spans for flat lintels with stirrups shall be determined from Tables R608.8(2) through R608.8(5). k. Where stirrups are required for ~~24-inch-deep~~ 24-inch-deep lintels, the spacing shall not exceed 12 inches on center. l. Allowable clear span without stirrups applicable to all lintels of the same depth, *D*. Top and bottom reinforcement for lintels without stirrups shall be not less than the least amount of reinforcement required for a lintel of the same depth and loading condition with stirrups. All other spans require stirrups spaced at not more than 12 inches. m. Where concrete with a minimum specified compressive strength of 3,000 psi is used, clear spans for lintels without stirrups shall be permitted to be multiplied by 1.05. If the increased span exceeds the allowable clear span for a lintel of the same depth and loading condition with stirrups, the top and bottom reinforcement shall be equal to or greater than that required for a lintel of the same depth and loading condition that has an allowable clear span that is equal to or greater than that of the lintel without stirrups that has been increased. n. Center distance, *A*, is the center portion of the span where stirrups are not required. This is applicable to all longitudinal bar sizes and steel yield strengths. o. Where concrete with a minimum specified compressive strength of 3,000 psi is used, center distance, *A*, shall be permitted to be multiplied by 1.10. p. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R608.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information only.		
	TABLE R608.8(9) **MAXIMUM ALLOWABLE CLEAR SPANS FOR FLAT LINTELS WITHOUT STIRRUPS IN NONLOAD-BEARING WALLS[a, b, c, d, e, g, h]** For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa, Grade 40 = 280 MPa, Grade 60 = 420 MPa. DR = Design Required. a. See Table R608.3 for tolerances permitted from nominal thickness. b. Table values are based on concrete with a minimum specified compressive strength of 2,500 psi. See Note e. c. Deflection criterion is *L*/240, where *L* is the clear span of the lintel in inches,or 1/2inch, whichever is less. d. Linear interpolation between lintels depths, *D*, is permitted provided the two cells being used to interpolate are shaded. e. Where concrete with a minimum specified compressive strength of 3,000 psi is used, spans in cells that are shaded shall be permitted to be multiplied by 1.05. f. Lintel depth, *D*, is permitted to include the available height of wall located directly above the lintel, provided that the increased lintel depth spans the entire length of the lintel. ~~g. DR indicates design required.~~ hg. The maximum clear opening width between two solid wall segments shall be 18 feet. See Section R608.7.2.1. Lintel spans in the table greater than 18 feet are shown for interpolation and information purposes only.		Minor wordsmithing changes.
	SECTION R609 **EXTERIOR WINDOWS AND DOORS** **R609.1 General.** This section prescribes performance and construction requirements for exterior windows and doors installed in walls. Windows and doors shall be installed ~~and flashed~~ in accordance with the fenestration manufacturer's written instructions. Window and door openings shall be flashed in accordance with **Section R703.4**. Written installation instructions shall be provided by the fenestration manufacturer for each window or door.		Minor wordsmithing changes.

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	R609.2 Performance. Exterior windows and doors shall be ~~designed to resist~~ capable of resisting the design wind loads specified in Table R301.2(2) adjusted for height and exposure in accordance with Table R301.2(3) or determined in accordance with ASCE 7 using the allowable stress design load combinations of ASCE 7. For exterior windows and doors tested in accordance with Sections R609.3 and R609.5, required design wind pressures determined from ASCE 7 using the ultimate strength design (USD) are permitted to be multiplied by 0.6. Design wind loads for exterior glazing not part of a labeled assembly shall be permitted to be determined in accordance with Chapter 24 of the International Building Code. Design wind loads for exterior glazing not part of a labeled assembly shall be permitted to be determined in accordance with Chapter 24 of the *International Building Code*.		Updates to base code requirements for window performance.
	R609.4.1 Garage door labeling. Garage doors shall be *labeled* with a permanent *label* provided by the garage door manufacturer. The *label* shall identify the garage door manufacturer, the garage door model/series number, the positive and negative design wind pressure rating, the installation instruction drawing reference number, and the applicable test standard.		New requirements for garage door labeling.
	R609.5 Other exterior window and door assemblies. Exterior windows and door assemblies not included within the scope of Section R609.3 or R609.4 shall be tested in accordance with ASTM ~~E 330.~~ E330. Glass in assemblies covered by this ~~exception~~ section shall comply with Section R308.5.		Minor wordsmithing changes.
	R609.6 ~~Wind-borne~~ Windborne debris protection. Protection of exterior ~~windows and~~ windows, glass doors and doors with glass in buildings located in ~~wind-borne~~ windborne debris regions shall be in accordance with Section R301.2.1.2.		Minor wordsmithing changes.
	R609.6.1 Fenestration testing and labeling. Fenestration shall be tested by an *approved* independent laboratory, listed by an *approved* entity, and bear a *label* identifying the manufacturer, performance characteristics~~,~~ and an *approved* inspection agency to indicate compliance with the requirements of the following specification(s): 1. ASTM ~~E 1886~~ E1886 and ASTM ~~E 1996;~~ E1996; or 2. AAMA 506.		Minor wordsmithing changes.
	R609.6.2 Impact protective systems-testing and labeling. Impact protective systems shall be tested for impact resistance by an approved independent laboratory for compliance with ASTM E1886 and ASTM E1996. Impact protective systems shall be tested for design wind pressure by an approved independent laboratory for compliance with ASTM E330. Required design wind pressures shall be determined in accordance with Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3) or determined in accordance with ASCE 7. For the purposes of this section, design wind pressures determined in accordance with ASCE 7 are permitted to be multiplied by 0.6.		New requirements for impact protective system testing and labeling.

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	Impact protective systems bear a label identifying the manufacturer, performance characteristics and an approved inspection agency. Impact protective systems shall have a permanent label providing traceability to the manufacturer, product designation and performance characteristics. The permanent label shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.		
	R609.7.2.1 Masonry, concrete or other structural substrate. Where the wood shim or buck thickness is less than 1 1/2 inches (38 mm), window and glass door assemblies shall be anchored through the jamb, or by jamb clip and anchors shall be embedded directly into the masonry, concrete or other substantial substrate material. Anchors shall adequately transfer load from the window or door frame into the rough opening substrate [see Figures R609.7.2(1) and ~~R6097.2(2)].~~ R609.7.2(2)]. Where the wood shim or buck thickness is 1 1/2 inches (38 mm) or more, the buck is securely fastened to the masonry, concrete or other substantial substrate, and the buck extends beyond the interior face of the window or door frame, window and glass door assemblies shall be anchored through the jamb, or by jamb clip, or through the flange to the secured wood buck. Anchors shall be embedded into the secured wood buck to adequately transfer load from the window or door frame assembly [see Figures R609.7.2(3), ~~R6097.2(4)~~ R609.7.2(4) and R609.7.2(5)].		Base code renumbering.
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 architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction having authority*.~~		**SECTION R610** **STRUCTURAL INSULATED PANEL WALL CONSTRUCTION** **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 architect or engineer responsible for design, unless otherwise required by the state law of the *jurisdiction* having authority.~~	No change to Houston amendment.
	R610.2 Applicability limits. The provisions of this section shall control the construction of exterior structural insulated panel walls and interior load-bearing structural insulated panel walls for buildings not greater than 60 feet (18 288 mm) in length perpendicular to the joist or truss span, not greater than 40 feet (12 192 mm) in width parallel to the joist or truss span and not greater than two stories in height with each wall not greater than 10 feet (3048 mm) high. Exterior walls installed in accordance with the provisions of this section shall be considered as load-bearing walls. Structural insulated panel walls constructed in accordance with the provisions of this section shall be limited to sites where the ultimate design wind speed (V_{ult}) is not greater than 155 miles per hour (69 m/s)~~,~~ in Exposure B or 140 miles per hour (63 m/s) in Exposure C, the ground snow load is not greater than 70 pounds per square foot (3.35 kPa), and the seismic design category is A, B or C.		Minor wordsmithing changes.

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	R610.3 Materials. SIPs shall comply with the ~~following criteria:~~ requirements of ANSI/APA PRS 610.1.		Updates to wall panel requirements in R610.3 and new reference standard.
	R610.3.1 ~~Core~~ Lumber. ~~The core material shall be composed of foam plastic insulation meeting one of the following requirements:~~The minimum lumber framing material used for SIPs prescribed in this document is NLGA graded No. 2 Spruce-pine-fir. Substitution of other wood species/grades that meet or exceed the mechanical properties and specific gravity of No. 2 Spruce-pine-fir shall be permitted. 1. ~~ASTM C 578 and have a minimum density of 0.90 pounds percubic feet kg/m3).~~ 2. ~~Polyurethane meeting the physical properties shown in Table R610.3.1.~~ 3. ~~An approved alternative.~~ 4. ~~All cores shall meet the requirements of Section R316.~~		Updates to wall panel requirements.
	R610.3.2 ~~Facing~~SIP screws. ~~Facing materials for SIPs shall be wood structural panels conforming to DOC PS 1 or DOC PS 2, each having a minimum nominal thickness of 7/16 inch (11 mm) and shall meet the additional minimum properties specified in Table R610.3.2. Facing shall be identified by a grade mark or certificate of inspection issued by an approved agency.~~ Screws used for the erection of SIPs as specified in Section R610.5 shall be fabricated from steel, shall be provided by the SIP manufacturer and shall be sized to penetrate the wood member to which the assembly is being attached by not less than 1 inch (25 mm). The screws shall be corrosion resistant and have a minimum shank diameter of 0.188 inch (4.7 mm) and a minimum head diameter of 0.620 inch (15.5 mm).		Updates to wall panel requirements.
	R610.3.3 ~~Adhesive~~Nails. ~~Adhesives used to structurally laminate the foam plastic insulation core material to the structural wood facers shall conform to ASTM D 2559 or approved alternative specifically intended for use as an adhesive used in the lamination of structural insulated panels. Each container of adhesive shall bear a label with the adhesive manufacturer's name, adhesive name and type and the name of the quality assurance agency~~Nails specified in Section R610 shall be common or galvanized box unless otherwise stated.		Updates to wall panel requirements.
	~~**R610.3.4 Lumber.** The minimum lumber framing material used for SIPs prescribed in this document is NLGA graded No. 2 Spruce-pine-fir. Substitution of other wood species/grades that meet or exceed the mechanical properties and specific gravity of No. 2 Spruce-pine-fir shall be permitted.~~		Base code removed.
	~~**R610.3.5 SIP screws.** Screws used for the erection of SIPs as specified in Section R610.5 shall be fabricated from steel, shall be provided by the SIP manufacturer and shall be sized to penetrate the wood member to which the assembly is being attached by not less than 1 inch (25 mm). The screws shall be corrosion resistant and have a minimum shank diameter of~~		Base code removed.

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	~~0.188 inch (4.7 mm) and a minimum head diameter of 0.620 inch (15.5 mm).~~		
	~~**R610.3.6 Nails.** Nails specified in Section R610 shall be common or galvanized box unless otherwise stated.~~		Base code removed.
	R610.3.2 ~~Facing~~SIP screws. ~~Facing materials for SIPs shall be wood structural panels conforming to DOC PS 1 or DOC PS 2, each having a minimum nominal thickness of 7/16 inch (11 mm) and shall meet the additional minimum properties specified in Table R610.3.2. Facing shall be identified by a grade mark or certificate of inspection issued by an approved agency.~~Screws used for the erection of SIPs as specified in Section R610.5 shall be fabricated from steel, shall be provided by the SIP manufacturer and shall be sized to penetrate the wood member to which the assembly is being attached by not less than 1 inch (25 mm). The screws shall be corrosion resistant and have a minimum shank diameter of 0.188 inch (4.7 mm) and a minimum head diameter of 0.620 inch (15.5 mm).		Updates to wall panel requirements.
	R610.4 SIP wall panels. SIPs shall comply with Figure R610.4 and shall have minimum panel thickness in accordance with Tables R610.5(1) and R610.5(2) for above-grade walls. SIPs shall be identified by grade mark or certificate of inspection issued by an *approved* agency in accordance with ANSI/APA PRS 610.1.		New reference standard for wall panels.
	~~**R610.4.1 Labeling.** Panels shall be identified by grade mark or certificate of inspection issued by an approved agency. Each (SIP) shall bear a stamp or label with the following minimum information:~~ ~~**1.** Manufacturer name/logo.~~ ~~**2.** Identification of the assembly.~~ ~~**3.** Quality assurance agency.~~		Base code removed.

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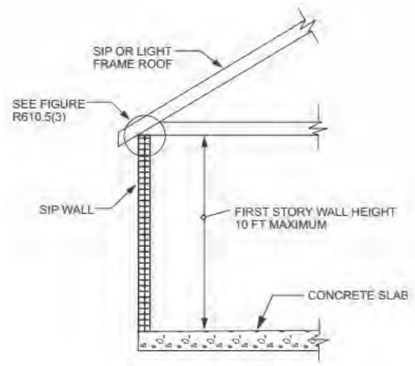
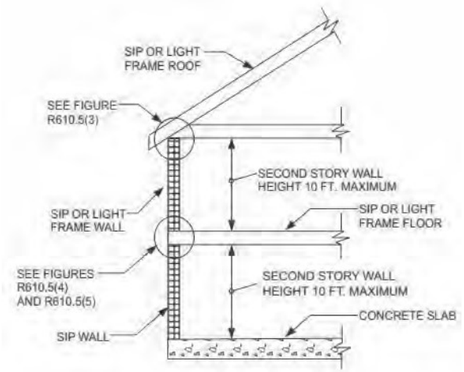
	 For SI: 1 foot = 304.8 mm. Note: Figure illustrates SIP-specific attachment requirements. Other connections shall be made in accordance with Tables R602.3(1) and (2), as appropriate. **FIGURE R610.5(1)** **MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS**		Minor updates to figure note.
	 For SI: 1 foot = 304.8 mm. Note: Figure illustrates SIP-specific attachment requirements. Other connections shall be made in accordance with Tables R602.3(1) and (2), as appropriate. **FIGURE R610.5(2)** **MAXIMUM ALLOWABLE HEIGHT OF SIP WALLS**		Minor updates to figure note.

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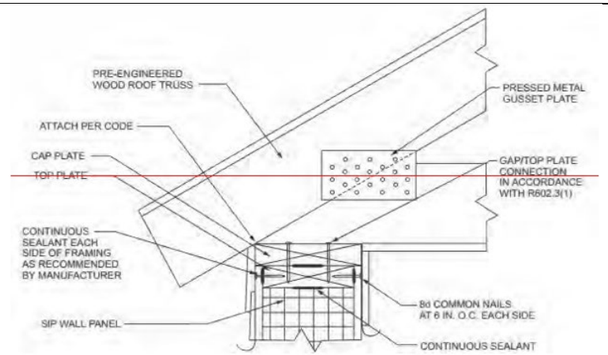

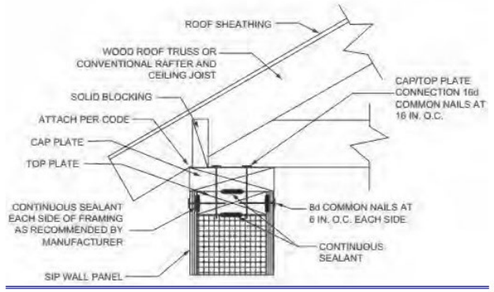

For SI: 1 inch = 25.4 mm.

Note: Figure illustrates SIP-specific attachment requirements. Other connections shall be made in accordance with Tables R602.3(1) and (2), as appropriate.

FIGURE R610.5(3)
TRUSSED ROOF TO TOP PLATE CONNECTION

Minor updates to figure note.

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TABLE R610.5(1)
MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP OR LIGHT-FRAME ROOF ONLY (inches)[a]

BUILDING WIDTH (ft)																	
ULTIMATE DESIGN WIND SPEED V_{ult} (mph)		GROUND SNOW LOAD (psf)	24			28			32			36			40		
Exp. B	Exp. C		Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)		
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
110	—	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	6.5
115	—	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
		50	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5
		70	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR
130	110	20	4.5	4.5	6.5	4.5	4.5	6.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR
		30	4.5	4.5	6.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR	4.5	4.5	DR
		50	4.5	4.5	DR	4.5	4.5	DR	4.5	4.5	DR	4.5	6.5	DR	4.5	DR	DR
		70	4.5	4.5	DR	4.5	DR	DR	4.5	DR	DR	4.5	DR	DR	DR	DR	DR
140	120	20	4.5	6.5	DR	4.5	6.5	DR	4.5	DR	DR	4.5	DR	DR	4.5	DR	DR
		30	4.5	6.5	DR	4.5	DR	DR	4.5	DR	DR	4.5	DR	DR	4.5	DR	DR
		50	4.5	DR	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
		70	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

DR = Design Required.

a. Design assumptions:
Maximum deflection criteria: L/240.
Maximum roof dead load: 10 psf.
Maximum roof live load: 70 psf.

Minor updates to table.

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TABLE R610.5(2)
MINIMUM THICKNESS FOR SIP WALL SUPPORTING SIP OR LIGHT-FRAME ONE STORY AND ROOF ONLY (inches)[a]

BUILDING WIDTH (ft)																			
ULTIMATE DESIGN WIND SPEED V_{ult} (mph)		GROUND SNOW LOAD (psf)	24			28			32			36			40		
Exp. B	Exp. C		Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)			Wall Height (feet)		
			8	9	10	8	9	10	8	9	10	8	9	10	8	9	10
110	—	20	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR
		30	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	6.5	DR
		50	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	DR	DR	DR	DR	DR
		70	4.5	4.5	6.5	4.5	4.5	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR
115	—	20	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR	4.5	DR	DR
		30	4.5	4.5	4.5	4.5	4.5	6.5	4.5	4.5	DR	4.5	6.5	DR	4.5	DR	DR
		50	4.5	4.5	6.5	4.5	4.5	DR	4.5	DR	DR	4.5	DR	DR	DR	DR	DR
		70	4.5	4.5	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
120	—	20	4.5	4.5	6.5	4.5	4.5	DR	4.5	4.5	DR	4.5	DR	DR	4.5	DR	DR
		30	4.5	4.5	DR	4.5	4.5	DR	4.5	6.5	DR	4.5	DR	DR	DR	DR	DR
		50	4.5	4.5	DR	4.5	DR	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR
		70	4.5	DR	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
130	110	20	4.5	6.5	DR	4.5	DR	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR
		30	4.5	DR	DR	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
		50	4.5	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
		70	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.

DR = Design Required.

a. Design assumptions:
Maximum deflection criteria: L/240.
Maximum roof dead load: 10 psf.
Maximum roof live load: 70 psf.
Maximum ceiling dead load: 5 psf.

Minor updates to table.

R610.5.1 Top plate connection. SIP walls shall be capped with a double top plate installed to provide overlapping at corner, intersections and splines in accordance with Figure R610.5.1. The double top plates shall be made up of a single 2 by (nominal 2-inch) top plate having a width equal to the width of the panel core, and shall be recessed into the SIP below. Over this top plate a cap plate shall be placed. The cap plate width shall match the SIP thickness and overlap the facers on both sides of the panel. End joints in top plates shall be offset not less than 24 inches (610 mm).

Minor wordsmithing change.

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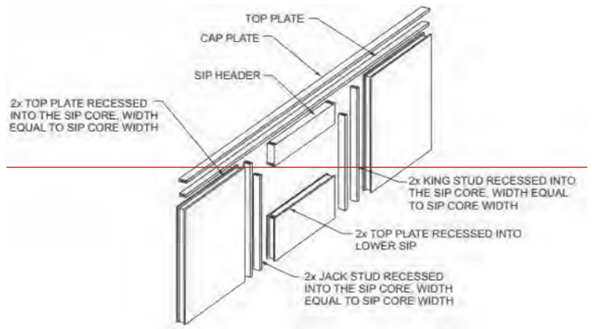

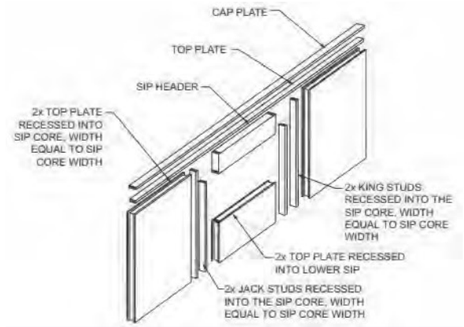

For SI: 1 inch = 25.4 mm.

Notes:

1. Top plates shall be continuous over header.
2. Lower 2x top plate shall have a width equal to the SIP core width and shall be recessed into the top edge of the panel. Cap plate shall be placed over the recessed top plate and shall have a width equal to the SIPs width.
3. SIP facing surfaces shall be nailed to framing and cripples with 8d common or galvanized box nails spaced 6 inches on center.
4. ~~**Galvanized nails shall be hot dipped or tumbled. Framing shall be attached in accordance to Section R602.3(1) unless otherwise provide for in Section R610.**~~

Minor change to figure notes.

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	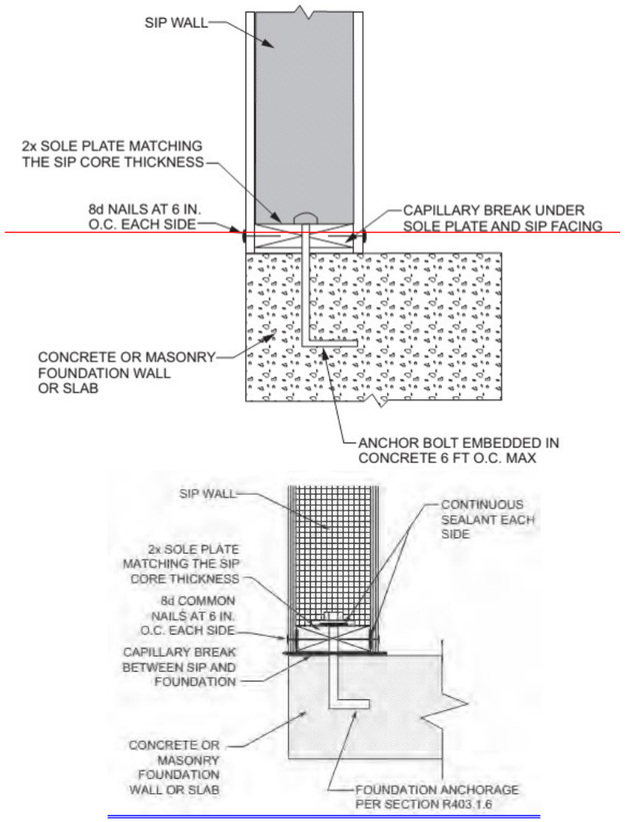 For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm. **FIGURE R610.5.2** **SIP WALL TO CONCRETE SLAB FOR FOUNDATION WALL ATTACHMENT**		Minor change to figure notes.
	R610.5.3 ~~Wall bracing~~ Panel-to-panel connection. ~~SIP walls shall be braced in accordance with Section R602.10. SIP walls shall be considered continuous wood structural panel sheathing for purposes of computing required bracing. SIP walls shall meet the requirements of Section R602.10.4.2 except that SIP corners shall be fabricated as shown in Figure R610.9. Where SIP walls are used for wall bracing, the SIP bottom plate shall be attached to wood framing below in accordance with Table R602.3(1)~~SIPs shall be connected at vertical in-plane joints in accordance with Figure R610.8 or by other *approved* methods.		New panel-to-panel connection requirements, wall bracing requirements relocated.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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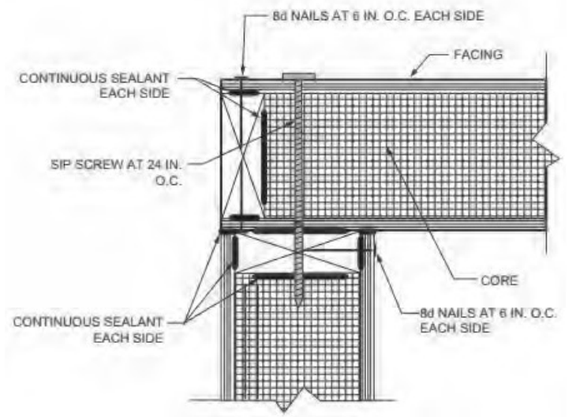
	R610.5.4 Corner framing. Corner framing of SIP walls shall be constructed in accordance with Figure R610.5.4.		New corner framing requirements.
	 **FIGURE R610.5.4** **SIP CORNER FRAMING DETAIL**		New corner framing figure.
	R610.5.5 Wall bracing. SIP walls shall be braced in accordance with Section R602.10. SIP walls shall be considered continuous wood structural panel sheathing (bracing Method CS-WSP) for purposes of computing required bracing. SIP walls shall meet the requirements of Section R602.10.4.2 except that SIP corners shall be fabricated as shown in Figure R610.8. Where SIP walls are used for wall bracing, the SIP bottom plate shall be attached to wood framing below in accordance with Table R602.3(1).		Base code renumbering.
	R610.5.6 Thermal barrier. SIP walls shall be separated from the interior of a building by an *approved* thermal barrier in accordance with Section R316.4.		Base code renumbering.
	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~~. A maximum of~~Not more than 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 48 inches (1220 mm) plus or minus 2 inches (51 mm) from the bottom edge of the SIP~~'~~s panel. Additional penetrations are permitted where justified by analysis.		Minor wordsmithing changes.

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<table>
<tr>
<td></td>
<td>
R610.8 ~~Connection Headers~~. ~~SIPs shall be connected at vertical inplane joints in accordance with Figure R610.8 or by other approved methods.~~SIP headers shall be designed and constructed in accordance with Table R610.8 and Figure R610.5.1. SIP headers shall be continuous sections without splines. Headers shall be not less than 11 7/8 inches (302 mm) deep. Headers longer than 4 feet (1219 mm) shall be constructed in accordance with Section R602.7. The strength axis of the factors on the header shall be oriented horizontally.
</td>
<td></td>
<td>Header requirements recloated.</td>
</tr>
<tr>
<td></td>
<td>
TABLE R610.~~10~~8
MAXIMUM SPANS FOR 11⁷/₈-INCH-~~DEEP~~OR DEEPER SIP HEADERS (feet)[a] [c, d]
<table>
<tr><th rowspan="2">LOAD CONDITION</th><th rowspan="2">SNOW LOAD (psf)</th><th colspan="5">BUILDING[b] width (feet)</th></tr>
<tr><th>24</th><th>28</th><th>32</th><th>36</th><th>40</th></tr>
<tr><td rowspan="4">Supporting roof only</td><td>20</td><td>4</td><td>4</td><td>4</td><td>4</td><td>2</td></tr>
<tr><td>30</td><td>4</td><td>4</td><td>4</td><td>2</td><td>2</td></tr>
<tr><td>50</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>70</td><td>2</td><td>2</td><td>2</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td></tr>
<tr><td rowspan="4">Supporting roof and one-story</td><td>20</td><td>2</td><td>2</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td></tr>
<tr><td>30</td><td>2</td><td>2</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td></tr>
<tr><td>50</td><td>2</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td></tr>
<tr><td>70</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td><td>~~N/A~~DR</td></tr>
</table>
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
~~N/A~~DR = ~~Not Applicable.~~Design Required.
a. Design assumptions:
Maximum deflection criterion: L/~~360~~240
Maximum roof dead load: 10 psf.
Maximum ceiling load: 5 psf.
Maximum ceiling live load: 20 psf
Maximum second-floor live load: 30 psf.
Maximum second-floor dead load: 10 psf.
Maximum second-floor dead load from walls: 10 psf.
Maximum first floor dead load: 10 psf
Wind loads based on Table R301.2(2).
Strength axis of facing material applied horizontally.
b. Building width is in the direction of horizontal framing members supported by the header.
c. The table provides for roof slopes between 3:12 and 12:12.
d. The maximum roof overhang is 24 inches (610 mm).
</td>
<td></td>
<td>Updates to base code table and notes.</td>
</tr>
</table>

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	TABLE R610.8 **MAXIMUM SPANS FOR 11 7/8-INCH OR DEEPER SIP HEADERS (feet)[a, c, d]**		

LOAD CONDITION	GROUND SNOW LOAD (psf)	BUILDING[b] width (feet)				
		24	28	32	36	40
Supporting roof only	20	4	4	4	4	2
	30	4	4	4	2	2
	50	2	2	2	2	2
	70	2	2	2	DR	DR
Supporting roof and one-story	20	2	2	DR	DR	DR
	30	2	2	DR	DR	DR
	50	2	DR	DR	DR	DR
	70	DR	DR	DR	DR	DR

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

DR = Design Required.

a. Design assumptions:

Maximum deflection criterion: L/240.
Maximum roof dead load: 10 psf.
Maximum ceiling load: 5 psf.
Maximum ceiling live load: 20 psf
Maximum second-floor live load: 30 psf.
Maximum second-floor dead load: 10 psf.
Maximum second-floor dead load from walls: 10 psf.
Maximum first floor dead load: 10 psf.
Wind loads based on **Table R301.2.1(1)**.
Strength axis of facing material applied horizontally.

b. Building width is in the direction of horizontal framing members supported by the header.

c. The table provides for roof slopes between 3:12 and 12:12.

d. The maximum roof overhang is 24 inches (610 mm).

	R610.8.1 Wood structural panel box headers. Wood structural panel box headers shall be allowed where SIP headers are not applicable. Wood structural panel box headers shall be constructed in accordance with Figure R602.7.3 and Table R602.7.3.		Wood panel box requirements relocated.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments	2021 IRC – Chapter 7 – Wall Covering	2021 Houston IRC Amendments	Code Change Summary
	TABLE R702.1(3) **CEMENT PLASTER PROPORTIONS, PARTS BY VOLUME**		Updates to base code table.

COAT	CEMENT PLASTER TYPE	CEMENTITIOUS MATERIALS: Portland Cement Type I, II or III; ~~or~~ Blended Hydraulic Cement Type IP, I (~~PM~~S ≤ 70), ~~IS~~ or IT (~~SM~~≤ 70); or Hydraulic Cement Type GU, HE, MS, HS or MH	CEMENTITIOUS MATERIALS: Plastic Cement	CEMENTITIOUS MATERIALS: Masonry Cement Type M, S or N	CEMENTITIOUS MATERIALS: Lime	VOLUME OF AGGREGATE PER SUM OF SEPARATE VOLUMES OF CEMENTITIOUS MATERIALS[b]
First	Portland or blended	1			3/4 - 1 1/2[a]	2 1/2 - 4
	Masonry			1		2 1/2 - 4
	Plastic		1			2 1/2 - 4
Second	Portland or blended	1			3/4 - 1 1/2	3 - 5
	Masonry			1		3 - 5
	Plastic		1			3 - 5
Finish	Portland or blended	1			3/4 - 2	1 1/2 - 3
	Masonry			1		1 1/2 - 3
	Plastic		1			1 1/2 - 3

For SI: 1 inch = 25.4 mm, 1 pound = 0.454 kg.

a. Lime by volume of 0 to 3/4 shall be used where the plaster will be placed over low-absorption surfaces such as dense clay tile or brick.

b. The same or greater sand proportion shall be used in the second coat than used in the first coat.

	R702.2.1 Gypsum plaster. Gypsum plaster materials shall conform to ASTM ~~C 5, C 22, C 28, C 35, C 59, C 61, C 587, C 631, C 847, C 933, C 1032~~ C5, C22, C28, C35, C59, C61, C587, C631, C847, C933, C1032 and ~~C 1047,~~ C1047, and shall be installed or applied in compliance with ASTM ~~C 843~~ C841, C842 and ~~C 844~~ C843. Gypsum lath or gypsum base for veneer plaster shall conform to ASTM ~~C 1396.~~C1396 and shall be installed in compliance with ASTM C844. Plaster shall be not less than three coats where applied over metal lath and not less than two coats where applied over other bases permitted by this section, except that veneer plaster shall be applied in one coat not to exceed 3/16 inch (4.76 mm) thickness, provided the total thickness is in accordance with Table R702.1(1).		Minor wordsmithing changes.
	R702.2.2 Cement plaster. Cement plaster materials shall conform to ASTM ~~C 91~~ C91 (Type M, S or N), ~~C 150~~ C150 (Types I, II and III), ~~C 595~~ C595 [Types IP, I (PM), IS and I (SM), ~~C 847, C 897, C 926, C 933, C 1032, C 1047~~C847, C897, C933, C1032, C1047 and ~~C 1328,~~ C1328, and shall be installed or applied in compliance with ASTM ~~C 1063.~~ C926 and C1063.		Minor wordsmithing changes.

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	Gypsum lath shall conform to ASTM ~~C 1396~~C1396. Plaster shall be not less than three coats where applied over metal lath and not less than two coats where applied over other bases permitted by this section~~, except that veneer plaster shall be applied in one coat not to exceed 3/16 inch (4.76 mm) thickness, provided the total thickness is in accordance with Table R702.1(1).~~		
	R702.3.1.1 Adhesives. Expandable foam adhesives for the installation of gypsum board and gypsum panel products shall conform to ASTM C6464. Other adhesives for the installation of gypsum board and gypsum panel products shall conform to ASTM C557. Supports and fasteners used to attach gypsum board and gypsum panel products shall comply with Table R702.3.5 or other approved method.		New section for foam adhesives for panels.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R702.3.5
MINIMUM THICKNESS AND APPLICATION OF GYPSUM BOARD AND GYPSUM PANEL PRODUCTS

THICKNESS OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS (inches)	APPLICATION	ORIENTATION OF GYPSUM BOARD OR GYPSUM PANEL PRODUCTS TO FRAMING	MAXIMUM SPACING OF FRAMING MEMBERS (inches o.c.)	MAXIMUM SPACING OF FASTENERS (inches)		SIZE OF NAILS FOR APPLICATION TO WOOD FRAMING[c]
				Nails[a]	Screws[b]	
Application without adhesive						
3/8	Ceiling[d]	Perpendicular	16	7	12	13 gage, 1 1/4" long, 19/64" head; 0.098" diameter, 1 1/4" long, ~~annular-ringed~~ring shank; or 4d cooler nail, 0.080" diameter, 1 3/8" long, 7/32" head.
	Wall	Either direction	16	8	16	
1/2	Ceiling	Either direction	16	7	12	13 gage, 1 3/8" long, 19/64" head; 0.098" diameter, 1 1/4" long, ~~annular-ringed~~ring shank; 5d cooler nail, 0.086" diameter, 1 5/8" long, 15/64" head; or gypsum board nail, 0.086" diameter, 1 5/8" long, 9/32" head.
	Ceiling[d]	Perpendicular	24	7	12	
	Wall	Either direction	24	8	12	
	Wall	Either direction	16	8	16	

Minor updates to table.

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$^5/_8$	Ceiling	Either direction	16	7	12	13 gage, $1^5/_8$" long, $^{19}/_{64}$" head; 0.098" diameter, $1^3/_8$" long, ~~annular-ringed~~ring shank; 6d cooler nail, 0.092" diameter, $1^7/_8$" long, $^1/_4$" head; or gypsum board nail, 0.0915" diameter, $1^7/_8$" long, $^{19}/_{64}$" head.
	Ceiling	Perpendicular	24	7	12	
	Type X at garage ceiling beneath habitable rooms	Perpendicular	24	6	6	$1^7/_8$" long ~~6d coated~~0.099" diameter galvanized nails or equivalent drywall screws. Screws shall comply with **Section R702.3.5.1**.
	Wall	Either direction	24	8	12	13 gage, $1^5/_8$" long, $^{19}/_{64}$" head; 0.098" diameter, $1^3/_8$" long, ~~annular-ringed~~ring shank; 6d cooler nail, 0.092" diameter, $1^7/_8$" long, $^1/_4$" head; or gypsum board nail, 0.0915" diameter, $1^7/_8$" long, $^{19}/_{64}$" head.
	Wall	Either direction	16	8	16	
Application with adhesive						
$^3/_8$	Ceiling[d]	Perpendicular	16	16	16	Same as above for $^3/_8$" gypsum board and gypsum panel products.
	Wall	Either direction	16	16	24	

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1/2 or 5/8	Ceiling	Either direction	16	16	16	Same as above for 1/2" and 5/8" gypsum board and gypsum panel products, respectively.
	Ceiling[d]	Perpendicular	24	12	16	
	Wall	Either direction	24	16	24	
Two 3/8 layers	Ceiling	Perpendicular	16	16	16	Base ply nailed as above for 1/2" gypsum board and gypsum panel products; face ply installed with adhesive.
	Wall	Either direction	24	24	24	

For SI: 1 inch = 25.4 mm.

a. For application without adhesive, a pair of nails spaced not less than 2 inches apart or more than 2 1/2 inches apart shall be permitted to be used with the pair of nails spaced 12 inches on center.
b. Screws shall be in accordance with **Section R702.3.5.1**. Screws for attaching gypsum board or gypsum panel products to structural insulated panels shall penetrate the wood structural panel facing not less than 7/16 inch.
c. Where cold-formed steel framing is used with a clinching design to receive nails by two edges of metal, the nails shall be not less than 5/8 inch longer than the gypsum board or gypsum panel product thickness and shall have ringed shanks. Where the cold-formed steel framing has a nailing groove formed to receive the nails, the nails shall have barbed shanks or be ~~5d, 13 1/2 gage~~0.086-inch diameter, 1 5/8 inches long, 15/64-inch head for 1/2-inch gypsum board or gypsum panel product; and~~6d, 13 gage~~ 0.099-inch diameter, 1 7/8 inches long, 15/64-inch head for 5/8-inch gypsum board or gypsum panel product.
d. Three-eighths-inch-thick single-ply gypsum board or gypsum panel product shall not be used on a ceiling where a water-based textured finish is to be applied, or where it will be required to support insulation above a ceiling. On ceiling applications to receive a water-based texture material, either hand or spray applied, the gypsum board or gypsum panel product shall be applied perpendicular to framing. Where applying a water-based texture material, the minimum gypsum board thickness shall be increased from 3/8 inch to 1/2 inch for 16-inch on center framing, and from 1/2 inch to 5/8 inch for 24-inch on center framing or 1/2-inch sag-resistant gypsum ceiling board shall be used.

R702.7 Vapor retarders. ~~Class I or II vapor retarders are required on the interior side of frame walls in Climate Zones 5, 6, 7, 8 and Marine 4.~~Vapor retarder materials shall be classified in accordance with **Table R702.7(1)**. A vapor retarder shall be provided on the interior side of frame walls of the class indicated in **Table R702.7(2)**, including compliance with **Table R702.7(3)** or **R702.7(4)** where applicable. An *approved* design using accepted engineering practice for hygrothermal analysis shall be permitted as an alternative. The climate zone shall be determined in accordance with **Section N1101.7** .

Exceptions:

1. *Basement walls*.
2. Below-grade portion of any wall.
3. Construction where accumulation, condensation ~~moisture~~ or ~~its~~ freezing of moisture will not damage the materials.
4. A vapor retarder shall not be required in Climate Zones 1, 2 and 3.

Update vapor retarder requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
	TABLE R702.7(1) **VAPOR RETARDER MATERIALS AND CLASSES** **CLASS** | **ACCEPTABLE MATERIALS** I | Sheet polyethylene, nonperforated aluminum foil or other approved materials with a perm rating less than or equal to 0.1. II | Kraft-faced fiberglass batts, vapor retarder paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0. III | Latex paint, enamel paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 1.0 and less than or equal to 10.0.		New table for vapor retarder requirements.
	TABLE R702.7(2) **VAPOR RETARDER OPTIONS** **CLIMATE ZONE** | **VAPOR RETARDER CLASS**: CLASS I[a] | CLASS II[a] | CLASS III 1, 2 | Not Permitted | Not Permitted | Permitted 3, 4 (except Marine 4) | Not Permitted | Permitted[c] | Permitted Marine 4, 5, 6, 7, 8 | Permitted[b] | Permitted[c] | See **Table R702.7(3)** a. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by **ASTM E96** water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones. b. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design. c. Where a Class II vapor retarder is used in combination with foam plasticinsulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with **Table R702.7(4)** and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by **ASTM E96** water method (Procedure B).		New table for vapor retarder requirements.

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~~TABLE R702.7.1~~TABLE R702.7(3)
CLASS III VAPOR RETARDERS

CLIMATE ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR:[a, b]
Marine 4	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with *R*-value ≥ 2.5 over 2 × 4 wall.
	Continuous insulation with *R*-value ≥ 3.75 over 2 × 6 wall.
5	Vented cladding over wood structural panels.
	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with *R*-value ≥ 5 over 2 × 4 wall.
	Continuous insulation with *R*-value ≥ 7.5 over 2 × 6 wall.
6	Vented cladding over fiberboard.
	Vented cladding over gypsum.
	Continuous insulation with *R*-value ≥ 7.5 over 2 × 4 wall.
	Continuous insulation with *R*-value ≥ 11.25 over 2 × 6 wall.
7 ~~and 8~~	Continuous insulation with *R*-value ≥ 10 over 2 × 4 wall.
	Continuous insulation with *R*-value ≥ 15 over 2 × 6 wall.
8	Continuous insulation with *R*-value ≥ 12.5 over 2 × 4 wall. Continuous insulation with *R*-value ≥ 20 over 2 × 6 wall.

a. ~~Spray foam with a maximum permeance of 1.5 perms at the installed thickness, applied to the interior cavity side of wood structural panels, fiberboard, insulating sheathing or gypsum is deemed to meet the continuous insulation requirement where the spray foam *R*-value meets or exceeds the specified continuous insulation *R*-value.~~Vented cladding shall include vinyl, polypropylene, or horizontal aluminum siding, brick veneer with a clear airspace as specified in **Table R703.8.4(1)**, and other approved vented claddings.
b. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class III vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of **Chapter 11**.

Updates to vapor retarder table.

TABLE R702.7(4)
CONTINUOUS INSULATION WITH CLASS II VAPOR RETARDER

CLIMATE ZONE	CLASS II VAPOR RETARDERS PERMITTED FOR:[a]
3	Continuous insulation with *R*-value ≥ 2.
4, 5 and 6	Continuous insulation with *R*-value ≥ 3 over 2 × 4 wall. Continuous insulation with *R*-value ≥ 5 over 2 × 6 wall.
7	Continuous insulation with *R*-value ≥ 5 over 2 × 4 wall. Continuous insulation with *R*-value ≥ 7.5 over 2 × 6 wall.
8	Continuous insulation with *R*-value ≥ 7.5 over 2 × 4 wall. Continuous insulation with *R*-value ≥ 10 over 2 × 6 wall.

a. The requirements in this table apply only to insulation used to control moisture in order to permit the use of Class II vapor retarders. The insulation materials used to satisfy this option also contribute to but do not supersede the thermal envelope requirements of **Chapter 11**.

New table for vapor retarder requirements.

R702.7.1 ~~Class III vapor retarders.~~ Spray foam plastic insulation for moisture control with Class II and III vapor retarders. ~~Class III vapor retarders shall be permitted where any one of the conditions in TABLE R702.7(3) is met.~~ For purposes of compliance with **Tables R702.7(3)** and **R702.7(4)**, spray foam with a maximum permeance of 1.5 perms at the installed thickness applied to the interior side of wood structural panels, fiberboard, *insulating sheathing* or gypsum shall be deemed to meet the continuous insulation moisture control requirement in accordance with one of the following conditions:

New spray foam vapor retarder requirements.

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	1. The spray foam *R*-value is equal to or greater than the specified continuous insulation *R*-value. 2. The combined *R*-value of the spray foam and continuous insulation is equal to or greater than the specified continuous insulation *R*-value.		
	~~**R702.7.2 Material vapor retarder class.** The *vapor retarder class* shall be based on the manufacturer's certified testing or a tested assembly.~~ ~~The following shall be deemed to meet the class specified:~~ ~~1. Class I: Sheet polyethylene, on perforated aluminum foil.~~ ~~2. Class II: Kraft-faced fiberglass batts.~~ ~~3. Class III: Latex or enamel paint.~~		Base code section removed.
	~~**R702.7.3 Minimum clear airspaces and vented openings for vented cladding.** For the purposes of this section, vented cladding shall include the following minimum clear airspaces. Other openings with the equivalent vent area shall be permitted.~~ ~~1. Vinyl polypropylene or horizontal aluminum siding applied over a weatherresistive barrier as specified in **Table R703.3(1)**.~~ ~~2. Brick veneer with a clear airspace as specified in **Table R703.8.4(1)**.~~ ~~3. Other approved vented claddings.~~		No Houston amendment.
	R703.1.1 Water resistance. The exterior wall envelope shall be designed and constructed in a manner that prevents the accumulation of water within the wall assembly by providing a water-resistant barrier behind the exterior ~~veneer~~ cladding as required by Section R703.2 and a means of draining to the exterior water that ~~enters~~ penetrates the assembly. Protection against condensation in the exterior wall assembly shall ~~be provided in accordance with Section R702.7 of this code.~~ cladding. **Exceptions:** 1. A weather-resistant exterior wall envelope shall not be required over concrete or masonry walls designed in accordance with Chapter 6 and flashed in accordance with Section R703.4 or R703.8. 2. Compliance with the requirements for a means of drainage, and the requirements of Sections R703.2 and R703.4, shall not be required for an exterior wall envelope that has been demonstrated to resist wind-driven rain through testing of the exterior wall envelope, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM ~~E 331~~ E331 under the following conditions: 2.1. Exterior wall envelope test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.		Minor updates and wordsmithing changes.

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	2.2. Exterior wall envelope test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size. 2.3. Exterior wall assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (299 Pa). 2.4. Exterior wall envelope assemblies shall be subjected to the minimum test exposure for a minimum of 2 hours. The exterior wall envelope design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the exterior wall envelope, joints at the perimeter of openings penetration or intersections of terminations with dissimilar materials.		
	R703.1.2 Wind resistance. Wall coverings, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3). Wind-pressure resistance of the-siding, soffit and backing materials shall be determined by ASTM ~~E 330~~E330 or other applicable standard test methods. Where wind-pressure resistance is determined by design analysis, data from approved design standards and analysis conforming to generally accepted engineering practice shall be used to evaluate the-siding, soffit and backing material and its fastening. All applicable failure modes including bending rupture of siding, fastener withdrawal and fastener head pull-through shall be considered in the testing or design analysis. Where the wall covering, soffit and ~~the~~ backing material resist wind load as an assembly, use of the design capacity of the assembly shall be permitted.		Minor wordsmithing changes.
	R703.2 Water-resistive barrier. ~~One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other *approved water-resistive barrier* shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.~~Not fewer than one layer of *water-resistive barrier* shall be applied over studs or sheathing of all exterior walls with flashing as indicated in **Section R703.4**, in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer. The water-resistive barrier material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in **Section R703.1**. Water-resistive barrier materials shall comply with one of the following:		Updated requirements for water-resistive barriers.

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	1. No. 15 felt complying with ASTM D226, Type 1. 2. ASTM E2568, Type 1 or 2. 3. ASTM E331 in accordance with Section R703.1.1. 4. Other approved materials in accordance with the manufacturer's installationinstructions. No.15 asphalt felt and *water-resistive barriers* complying with **ASTM E2556** shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm), and where joints occur, shall be lapped not less than 6 inches (152 mm). ~~The water-resistive barrier is not required for detached accessory buildings.~~		
	R703.3 ~~Nominal~~ Wall covering nominal thickness and attachments.		Minor wordsmithing changes.
	~~**TABLE R703.3.1**~~ ~~**LIMITS FOR ATTACHMENT PER TABLE R703.3(1)**~~ ~~MAXIMUM MEAN ROOF HEIGHT~~ ~~Ultimate Wind Speed (mph 3-second gust) / 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.~~		Base code table removed.
	R703.3.1 ~~Wind limitations.~~Soffit installation. ~~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 m2).~~ Soffits shall comply with **Section R704** ~~R703.3.1.1, Section R703.3.1.2 or the manufacturer's installation instructions~~.		Base code section relocated and new soffit requirements provided.
	~~**R703.3.1.1 Wood structural panel soffit.** The minimum nominal thickness for wood structural panel soffits shall be 3/8 inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm × 2.5 mm) nails. Fasteners shall be in spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.~~		Base code section removed and relocated.

	~~**R703.3.1.2 Vinyl soffit panels.** Soffit panels shall be fastened at fascia and wall ends and to intermediate nailing strips as necessary to ensure that there is no unsupported span greater than 16 inches (406 mm), or as specified by the manufacturer's instructions.~~		Base code section removed and relocated.
	R~~703.3.1~~703.3.2 Wind limitations. Where the design wind pressure exceeds 30 psf or where the limits of Table R703.3.1~~2~~ are exceeded, the attachment of wall coverings and soffits shall be designed to resist the component and cladding loads specified in Table R301.2(2) for walls, adjusted for height and exposure in accordance with Table R301.2(3). For the determination of wall covering and soffit attachment, component and cladding loads shall be determined using an effective wind area of 10 square feet (0.93 m2).		Base code renumbering and minor wordsmithing changes.
	TABLE R703.3.2 LIMITS FOR ATTACHMENT PER Table R703.3(1) MAXIMUM MEAN ROOF HEIGHT Ultimate Wind Speed (mph 3-second gust) / Exposure: B, C, D 95: NL, NL, NL 100: NL, NL, NL 105: NL, NL, NL 110: NL, NL, 40′ 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 R703.3.2**, DR = Design Required.		Updates to base code table.
	R~~703.3.2~~703.3.3 Fasteners. Exterior wall coverings and roof overhang soffits 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 ~~F 1667~~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 R703.3.3.		Base code renumbering and minor wordsmithing changes.
	R~~703.3.3~~703.3.4 Minimum fastener length and penetration.		Base code renumbering.

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	R703.4 Flashing. *Approved* corrosion-resistant flashing shall be applied *shingle-fashion* in a manner to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with **AAMA 711**. Fluid-applied membranes used as flashing in exterior walls shall comply with **AAMA 714**. The flashing shall extend to the surface of the exterior wall finish. *Approved* corrosion-resistant flashings shall be installed at the following locations: 1. Exterior window and door openings. Flashing at exterior window and door openings shall be installed in accordance with **Section R703.4.1**. ~~extend to the surface of the exterior wall finish or to the water-resistive barrier complying with Section 703.2 for subsequent drainage. Mechanically attached flexible flashings shall comply with AAMA 712. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:~~ ~~1.1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, pan flashing shall be installed at the sill of exterior window and door openings. Pan flashing shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using pan flashing shall incorporate flashing or protection at the head and sides.~~ ~~1.2. In accordance with the flashing design or method of a registered design professional.~~ ~~1.3. In accordance with other approved methods.~~ 2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings. 3. Under and at the ends of masonry, wood or metal copings and sills. 4. Continuously above all projecting wood *trim*. 5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood frame construction. 6. At wall and roof intersections. 7. At built-in gutters.		Updates to flashing requirements.
	R703.4.1 Flashing installation at exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to a *water-resistive barrier* complying with **Section 703.2** for subsequent drainage. Air sealing shall be installed around all window and door openings on the interior side of the rough opening gap. Mechanically attached flexible flashings shall comply with **AAMA 712**. Flashing at exterior window and door openings shall be installed in accordance with one or more of the following:		New flashing installation requirements.

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	1. The fenestration manufacturer's installation and flashing instructions, or for applications not addressed in the fenestration manufacturer's instructions, in accordance with the flashing manufacturer's instructions. Where flashing instructions or details are not provided, *pan flashing* shall be installed at the sill of exterior window and door openings. *Pan flashing* shall be sealed or sloped in such a manner as to direct water to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage. Openings using *pan flashing* shall incorporate flashing or protection at the head and sides. 2. In accordance with the flashing design or method of a *registered design professional*. 3. In accordance with other *approved* methods.		
	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 **ANSI A135.5**. ~~Hardboard siding used as architectural trim shall comply with CPA/ANSI A 135.7.~~		Updated reference standard for panel siding.
	R703.5.2 Panel siding. ~~3/8 inch~~ Three-eighths-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 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 shiplapped or covered with a batten. Horizontal joints in panel siding shall be lapped not less than 1 inch (25 mm) or shall be shiplapped or flashed with Z-flashing and occur over solid blocking, wood or wood structural panel sheathing.		Minor wordsmithing changes.
	R703.6 Wood shakes and shingles. Wood shakes and shingles shall conform to CSSB ~~Grading Rules for Wood Shakes and Shingles.~~		Minor wordsmithing changes.
	R703.6.3 Attachment. Wood shakes or shingles shall be installed according to this chapter and the manufacturer's instructions. Each shake or shingle shall be held in place by two stainless steel Type 304, Type 316 or hot-dipped zinc-coated galvanized corrosion-resistant box nails in accordance with Table R703.6.3(1) or R703.6.3(2). The hot-dipped zinc-coated galvanizing shall ~~conform to minimum standard~~ be in compliance with ASTM ~~A 153D~~A153, 1.0 ounce per square foot. Alternatively, 16-gage stainless steel Type 304 or Type		Minor wordsmithing changes.

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316 staples with crown widths 7/16 inch (11 mm) minimum, 3/4 inch (19 mm) maximum, shall be used and the crown of the staple shall be placed parallel with the butt of the shake or the shingle. In single-course application, the fasteners shall be concealed by the course above and shall be driven approximately 1 inch (25 mm) above the butt line of the succeeding course and 3/4 inch (19 mm) from the edge. In double-course applications, the exposed shake or shingle shall be face-nailed with two fasteners, driven approximately 2 inches (51 mm) above the butt line and 3/4 inch (19 mm) from each edge. Fasteners installed within 15 miles (24 km) of salt water coastal areas shall be stainless steel Type 316.

Fasteners for fire-retardant-treated shakes or shingles in accordance with Section R902 or pressure-impregnated-preservative-treated shakes or shingles in accordance with AWPA U1 shall be stainless steel Type 316. The fasteners shall penetrate the sheathing or furring strips by not less than 1/2 inch (13 mm) and shall not be overdriven. Fasteners for untreated (natural) and treated products shall comply with ASTM ~~F 1667~~ **F1667**.

TABLE R703.6.3(1)
SINGLE-COURSE SIDEWALL FASTENERS

SINGLE-COURSE SIDEWALL FASTENERS			
Product type	**Nail type and minimum length (inches)**	**Minimum head diameter (inches)**	**Minimum shank thickness (inches)**
R & R and sanded shingles	~~Type~~		
16□ and 18□ shingles	3d box $1^1/_4$	0.19	0.08
24□ shingles	4d box $1^1/_2$	0.19	0.08
Grooved shingles	~~Type~~		
16□ and 18□ shingles	3d box $1^1/_4$	0.19	0.08
24□ shingles	4d box $1^1/_2$	0.19	0.08
Split and sawn shakes	~~Type~~		
18□ straight-split shakes	5d box $1^3/_4$	0.19	0.08
18□ and 24□ handsplit shakes	6d box 2	0.19	0.0915
24□ tapersplit shakes	5d box $1^3/_4$	0.19	0.08
18□ and 24□ tapersawn shakes	6d box 2	0.19	0.0915

For SI: 1 inch = 25.4 mm.

Minor updates to base code table.

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<table>
<tr>
<td></td>
<td>
TABLE R703.6.3(1)
SINGLE-COURSE SIDEWALL FASTENERS
<table>
<tr><th colspan="4">~~SINGLE-COURSE SIDEWALL FASTENERS~~</th></tr>
<tr><th>PRODUCT TYPE</th><th>NAIL TYPE, ~~and~~ MINIMUM LENGTH AND SHANK DIAMETER (inches)</th><th>~~Minimum head diameter(inches)~~</th><th>~~Minimum shank thickness(inches)~~</th></tr>
<tr><td colspan="4">R & R and sanded shingles</td></tr>
<tr><td>16″ and 18″ shingles</td><td>3d box 1 $^1/_4$ × 0.076</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td>24″ shingles</td><td>4d box $1^1/_2$ × 0.076</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td colspan="4">Grooved shingles</td></tr>
<tr><td>16″ and 18″ shingles</td><td>3d box $1^1/_4$ × 0.076</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td>24″ shingles</td><td>4d box $1^1/_2$ × 0.076</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td colspan="4">Split and sawn shakes</td></tr>
<tr><td>18″ straight-split shakes</td><td>5d box $1^3/_4$ × 0.080</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td>18″ and 24″ handsplit shakes</td><td>6d box 2 × 0.099</td><td>~~0.19~~</td><td>~~0.0915~~</td></tr>
<tr><td>24″ tapersplit shakes</td><td>5d box $1^3/_4$ × 0.080</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td>18″ and 24″ tapersawn shakes</td><td>6d box 2 × 0.099</td><td>~~0.19~~</td><td>~~0.0915~~</td></tr>
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For SI: 1 inch = 25.4 mm.

TABLE R703.6.3(2)
DOUBLE-COURSE SIDEWALL FASTENERS
<table>
<tr><th colspan="4">~~DOUBLE-COURSE SIDEWALL FASTENERS~~</th></tr>
<tr><th>PRODUCT TYPE</th><th>NAIL TYPE, ~~and~~ MINIMUM LENGTH AND SHANK DIAMETER (inches)</th><th>~~Minimum head diameter (inches)~~</th><th>~~Minimum shank thickness (inches)~~</th></tr>
<tr><td colspan="4">R & R and sanded shingles</td></tr>
<tr><td>16″, 8″ and 24″ shingles</td><td>5d box $1^3/_4$ × 0.08 or ~~same size~~ 5d casing nails $1^3/_4$ × 0.080</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td colspan="4">Grooved shingles</td></tr>
<tr><td>16″, 18″ and 24″shingles</td><td>5d box $1^3/_4$ × 0.080</td><td>~~0.19~~</td><td>~~0.08~~</td></tr>
<tr><td colspan="4">Split and sawn shakes</td></tr>
<tr><td>18″ straight-split shakes</td><td>7d box $2^1/_4$ × 0.099 or 8d box $2^1/_2$ × 0.113</td><td>~~0.19~~</td><td>~~0.099~~</td></tr>
<tr><td>18″ and 24″ handsplit shakes</td><td>7d box $2^1/_4$ × 0.099 or 8d box $2^1/_2$ × 0.113</td><td>~~0.19~~</td><td>~~0.099~~</td></tr>
<tr><td>24″ tapersplit shakes</td><td>7d box $2^1/_4$ × 0.099 or 8d box $2^1/_2$ × 0.113</td><td>~~0.19~~</td><td>~~0.099~~</td></tr>
<tr><td>18″ and 24″ tapersawn shakes</td><td>7d box $2^1/_4$ × 0.099 or 8d box $2^1/_2$ × 0.113</td><td>~~0.19~~</td><td>~~0.099~~</td></tr>
</table>
For SI: 1 inch = 25.4 mm.
</td>
<td></td>
<td>Minor updates to base code table.</td>
</tr>
<tr>
<td>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.</td>
<td>R703.7 Exterior plaster (stucco). Installation of ~~these materials~~ exterior plaster shall be in compliance with ASTM ~~C 926~~ C926, ASTM ~~C 1063~~ C1063 and the provisions of this code.</td>
<td>R703.7 Exterior plaster ~~(stucco)~~. Installation of these materials ~~exterior plaster~~ shall be in compliance with ASTM C926, ASTM C1063 and the provisions of this code.
Exception: Lath may be continuous behind control joints.</td>
<td>Minor base code wordsmithing.

No change to Houston amendment.</td>
</tr>
</table>

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	R703.7.1 Lath. Lath and lath attachments shall be of corrosion-resistant materials in accordance with **ASTM C1063**. Expanded metal, welded wire, or woven wire lath shall be attached to wood framing members or furring. Where the exterior plaster is serving as wall bracing in accordance with Table R602.10.4, the lath shall be attached directly to framing. The lath shall be attached with $1^1/_2$-inch-long (38 mm), 11-gage nails having a $^7/_{16}$-inch (11.1 mm) head, or $^7/_8$-inch-long (22.2 mm), 16-gage staples, spaced not more than ~~6~~7 inches (~~152~~178 mm) on center along framing members or furring and not more than 24 inches (610 mm) on center between framing members or furring, or as otherwise *approved*. Additional fastening between wood framing members shall not be prohibited. Lath attachments to cold-formed steel framing or to masonry, stone, or concrete substrates shall be in accordance with **ASTM C1063**. Where lath is installed directly over foam sheathing, lath connections shall also be in accordance with **Section R703.15**, **R703.16** or **R703.17**. Where lath is attached to furring installed over foam sheathing, the furring connections shall be in accordance with **Section R703.15**, **R703.16** or **R703.17**. **Exception:** Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063.		Updated requirements for lath construction.
	703.7.1.1 Furring. Where provided, furring shall consist of wood furring strips not less than 1 inch by 2 inches (25 mm by 51 mm), minimum $^3/_4$-inch (19 mm) metal channels, or self-furring lath, and shall be installed in accordance with **ASTM C1063** . Furring shall be spaced not greater than 24 inches (600 mm) on center and, where installed over wood or cold-formed steel framing, shall be fastened into framing members.		New requirements for furring.
	R703.7.2 Plaster. Plastering with ~~portland~~ cement plaster shall be ~~not less than three coats where applied over metal lath or wire lath and shall be not less than two coats where applied over masonry, concrete, pressure-preservative-treated wood or decay-resistant wood as specified in Section R317.1 or gypsum backing. If the plaster surface is completely covered by veneer or other facing material or is completely concealed, plaster application need be only two coats, provided the total thickness is as set forth in Table R702.1(1).~~ in accordance with ASTM C926. Cement materials shall be in accordance with one of the following: 1. Masonry cement conforming to ASTM C91 Type M, S or N. 2. Portland cement conforming to ASTM C150 Type I, II, or III. 3. Blended hydraulic cement conforming to ASTM C595 Type IP, IS (< 70), IL, or IT (S < 70). 4. Hydraulic cement conforming to ASTM C1157 Type GU, HE, MS, HS, or MH. 5. Plastic (stucco) cement conforming to ASTM C1328. Plaster shall be not less than three coats where applied over metal lath or wire lath and shall be not less than two coats where applied over masonry, concrete, pressure-preservative-		Updated plaster requirements.

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	treated wood or decay-resistant wood as specified in Section R317.1 or gypsum backing. If the plaster surface is completely covered by veneer or other facing material or is completely concealed, plaster application need be only two coats, provided the total thickness is as set forth in Table R702.1(1). On wood-frame construction with an on-grade floor slab system, exterior plaster shall be applied to cover, but not extend below, lath, paper and screed. The proportion of aggregate to cementitious materials shall be as set forth in Table R702.1(3).		
		R703.7.2.2 Alternative plaster applications. When approved by the building official, plaster products and applications not covered in Section R703.7.2 shall be provided and installed in accordance with the manufacturer's approved instructions and approved design. Products and applications approved by ICC-ES Evaluation reports are considered approved unless specifically prohibited by the building official.	New Houston amendment accepted during Public Comment. Provides alternates to plaster applications.
	R703.7.3 Water-resistive barriers. Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall comply with **Section R703.7.3.1** or **R703.7.3.2** ~~include a water-resistive, vaporpermeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing, installed in accordance with Section R703.4 and intended to drain to the *water-resistive barrier*, is directed between the layers~~. ~~**Exception:** Where the *water-resistive barrier* that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwatery absorbing layer or designed drainage space.~~		Update to water-resistive barrier section to provide correct references.
	R703.7.3.1 Dry climates. In Dry (B) climate zones indicated in **Figure N1101.7**, *water-resistive barriers* shall comply with one of the following: 1. The *water-resistive barrier* shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of a *waterresistive barrier* complying with **ASTM E2556**, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with **Section R703.4** and intended to drain to the *water-resistive barrier* shall be directed between the layers. 2. The *water-resistive barrier* shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of a *water-resistive barrier* complying with **ASTM E2556**, Type II. The *water-resistive barrier* shall be separated from the stucco by a layer of foam plastic *insulating sheathing* or other non-water-absorbing layer, or a designed drainage space.		New requirements for barriers in dry climates.

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	R703.7.3.2 Moist or marine climates. In the Moist (A) or Marine (C) climate zones indicated in **Figure N1101.7**, *water-resistive barriers* shall comply with one of the following: 1. In addition to complying with **Section R703.7.3.1**, a space or drainage material not less than $^{3}/_{16}$ inch (5 mm) in depth shall be added to the exterior side of the *water-resistive barrier*. 2. In addition to complying with **Section R703.7.3.1**, Item 2, drainage on the exterior of the *water-resistive barrier* shall have a drainage efficiency of not less than 90 percent, as measured in accordance with **ASTM E2273** or Annex A2 of **ASTM E2925**.		New requirements for barriers in moist/marine climates.
	R703.8.4 Anchorage. Masonry veneer shall be anchored to the supporting wall studs with corrosion-resistant metal ties embedded in mortar or grout and extending into the veneer a minimum of 1 1/2 inches (38 mm), with not less than 5/8 -inch (15.9 mm) mortar or grout cover to outside face. Masonry veneer shall conform to Table R703.8.4(1). ~~For~~ Where the masonry veneer tie attachment is fastened to wood structural panel not less than 7/16 performance category through insulating sheathing not greater than 2 inches (51 mm) in thickness ~~to not less than 7/16 performance category wood structural panel~~, see **Table R703.8.4(2).** Where **Table R703.8.4(2)** is used, attachment to the studs behind the sheathing is not required.		Updates to base code anchorage requirements.
	TABLE R703.8.4 R703.8.4(1) **TIE ATTACHMENT AND AIRSPACE REQUIREMENTS** **BACKING AND TIE** / **MINIMUM TIE** / **MINIMUM TIE FASTENER[a]** / **AIRSPACE[c]** Wood stud backing with corrugated sheet metal / 22 U.S. gage (0.0299 in.) × $^{7}/_{8}$ in. wide / 8d common nail b ($2^{1}/_{2}$ in. × 0.131 in.) / Nominal 1 in. between sheathing and veneer Wood stud backing with metal strand wire / W1.7 (No. 9 U.S. gage; 0.148 in.) with hook embedded in mortar joint / 8d common nail b ($2^{1}/_{2}$ in. × 0.131 in.) / Minimum nominal 1 in. between sheathing and veneer / Maximum $4^{1}/_{2}$ in. between backing and veneer Cold-formed steel stud backing with adjustable metal strand wire / W1.7 (No. 9 U.S. gage; 0.148 in.) with hook embedded in mortar joint / No. 10 screw extending through the steel framing a minimum of three exposed threads / Minimum nominal 1 in. between sheathing and veneer / Maximum $4^{1}/_{2}$ in. between backing and veneer For SI: 1 inch = 25.4 mm. a. In Seismic Design Category D_0, D_1 or D_2, the minimum tie fastener shall be an 8d ring-shank nail ($2^{1}/_{2}$ in. × 0.131 in.) or a No. 10 screw extending through the steel framing a minimum of three exposed threads. b. All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion. **c. An airspace that provides drainage shall be permitted to contain mortar from construction.**		Base code renumbering and minor updates to table and footnotes.

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TABLE R703.8.4(1)
TIE ATTACHMENT AND AIRSPACE REQUIREMENTS

BACKING AND TIE	MINIMUM TIE	MINIMUM TIE FASTENER[a]	AIRSPACE[eb]	
Wood stud backing with corrugated sheet metal	22 U.S. gage (0.0299 in.) × $^{7}/_{8}$ in. wide	8d common nail[bc] ($2^{1}/_{2}$ in. × 0.131 in.)	Nominal 1 in. between sheathing and veneer	
Wood stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint[d]	8d common nail[bc] ($2^{1}/_{2}$ in. × 0.131 in.)	Minimum nominal 1 in. between sheathing and veneer	Maximum $4^{5}/_{8}$ in. between backing and veneer
Wood stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint[e, f]	8d common nail[c] ($2^{1}/_{2}$ in. × 0.131 in.)	Greater than $4^{5}/_{8}$ in. between backing and veneer	Maximum $6^{5}/_{8}$ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W1.7 (No. 9 U.S. gage; 0.148 in. dia.) with hook embedded in mortar joint[d]	No. 10 screw extending through the steel framing a minimum of three exposed threads	Minimum nominal 1 in. between sheathing and veneer	Maximum $4^{5}/_{8}$ in. between backing and veneer
Cold-formed steel stud backing with adjustable metal strand wire	W2.8 (0.187 in. dia.) with hook embedded in mortar joint[e, f]	No. 10 screw extending through the steel framing a minimum of three exposed threads	Greater than $4^{5}/_{8}$ in. between backing and veneer	Maximum $6^{5}/_{8}$ in. between backing and veneer

For SI: 1 inch = 25.4 mm.

~~b~~a. All fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.

~~e~~b. An airspace that provides drainage shall be permitted to contain mortar from construction.

~~a~~c. In Seismic Design Category D_0, D_1 or D_2, the minimum tie fastener shall be an 8d ring-shank nail ($2^{1}/_{2}$ in. × 0.131 in.) ~~or a No. 10 screw extending through the steel framing a minimum of three exposed threads~~.

d. Adjustable tie pintles shall include not fewer than 1 pintle leg of wire size W2.8 (MW18) with a maximum offset of $1^{1}/_{4}$ inches.

e. Adjustable tie pintles shall include not fewer than 2 pintle legs with a maximum offset of $1^{1}/_{4}$ inches. Distance between inside face of brick and end of pintle shall be a maximum of 2 inches.

f. Adjustable tie backing attachment components shall consist of one of the following: eyes with minimum wire W2.8 (MW18), barrel with minimum $^{1}/_{4}$-inch outside diameter, or plate with minimum thickness of 0.074 inch and minimum width of $1^{1}/_{4}$ inches.

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TABLE R703.8.4(2)
REQUIRED BRICK TIE SPACING FOR DIRECT APPLICATION TO WOOD STRUCTURAL PANEL SHEATHING[a, b, c]

FASTENER TYPE[d]	SIZE (DIA OR SCREW #)	REQUIRED BRICK-TIE SPACING (VERTICAL-TIE SPACING/HORIZONTAL-TIE SPACING) (inches/inches)											
		110 mph V Ultimate			115 mph V Ultimate			130 mph V Ultimate			140 mph V Ultimate		
		Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D	Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D	Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D	Zone 5, Exposure B	Zone 5, Exposure C	Zone 5, Exposure D
Ring = Shank = Nails	0.091	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	12/12	16/12, 12/16, 12/12	12/12	=	12/12	=	=
	0.148	24/16, 16/24, 16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	24/16, 16/24, 16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	12/12
Screws	#6	24/16, 16/24, 16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	24/16, 16/24, 16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	12/12
	#8	24/16, 16/24, 16/16, 16/12, 12/16, 12/1	24/16, 16/24, 16/16, 16/12, 12/16, 12/1	16/16, 16/12, 12/16, 12/12	24/16, 16/24, 16/16, 16/12, 12/16, 12/1	16/16, 16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	24/16, 16/24, 16/16, 16/12, 12/16, 12/1	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/16, 16/12, 12/16, 12/12	16/12, 12/16, 12/12	16/12, 12/16, 12/12

New table for panel sheathing requirements.

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For SI: 1 inch = 25.4 mm, 1 mph = 0.447 m/s.
a. This table is based on attachment of brick ties directly to wood structural panel sheathing only. Additional attachment of the brick tie to lumber framing is not required. The brick ties shall be permitted to be placed over any insulating sheathing, not to exceed 2 inches in thickness. Wood structural panel sheathing shall be a minimum 7/16 performance category. The table is based on a building height of 30 feet or less.
b. Wood structural panels shall have a specific gravity of 0.42 or greater in accordance with NDS.
c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
d. Fasteners shall be sized such that the tip of the fastener passes completely through the wood structural panel sheathing by not less than 1/4 inch.
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<td>~~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.~~</td>
<td></td>
<td>Base code section removed.</td>
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<td>R703.11.2 Installation over ~~F~~foam plastic sheathing. Where Vinyl siding ~~and~~or insulated vinyl siding ~~used with~~is installed over foam plastic sheathing ~~shall be installed in accordance~~the vinyl siding shall comply with Section R703.11.~~2.1, R703.11.2.2 or R703.11.2.3.~~and shall have a wind load design ~~wind~~ pressure ~~resistance~~ rating in accordance with Table R703.11.2.
Exceptions:
1. 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 Sections R703.3.3 and R703.11.1.
2. Where the vinyl siding manufacturer’s product specifications provide an approved wind load design ~~wind~~ pressure rating for installation over foam plastic sheathing, use of this wind load design ~~wind~~ pressure rating shall be permitted and the siding shall be installed in accordance with the manufacturer’s installation instructions.
3. Where the foam plastic sheathing and its attachment have a design wind pressure resistance complying with Sections R316.8 and R301.2.1, the vinyl siding shall be installed in</td>
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<td>Updated requirements for foam sheathing installations.</td>
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	accordance with Sections R703.3.3 and R703.11.1.		
	TABLE R703.11.2 **ADJUSTED MINIMUM DESIGN WIND PRESSURE REQUIREMENT FOR VINYL SIDING** **ULTIMATE DESIGN WIND SPEED (MPH)** | **ADJUSTED MINIMUM DESIGN WIND PRESSURE (ASD) (PSF)[a, b]** | | | | | | | **Case 1: With interior gypsum wallboard[c]** | | | **Case 2: Without interior gypsum wallboard[c]** | | | | **Exposure** | | | **Exposure** | | | | **B** | **C** | **D** | **B** | **C** | **D** | | 110 | -44.0 | -61.6 | -73.1 | -62.9 | -88.1 | -104.4 | | 115 | -49.2 | -68.9 | -81.7 | -70.3 | -98.4 | -116.7 | | 120 | -51.8 | -72.5 | -86.0 | -74.0 | -103.6 | -122.8 | | 130 | -62.2 | -87.0 | -103.2 | -88.8 | -124.3 | -147.4 | | ≥ 130 | Not Allowed[d] | | | | | For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa. a. Linear interpolation is permitted. b. The table values are based on a maximum 30-foot mean roof height, and effective wind area of 10 square feet Wall Zone 5 (corner), and the ASD design wind pressure from Table R301.2(2) multiplied by the following adjustment factors: 2.6 (Case 1) and 3.7 (Case 2) for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph. c. Gypsum wallboard, gypsum panel product or equivalent. d. For the indicated wind speed condition, foam sheathing only on the exterior of frame walls with vinyl siding is not allowed unless the vinyl siding complies with an adjusted minimum design wind pressure requirement as determined in accordance with Note b and the wall assembly is capable of resisting an impact without puncture at least equivalent to that of a wood frame wall with minimum 7/16-inch OSB sheathing as tested in accordance with ASTM E1886.		New table for vinyl siding wind pressure requirements.

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TABLE R703.11.2
~~ADJUSTED~~REQUIRED MINIMUM WIND LOAD DESIGN ~~WIND~~ PRESSURE ~~REQUIREMENT~~RATING FOR VINYL SIDING INSTALLED OVER FOAM PLASTIC SHEATHING ALONE

ULTIMATE DESIGN WIND SPEED (MPH)	ADJUSTED MINIMUM DESIGN WIND PRESSURE (ASD) (PSF)[a, b]					
	Case 1: With interior gypsum wallboard[c]			Case 2: Without interior gypsum wallboard[c]		
	Exposure			Exposure		
	B	C	D	B	C	D
≤ 95	-30.0	-33.2	-39.4	-33.9	-47.4	-56.2
100	-30.0	-36.8	-43.6	-37.2	-52.5	-62.2
105	-30.0	-40.5	-48.1	-41.4	-57.9	-68.6
110	~~-44.0~~ 31.8	~~-61.6~~ 44.5	~~-73.1~~ 52.8	~~-62.9~~ 45.4	~~-88.1~~ 63.5	~~-104.4~~ 75.3
115	~~-49.2~~ 35.5	~~-68.9~~ 49.7	~~-81.7~~ 59.0	~~-70.3~~ 50.7	~~-98.4~~ 71.0	~~-116.7~~ 84.2
120	~~-51.8~~ 37.4	~~-72.5~~ 52.4	~~-86.0~~ 62.1	~~-74.0~~ 53.4	~~-103.6~~ 74.8	~~-122.8~~ 88.6
130	~~-62.2~~ 44.9	~~-87.0~~ 62.8	~~-103.2~~ 74.5	~~-88.8~~ 64.1	~~-124.3~~ 89.7	~~-147.4~~ 106
> 130	~~Not Allowed~~[d] See Note d					

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

a. Linear interpolation is permitted.
b. The table values are based on a maximum 30-foot mean roof height, and effective wind area of 10 square feet Wall Zone 5 (corner), and the ASD design component and cladding wind pressure from **Table R301.2.1(1)**~~R301.2(2)~~, adjusted for exposure in accordance with **Table R301.2.1(2)**, multiplied by the following adjustment factors: ~~2.6~~1.87 (Case 1) and ~~3.7~~2.67 (Case 2) ~~for wind speeds less than 130 mph and 3.7 (Case 2) for wind speeds greater than 130 mph~~.
c. Gypsum wallboard, gypsum panel product or equivalent.
d. For the indicated wind speed condition~~,~~ and where foam sheathing is the only sheathing on the exterior of a frame wall with vinyl siding, ~~is not allowed unless the vinyl siding complies with an adjusted minimum design wind pressure requirement as determined in accordance with Note b and~~ the wall assembly ~~is~~ shall be capable of resisting an impact without puncture at least equivalent to that of a wood frame wall with minimum $^7/_{16}$-inch OSB sheathing as tested in accordance with **ASTM E1886**. The vinyl siding shall comply with an adjusted design wind pressure requirement in accordance with Note b, using an adjustment factor of 2.67.

	~~**R703.11.2.1 Basic wind speed not exceeding 115 miles per hour and Exposure Category B.** Where the ultimate design wind speed does not exceed 115 miles per hour (51 m/s), the exposure category is B and gypsum board, gypsum panel product 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 (3 mm) nail (shank) with a minimum 0.313-inch-diameter head, 16 inches (406 mm) on center. The foam plastic sheathing shall be minimum 1/2 -inch-thick (12.7 mm) (nominal) extruded polystyrene in accordance with ASTM C 578, 1/2 -inch-thick (12.7 mm) (nominal) polyisocyanurate in accordance with ASTM C 1289 or 1-inch-thick (25 mm) (nominal) expanded polystyrene in accordance with ASTM C 578.~~		Base code section removed.

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	~~**R703.11.2.2 Basic wind speed exceeding 115 miles per hour or Exposure Categories C and D.** Where the ultimate design wind speed exceeds 115 miles per hour (51 m/s), 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 Table 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, gypsum panel product 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 without gypsum wall board, gypsum panel product or equivalent on the interior side of wall, the vinyl siding's design wind pressure rating shall be multiplied by 0.27.~~		Base code section removed.
	~~**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 instructions.~~		Base code section removed.
	R703.13.1 Insulated vinyl siding and accessories. Insulated vinyl siding and accessories shall be installed in accordance with the manufacturer's installation instructions.		Minor wordsmithing changes.
	R703.14 Polypropylene siding. Polypropylene siding shall be certified and labeled as conforming to the requirements of ASTM ~~D 7254~~D7254, and those of Section R703.14.2 or Section R703.14.3, by an approved quality control agency.		Minor wordsmithing changes and new code references.
	R703.14.3 Flame spread index. The certification of the flame spread index shall be accompanied by a test report stating that all portions of the test specimen ahead of the flame front remained in position during the test in accordance with ASTM E84 or UL 723.		New requirements for flame spread index testing reports.

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TABLE R703.15.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHTa

~~CLADDING FASTENER THROUGH FOAD SHEATHING~~	~~CLADDING FASTENER TYPE AND MINIMUM SIZE~~[b]	~~CLADDING FASTENER VERTICAL SPACING (inches)~~	~~MAXIMUM THICKNESS OF FOAM SHEATHING~~[c] ~~(inches)~~					
			~~16" o.c. Fastener Horizontal Spacing~~			~~24" o.c. Fastener Horizontal Spacing~~		
			~~Cladding Weight:~~			~~Cladding Weight:~~		
			~~3 psf~~	~~11 psf~~	~~25 psf~~	~~3 psf~~	~~11 psf~~	~~25 psf~~
~~Wood Framing (minimum 1 1/2-inch penetration)~~	~~0.113" diameter nail~~	~~6~~	~~2~~	~~1~~	~~DR~~	~~2~~	~~0.75~~	~~DR~~
		~~8~~	~~2~~	~~1~~	~~DR~~	~~2~~	~~0.5~~	~~DR~~
		~~12~~	~~2~~	~~0.5~~	~~DR~~	~~2~~	~~DR~~	~~DR~~
	~~0.120" diameter nail~~	~~6~~	~~3~~	~~1.5~~	~~0.5~~	~~3~~	~~0.75~~	~~DR~~
		~~8~~	~~3~~	~~1~~	~~DR~~	~~3~~	~~0.5~~	~~DR~~
		~~12~~	~~3~~	~~0.5~~	~~DR~~	~~2~~	~~DR~~	~~DR~~
	~~0.131" diameter nail~~	~~6~~	~~4~~	~~2~~	~~0.75~~	~~4~~	~~1~~	~~DR~~
		~~8~~	~~4~~	~~1.5~~	~~0.5~~	~~4~~	~~0.75~~	~~DR~~
		~~12~~	~~4~~	~~0.75~~	~~DR~~	~~2~~	~~0.5~~	~~DR~~
	~~0.162" diameter nail~~	~~6~~	~~4~~	~~4~~	~~1.5~~	~~4~~	~~2~~	~~1~~
		~~8~~	~~4~~	~~3~~	~~1~~	~~4~~	~~1.5~~	~~0.75~~
		~~12~~	~~4~~	~~2~~	~~0.75~~	~~4~~	~~1~~	~~DR~~
CLADDING FASTENER THROUGH FOAM SHEATHING	**CLADDING FASTENER TYPE AND MINIMUM SIZE**[b]	**CLADDING FASTENER VERTICAL SPACING (inches)**	**MAXIMUM THICKNESS OF FOAM SHEATHING**[c] **(inches)**					
			16" o.c. Fastener Horizontal Spacing			**24" o.c. Fastener Horizontal Spacing**		
			Cladding Weight:			**Cladding Weight:**		
			3 psf	**11 psf**	**18 psf**	**25 psf**	**3 psf**	**11 psf**	**18 psf**	**25 psf**
Wood framing (minimum 1 1/4-inch penetration)	**0.113" diameter nail**	**6**	**2.00**	**1.45**	**0.75**	**DR**	**2.00**	**0.85**	**DR**	**DR**
		8	**2.00**	**1.00**	**DR**	**DR**	**2.00**	**0.55**	**DR**	**DR**
		12	**2.00**	**0.55**	**DR**	**DR**	**1.85**	**DR**	**DR**	**DR**
	0.120" diameter nail	**6**	**3.00**	**1.70**	**0.90**	**0.55**	**3.00**	**1.05**	**0.50**	**DR**
		8	**3.00**	**1.20**	**0.60**	**DR**	**3.00**	**0.70**	**DR**	**DR**
		12	**3.00**	**0.70**	**DR**	**DR**	**2.15**	**DR**	**DR**	**DR**
	0.131" diameter nail	**6**	**4.00**	**2.15**	**1.20**	**0.75**	**4.00**	**1.35**	**0.70**	**DR**
		8	**4.00**	**1.55**	**0.80**	**DR**	**4.00**	**0.90**	**DR**	**DR**
		12	**4.00**	**0.90**	**DR**	**DR**	**2.70**	**0.50**	**DR**	**DR**
	0.162" diameter nail	**6**	**4.00**	**3.55**	**2.05**	**1.40**	**4.00**	**2.25**	**1.25**	**0.80**
		8	**4.00**	**2.55**	**1.45**	**0.95**	**4.00**	**1.60**	**0.85**	**0.50**
		12	**4.00**	**1.60**	**0.85**	**0.50**	**4.00**	**0.95**	**DR**	**DR**

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.
DR = Design ~~r~~Required.
o.c. = On ~~e~~Center.
a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
b. Nail fasteners shall comply with ASTM ~~F 1667~~**F1667**, except nail length shall be permitted to exceed ASTM ~~F 1667~~**F1667** standard lengths.
c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM ~~C 578~~, **C578** or ASTM ~~C 1289~~**C1289**.

Updates to table for cladding requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R703.15.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

CLADDING FASTENER THROUGH FOAM SHEATHING[b]	CLADDING FASTENER TYPE AND MINIMUM SIZE[b,c]	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[c,d] (inches)									
			16" o.c. Fastener Horizontal Spacing					24" o.c. Fastener Horizontal Spacing				
			Cladding Weight:					Cladding Weight:				
			3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Wood framing (minimum 1 1/4-inch penetration)	0.113" diameter nail	6	2.00	1.45	1.00	0.75	DR	2.00	0.85	0.55	DR	DR
		8	2.00	1.00	0.65	DR	DR	2.00	0.55	DR	DR	DR
		12	2.00	0.55	DR	DR	DR	1.85	DR	DR	DR	DR
	0.120" diameternail	6	3.00	1.70	1.15	0.90	0.55	3.00	1.05	0.65	0.50	DR
		8	3.00	1.20	0.80	0.60	DR	3.00	0.70	DR	DR	DR
		12	3.00	0.70	DR	DR	DR	2.15	DR	DR	DR	DR
	0.131" diameter nail	6	4.00	2.15	1.50	1.20	0.75	4.00	1.35	0.90	0.70	DR
		8	4.00	1.55	1.05	0.80	DR	4.00	0.90	0.55	DR	DR
		12	4.00	0.90	0.55	DR	DR	2.70	0.50	DR	DR	DR
	0.162" diameter nail	6	4.00	3.55	2.50	2.05	1.40	4.00	2.25	1.55	1.25	0.80
		8	4.00	2.55	1.80	1.45	0.95	4.00	1.60	1.10	0.85	0.50
		12	4.00	1.60	1.10	0.85	0.50	4.00	0.95	0.60	DR	DR

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Wood framing shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with **AWC NDS**.

b. The thickness of wood structural panels complying with the specific gravity requirement of Note a shall be permitted to be included in satisfying the minimum penetration into framing. For cladding connections to wood structural panels, refer to **Table R703.3.3**. For brick veneer tie connections to wood structural panels, refer to **Table R703.8.4(2)**.

~~b~~c. Nail fasteners shall comply with **ASTM F1667**, except nail length shall be permitted to exceed **ASTM F1667** standard lengths.

~~c~~d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with **ASTM C578** or **ASTM C1289**.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R703.15.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a, b]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d] (inches)					
					16" o.c. Furringe			24" o.c. Furringe		
					Siding Weight:			Siding Weight:		
					3 psf	11 psf	25 psf	3 psf	11 psf	25 psf
~~Minimum 1" Wood Furring~~	~~Minimum 2" Wood Stud~~	~~0.131" diameter nail~~	~~1 3/4~~	~~8~~	~~4~~	~~2~~	~~1~~	~~4~~	~~1.5~~	~~DR~~
				~~12~~	~~4~~	~~1.5~~	~~DR~~	~~3~~	~~1~~	~~DR~~
				~~16~~	~~4~~	~~1~~	~~DR~~	~~3~~	~~0.5~~	~~DR~~
		~~0.162" diameter nail~~	~~1 3/4~~	~~8~~	~~4~~	~~4~~	~~1.5~~	~~4~~	~~2~~	~~0.75~~
				~~12~~	~~4~~	~~2~~	~~0.75~~	~~4~~	~~1.5~~	~~DR~~
				~~16~~	~~4~~	~~1.5~~	~~DR~~	~~4~~	~~1~~	~~DR~~
		~~No.10 wood screw~~	~~1~~	~~12~~	~~4~~	~~2~~	~~0.75~~	~~4~~	~~1.5~~	~~DR~~
				~~16~~	~~4~~	~~1.5~~	~~DR~~	~~4~~	~~1~~	~~DR~~
				~~24~~	~~4~~	~~1~~	~~DR~~	~~3~~	~~DR~~	~~DR~~
		~~1/4" lag screw~~	~~1 1/2~~	~~12~~	~~4~~	~~3~~	~~1~~	~~4~~	~~2~~	~~0.5~~
				~~16~~	~~4~~	~~1.5~~	~~DR~~	~~4~~	~~1.5~~	~~DR~~
				~~24~~	~~4~~	~~1.5~~	~~DR~~	~~4~~	~~0.75~~	~~DR~~

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d] (inches)							
					16" o.c. Furring[e]				24" o.c. Furring[e]			
					Siding Weight:				Siding Weight:			
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf
Minimum 1" wood	Minimum 2" wood stud	0.131" diameter nail	1 1/4	8	4.00	2.45	1.45	0.95	4.00	1.60	0.85	DR
				12	4.00	1.60	0.85	DR	4.00	0.95	DR	DR
				16	4.00	1.10	DR	DR	3.05	0.60	DR	DR
furring[c]		0.162" diameter nail	1 1/4	8	4.00	4.00	2.45	1.60	4.00	2.75	1.45	0.85
				12	4.00	2.75	1.45	0.85	4.00	1.65	0.75	DR
				16	4.00	1.90	0.95	DR	4.00	1.05	DR	DR
		No.10 wood screw	1	12	4.00	2.30	1.20	0.70	4.00	1.40	0.60	DR
				16	4.00	1.65	0.75	DR	4.00	0.90	DR	DR
				24	4.00	0.90	DR	DR	2.85	DR	DR	DR
		1/4" lag screw	1 1/2	12	4.00	2.65	1.50	0.90	4.00	1.65	0.80	DR
				16	4.00	1.95	0.95	0.50	4.00	1.10	DR	DR
				24	4.00	1.10	DR	DR	3.25	0.50	DR	DR

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.
DR = Design ~~r~~Required.
o.c. = On ~~c~~Center.

a. Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with AWC NDS.
b. Nail fasteners shall comply with ASTM ~~F 1667~~F1667, except nail length shall be permitted to exceed ASTM ~~F 1667~~F1667 standard lengths.
c. Where the required cladding fastener penetration into wood material exceeds 3/4 inch and is not more than 1 1/2 inches, a minimum 2× wood furring or an approved design shall be used.
d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM ~~C 578~~C578 or ASTM ~~C 1289~~C1289.
e. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

Updates to table for furring requirements.

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TABLE R703.15.2

FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT [a, b]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE	MINIMUM PENETRATION INTO WALL FRAMING (inches)[c]	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[e] (inches)									
					16" o.c. Furring[e,f]					24" o.c. Furring[e,f]				
					Siding Weight:					Siding Weight:				
					3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Minimum 1× wood furring[e,d]	Minimum 2× wood stud	0.131" diameter nail	1 1/4	8	4.00	2.45	1.75	1.45	0.95	4.00	1.60	1.10	0.85	DR
				12	4.00	1.60	1.10	0.85	DR	4.00	0.95	0.55	DR	DR
				16	4.00	1.10	0.70	DR	DR	3.05	0.60	DR	DR	DR
		0.162" diameter nail	1 1/4	8	4.00	4.00	3.05	2.45	1.60	4.00	2.75	1.85	1.45	0.85
				12	4.00	2.75	1.85	1.45	0.85	4.00	1.65	1.05	0.75	DR
				16	4.00	1.90	1.25	0.95	DR	4.00	1.05	0.60	DR	DR
		No.10 wood screw	1	12	4.00	2.30	1.60	1.20	0.70	4.00	1.40	0.85	0.60	DR
				16	4.00	1.65	1.05	0.75	DR	4.00	0.90	DR	DR	DR
				24	4.00	0.90	DR	DR	DR	2.85	DR	DR	DR	DR
		1/4" lag screw	1 1/2	12	4.00	2.65	1.90	1.50	0.90	4.00	1.65	1.05	0.80	DR
				16	4.00	1.95	1.25	0.95	0.50	4.00	1.10	0.65	DR	DR
				24	4.00	1.10	0.65	DR	DR	3.25	0.50	DR	DR	DR

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Wood framing and furring shall be Spruce-pine-fir or any wood species with a specific gravity of 0.42 or greater in accordance with **AWC NDS**.
b. Nail fasteners shall comply with **ASTM F1667**, except nail length shall be permitted to exceed **ASTM F1667** standard lengths.
c. The thickness of wood structural panels complying with the specific gravity requirements of Note a shall be permitted to be included in satisfying the minimum required penetration into framing.
~~e~~d. Where the required cladding fastener penetration into wood material exceeds 3/4 inch and is not more than 1 1/2 inches, a minimum 2× wood furring or an approved design shall be used.
d.e. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with **ASTM C578** or **ASTM C1289**.
~~e~~f. Furring shall be spaced not more than 24 inches on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

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TABLE R703.16.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE[b]	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[c] (inches)					
			16″ o.c. Fastener Horizontal Spacing			24″ o.c. Fastener Horizontal Spacing		
			Cladding Weight:			Cladding Weight:		
~~Steel Framing (minimum penetration of steel thickness + 3 threads)~~	~~No. 8 screw into 33 mil steel or thicker~~	~~6~~	~~3 psf~~	~~11 psf~~	~~25 psf~~	~~3 psf~~	~~11 psf~~	~~25 psf~~
		~~8~~	~~3~~	~~2~~	~~1.5~~	~~3~~	~~1.5~~	~~DR~~
		~~12~~	~~3~~	~~1.5~~	~~0.5~~	~~3~~	~~2~~	~~DR~~
	~~No. 10 screw into 33 mil steel~~	~~6~~	~~3~~	~~1.5~~	~~DR~~	~~3~~	~~0.75~~	~~DR~~
		~~8~~	~~4~~	~~3~~	~~2~~	~~4~~	~~3~~	~~0.5~~
		~~12~~	~~4~~	~~3~~	~~1~~	~~4~~	~~2~~	~~DR~~
	~~No. 10 screw into 43 mil steel or thicker~~	~~6~~	~~4~~	~~2~~	~~DR~~	~~3~~	~~1~~	~~DR~~
		~~8~~	~~4~~	~~4~~	~~3~~	~~4~~	~~4~~	~~2~~
		~~12~~	~~4~~	~~4~~	~~2~~	~~4~~	~~3~~	~~1.5~~
			~~4~~	~~3~~	~~1.5~~	~~4~~	~~3~~	~~DR~~
CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	**CLADDING FASTENER TYPE AND MINIMUM SIZE[b]**	**CLADDING FASTENER VERTICAL SPACING (inches)**	**MAXIMUM THICKNESS OF FOAM SHEATHING[c] (inches)**					
			16″ o.c. Fastener Horizontal Spacing			**24″ o.c. Fastener Horizontal Spacing**		
			Cladding Weight:			**Cladding Weight:**		
Steel framing (minimum penetration of steel thickness + 3 threads)	**No. 8 screw into 33-mil steel or thicker**	**6**	**3.00**	**2.95**	**2.20**	**1.45**	**3.00**	**2.35**	**1.25**	**DR**
		8	**3.00**	**2.55**	**1.60**	**0.60**	**3.00**	**1.80**	**DR**	**DR**
		12	**3.00**	**1.80**	**DR**	**DR**	**3.00**	**0.65**	**DR**	**DR**
	No. 10 screw into 33-mil steel	**6**	**4.00**	**3.50**	**2.70**	**1.95**	**4.00**	**2.90**	**1.70**	**0.55**
		8	**4.00**	**3.10**	**2.05**	**1.00**	**4.00**	**2.25**	**0.70**	**DR**
		12	**4.00**	**2.25**	**0.70**	**DR**	**3.70**	**1.05**	**DR**	**DR**
	No. 10 screw into 43-mil steel or thicker	**6**	**4.00**	**4.00**	**4.00**	**3.60**	**4.00**	**4.00**	**3.45**	**2.70**
		8	**4.00**	**4.00**	**3.70**	**3.00**	**4.00**	**3.85**	**2.80**	**1.80**
		12	**4.00**	**3.85**	**2.80**	**1.80**	**4.00**	**3.05**	**1.50**	**DR**

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.
DR = Design ~~r~~**R**equired.
o.c. = On ~~e~~**C**enter.
a. Steel framing shall be minimum 33 ksi steel for 33 mil and 43 mil steel, and 50 ksi steel for 54 mil steel or thicker.
b. Screws shall comply with the requirements of ASTM ~~C 1513~~**C1513.**
c. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM ~~C 578~~**C578** or ASTM ~~C 1289~~**C1289.**

TABLE R703.16.1
CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a, b]

CLADDING FASTENER THROUGH FOAM SHEATHING INTO:	CLADDING FASTENER TYPE AND MINIMUM SIZE[b,c]	CLADDING FASTENER VERTICAL SPACING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[c,d] (inches)									
			16" o.c. Fastener Horizontal Spacing					24" o.c. Fastener Horizontal Spacing				
			Cladding Weight:					Cladding Weight:				
			3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Steel framing (minimum penetration of steel thickness + 3 threads)	No. 8 screw into 33-mil steel or thicker	6	3.00	2.95	2.50	2.20	1.45	3.00	2.35	1.75	1.25	DR
		8	3.00	2.55	2.00	1.60	0.60	3.00	1.80	0.90	DR	DR
		12	3.00	1.80	0.95	DR	DR	3.00	0.65	DR	DR	DR
	No. 10 screw into 33-mil steel	6	4.00	3.50	3.05	2.70	1.95	4.00	2.90	2.20	1.70	0.55
		8	4.00	3.10	2.50	2.05	1.00	4.00	2.25	1.35	0.70	DR
		12	4.00	2.25	1.35	0.70	DR	3.70	1.05	DR	DR	DR
	No. 10 screw into 43-mil steel or thicker	6	4.00	4.00	4.00	4.00	3.60	4.00	4.00	3.80	3.45	2.70
		8	4.00	4.00	4.00	3.70	3.00	4.00	3.85	3.25	2.80	1.80
		12	4.00	3.85	3.25	2.80	1.80	4.00	3.05	2.15	1.50	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Steel framing shall be minimum 33-ksi steel for 33-mil and 43-mil steel, and 50-ksi steel for 54-mil steel or thicker.
b. Where cladding is attached to wood structural panel sheathing only, fastening requirements shall be in accordance with **Table R703.3.3**.
~~b.~~c. Screws shall comply with the requirements of **ASTM C1513**.
~~c.~~d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with **ASTM C578** or **ASTM C1289**.

Updates to table for cladding requirements.

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TABLE R703.16.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE[b]	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d] (inches)						
					16" o.c. Furring[e]			24" o.c. Furring[e]			
					Cladding Weight:			Cladding Weight:			
					3 psf	11 psf	25 psf	3 psf	11 psf	25 psf	
~~Minimum 33 mil Steel Furring or Minimum 1 inch Wood Furring[c]~~	~~33 mil Steel Stud~~	~~No. 8 screw~~	~~Steel thickness + 3 threads~~	~~12~~	~~3~~	~~1.5~~	~~DR~~	~~3~~	~~0.5~~	~~DR~~	
				~~16~~	~~3~~	~~1~~	~~DR~~	~~2~~	~~DR~~	~~DR~~	
				~~24~~	~~2~~	~~DR~~	~~DR~~	~~2~~	~~DR~~	~~DR~~	
		~~No. 10 screw~~	~~Steel thickness + 3 threads~~	~~12~~	~~4~~	~~2~~	~~DR~~	~~4~~	~~1~~	~~DR~~	
				~~16~~	~~4~~	~~1.5~~	~~DR~~	~~3~~	~~DR~~	~~DR~~	
				~~24~~	~~3~~	~~DR~~	~~DR~~	~~2~~	~~DR~~	~~DR~~	
	~~43 mil or thicker Steel Stud~~	~~No. 8 Screw~~	~~Steel thickness + 3 threads~~	~~12~~	~~3~~	~~1.5~~	~~DR~~	~~3~~	~~0.5~~	~~DR~~	
				~~16~~	~~3~~	~~1~~	~~DR~~	~~2~~	~~DR~~	~~DR~~	
				~~24~~	~~2~~	~~DR~~	~~DR~~	~~2~~	~~DR~~	~~DR~~	
		~~No. 10 screw~~	~~Steel thickness + 3 threads~~	~~12~~	~~4~~	~~3~~	~~1.5~~	~~4~~	~~3~~	~~DR~~	
				~~16~~	~~4~~	~~3~~	~~0.5~~	~~4~~	~~2~~	~~DR~~	
				~~24~~	~~4~~	~~2~~	~~DR~~	~~4~~	~~0.5~~	~~DR~~	

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE[b]	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d] (inches)							
					16" o.c. Furring[e]				24" o.c. Furring[e]			
					Cladding Weight:				Cladding Weight:			
					3 psf	11 psf	18 psf	25 psf	3 psf	11 psf	18 psf	25 psf

Updates to table for furring requirements.

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Minimum 33-mil steel furring or minimum 1" wood furring[c]	33-mil steel stud	No. 8 screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	2.25	0.70	DR	3.70	1.05	DR	DR
				16	3.85	1.45	DR	DR	3.40	DR	DR	DR
				24	3.40	DR	DR	DR	2.70	DR	DR	DR
	43-mil or thicker steel stud	No. 8 Screw	Steel thickness + 3 threads	12	3.00	1.80	DR	DR	3.00	0.65	DR	DR
				16	3.00	1.00	DR	DR	2.85	DR	DR	DR
				24	2.85	DR	DR	DR	2.20	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	3.85	2.80	1.80	4.00	3.05	1.50	DR
				16	4.00	3.30	1.95	0.60	4.00	2.25	DR	DR
				24	4.00	2.25	DR	DR	4.00	0.65	DR	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design ~~r~~Required.

o.c. = On ~~c~~Center.

a. Wood furring shall be Spruce-pine-fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33-ksi steel. Steel studs shall be minimum 33-ksi steel for 33-mil and 43-mil thickness, and 50-ksi steel for 54-mil steel or thicker.

b. Screws shall comply with the requirements of ASTM ~~C 1513~~C1513.

c. Where the required cladding fastener penetration into wood material exceeds $^{3}/_{4}$ inch and is not more than $1\,^{1}/_{2}$ inches, a minimum 2-inch nominal wood furring or an approved design shall be used.

d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM ~~C 578~~C578 or ASTM ~~C 1289~~C1289.

e. Furring shall be spaced not more than 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

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TABLE R703.16.2
FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT [a]

FURRING MATERIAL	FRAMING MEMBER	FASTENER TYPE AND MINIMUM SIZE[b]	MINIMUM PENETRATION INTO WALL FRAMING (inches)	FASTENER SPACING IN FURRING (inches)	MAXIMUM THICKNESS OF FOAM SHEATHING[d] (inches)									
					16" o.c. Furring[e]					24" o.c. Furring[e]				
					Cladding Weight:					Cladding Weight:				
					3 psf	11 psf	15 psf	18 psf	25 psf	3 psf	11 psf	15 psf	18 psf	25 psf
Minimum 33-mil steel furring or minimum 1× wood furring[c]	33-mil steel stud	No. 8 screw	Steel thickness + 3 threads	12	3.00	1.80	0.95	DR	DR	3.00	0.65	DR	DR	DR
				16	3.00	1.00	DR	DR	DR	2.85	DR	DR	DR	DR
				24	2.85	DR	DR	DR	DR	2.20	DR	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	2.25	1.35	0.70	DR	3.70	1.05	DR	DR	DR
				16	3.85	1.45	DR	DR	DR	3.40	DR	DR	DR	DR
				24	3.40	DR	DR	DR	DR	2.70	DR	DR	DR	DR
	43-milor thicker steel stud	No. 8 Screw	Steel thickness + 3 threads	12	3.00	1.80	0.95	DR	DR	3.00	0.65	DR	DR	DR
				16	3.00	1.00	DR	DR	DR	2.85	DR	DR	DR	DR
				24	2.85	DR	DR	DR	DR	2.20	DR	DR	DR	DR
		No. 10 screw	Steel thickness + 3 threads	12	4.00	3.85	3.25	2.80	1.80	4.00	3.05	2.15	1.50	DR
				16	4.00	3.30	2.55	1.95	0.60	4.00	2.25	1.03	DR	DR
				24	4.00	2.25	1.05	DR	DR	4.00	0.65	DR	DR	DR

For SI: 1 inch = 25.4 mm, 1 mil = 0.0254 mm, 1 pound per square foot = 0.0479 kPa, 1 pound per square inch = 6.895 kPa.

DR = Design Required.

o.c. = On Center.

a. Wood furring shall be Spruce-pine-fir or any softwood species with a specific gravity of 0.42 or greater. Steel furring shall be minimum 33-ksi steel. Steel studs shall be minimum 33-ksi steel for 33-mil and 43-mil thickness, and 50-ksi steel for 54-mil steel or thicker.
b. Screws shall comply with the requirements of **ASTM C1513**.
c. Where the required cladding fastener penetration into wood material exceeds $^3/_4$ inch and is not more than 1 $^1/_2$ inches, a minimum 2-inch nominal wood furring or an approved design shall be used.
d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with **ASTM C578** or **ASTM C1289**.
e. Furring shall be spaced not more than 24 inches (610 mm) on center, in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. In a horizontal orientation, the indicated 8-inch and 12-inch fastener spacing in furring shall be achieved by use of two fasteners into studs at 16 inches and 24 inches on center, respectively.

	SECTION R704 **SOFFITS** **R704.1 General wind limitations.** Where the design wind pressure is 30 pounds per square foot (1.44 kPa) or less, soffits shall comply with **Section R704.2**. Where the design wind pressure exceeds 30 pounds per square foot (1.44 kPa), soffits shall comply with **Section R704.3**. The design wind pressure on soffits shall be determined using the component and cladding loads specified in **Table R301.2.1(1)** for walls using an effective wind area of 10 square feet (0.93 m^2) and adjusted for height and exposure in accordance with **Table R301.2.1(2)**.		New base code section and requirements for soffits.
	R704.2 Soffit installation where the design wind pressure is 30 psf or less. Where the design wind pressure is 30 pounds per square foot (1.44 kPa) or less, soffit installation shall comply with **Section R704.2.1**, **R704.2.2**, **R704.2.3** or **R704.2.4**. Soffit materials not addressed in **Sections R704.2.1** through **R704.2.4** shall be in accordance with the manufacturer's installation instructions.		New base code section and requirements for soffits.
	R704.2.1 Vinyl soffit panels. Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with **Figure R704.2.1(1)**. Where the unsupported span of soffit panels is greater than 16 inches (406 mm), intermediate nailing strips shall be provided in accordance with **Figure R704.2.1(2)**. Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.		New base code section and requirements for soffits.

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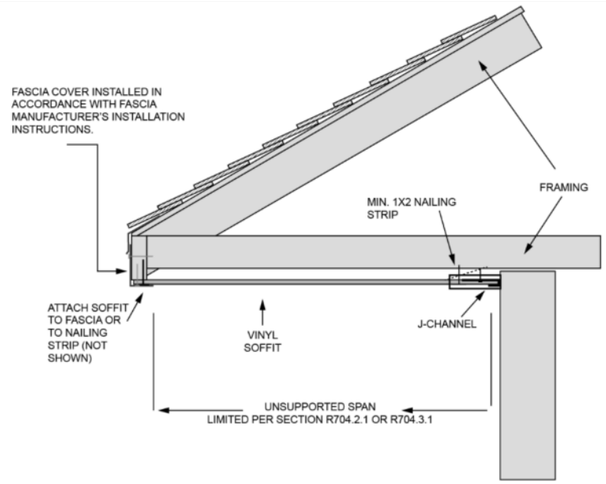
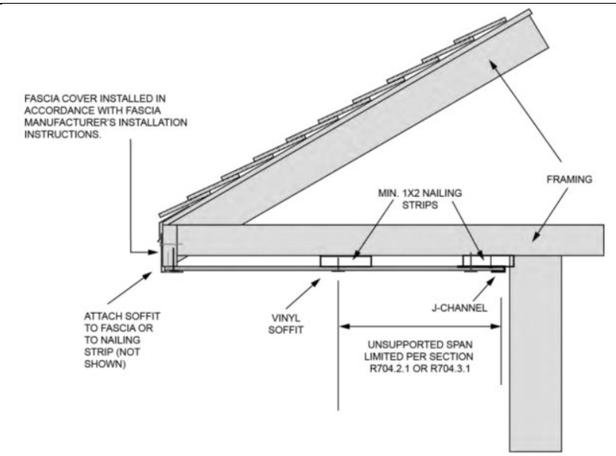
	 FIGURE R704.2.1(1) TYPICAL SINGLE-SPAN VINYL SOFFIT PANEL SUPPORT		New figure for soffit installation.
	 FIGURE R704.2.1(2) TYPICAL DOUBLE-SPAN VINYL SOFFIT PANEL SUPPORT		New figure for soffit installation.
	R704.2.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall be a minimum of 1/4 inch (6.4 mm) in thickness and shall comply with the requirements of **ASTM C1186**, Type A, minimum Grade II, or **ISO 8336**, Category A, minimum Class 2. Panel joints shall occur over framing or over wood structural panel sheathing. Soffit panels shall be installed with spans and fasteners in accordance with the manufacturer's installation instructions.		New base code section and requirements for soffits.

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	R704.2.3 Hardboard soffit panels. Hardboard soffit panels shall be not less than $^{7}/_{16}$ inch (11.11 mm) in thickness and shall be fastened to framing or nailing strips with $2^{1}/_{2}$ inch by 0.113-inch (64 mm by 2.9 mm) siding nails spaced not more than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.		New base code section and requirements for soffits.
	R704.2.4 Wood structural panel soffit. The minimum nominal thickness for wood structural panel soffits shall be $^{3}/_{8}$ inch (9.5 mm) and shall be fastened to framing or nailing strips with 2-inch by 0.099-inch (51 mm by 2.5 mm) nails. Fasteners shall be spaced not less than 6 inches (152 mm) on center at panel edges and 12 inches (305 mm) on center at intermediate supports.		New base code section and requirements for soffits.
	R704.3 Soffit installation where the design wind pressure exceeds 30 psf. Where the design wind pressure is greater than 30 psf, soffit installation shall comply with **Section R704.3.1**, **R704.3.2**, **R704.3.3** or **R704.3.4**. Soffit materials not addressed in **Sections R704.3.1** through **R704.3.4** shall be in accordance with the manufacturer's installation instructions.		New base code section and requirements for soffits.
	R704.3.1 Vinyl soffit panels. Vinyl soffit panels and their attachments shall be capable of resisting wind loads specified in **Table R301.2.1(1)** for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with **Table R301.2.1(2)** . Vinyl soffit panels shall be installed using fasteners specified by the manufacturer and shall be fastened at both ends to a supporting component such as a nailing strip, fascia or subfascia component in accordance with **Figure R704.2.1(1)**. Where the unsupported span of soffit panels is greater than 12 inches (305 mm), intermediate nailing strips shall be provided in accordance with **Figure R704.2.1(2)**. Vinyl soffit panels shall be installed in accordance with the manufacturer's installation instructions. Fascia covers shall be installed in accordance with the manufacturer's installation instructions.		New base code section and requirements for soffits.
	R704.3.2 Fiber-cement soffit panels. Fiber-cement soffit panels shall comply with Section R704.2.2 and shall be capable of resisting wind loads specified in Table R301.2.1(1) for walls using an effective wind area of 10 square feet (0.929 m2) and adjusted for height and expo-sure in accordance with Table R301.2.1(2).		New base code section and requirements for soffits.
	Section R704.2.2 and shall be capable of resisting wind loads specified in **Table R301.2.1(1)** for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with **Table R301.2.1(2)**.		New base code section and requirements for soffits.
	R704.3.3 Hardboard soffit panels. Hardboard soffit panels shall comply with the manufacturer's installation instructions and shall be capable of resisting wind loads specified in **Table R301.2.1(1)** for walls using an effective wind area of 10 square feet (0.929 m^2) and adjusted for height and exposure in accordance with **Table R301.2.1(2)**.		New base code section and requirements for soffits.

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TABLE R704.3.4
PRESCRIPTIVE ALTERNATIVE FOR WOOD STRUCTURAL PANEL SOFFIT[b, c, d, e]

MAXIMUM DESIGN PRESSURE (+ or - psf)	MINIMUM PANEL SPAN RATING	MINIMUM PANEL PERFORMANCE CATEGORY	NAIL TYPE AND SIZE	FASTENER[a] SPACING ALONG EDGES AND INTERMEDIATE SUPPORTS	
				Galvanized Steel	Stainless Steel
30	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	6[f]	4
40	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	6	4
50	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	4	4
			8d common ($2^1/_2$ × 0.131 × 0.281 head diameter)	6	6
60	24/0	3/8	6d box (2 × 0.099 × 0.266 head diameter)	4	3
			8d common ($2^1/_2$ × 0.131 × 0.281 head diameter)	6	4
70	24/16	7/16	8d common ($2^1/_2$ × 0.131 × 0.281 head diameter)	4	4
			10d box (3 × 0.128 × 0.312 head diameter)	6	4

New table for soffit installation requirements.

80	24/16	7/16	8d common ($2^1/_2$ × 0.131 × 0.281 head diameter)	4	4
			10d box (3 × 0.128 × 0.312 head diameter)	6	4
90	32/16	15/32	8d common ($2^1/_2$ × 0.131 × 0.281 head diameter)	4	3
			10d box (3 × 0.128 × 0.312 head diameter)	6	4

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

a. Fasteners shall comply with **Sections R703.3.2** and **R703.3.3**.
b. Maximum spacing of soffit framing members shall not exceed 24 inches.
c. Wood structural panels shall be of an exterior exposure grade.
d. Wood structural panels shall be installed with strength axis perpendicular to supports with not fewer than two continuous spans.
e. Wood structural panels shall be attached to soffit framing members with specific gravity of at least 0.42. Framing members shall be minimum 2 × 3 nominal with the larger dimension in the cross section aligning with the length of fasteners to provide sufficient embedment depths.
f. Spacing at intermediate supports shall be not greater than 12 inches on center.

2015 Houston IRC Amendments	2021 IRC – Chapter 8 – Roof-Ceiling Construction	2021 Houston IRC Amendments	Code Change Summary
	R801.3 Roof drainage. In areas where *expansive* soils or *collapsible soils* are known to exist, all *dwellings* shall have a controlled method of water disposal from roofs that will collect and discharge roof drainage to the ground surface not less than 5 feet (1524 mm) from foundation walls or to an *approved* drainage system.		Minor wordsmithing change.
	R802.1.2 Structural glued laminated timbers. Glued-laminated timbers shall be manufactured and identified as required in ANSI/~~**AITC**~~ A190.1, ANSI 117 and ASTM D 3737.		New reference standard included.
	R802.1.5 Fire-retardant-treated wood. Fire-retardant-treated wood (FRTW) is any wood product that, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84 or UL 723, a listed flame spread index of 25 or less ~~not show evidence of significant progressive combustion where the test is~~. In addition, the **ASTM E84**or **UL 723** test shall be continued for an additional 20-minute period~~. In addition,~~ and the flame front shall not progress more than 10.5 feet (3200 mm) beyond the center line of the burners at any time during the test.		New reference standard included.

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	R802.1.5.2 Other means during manufacture. For wood products ~~produced~~ impregnated with chemicals by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product. The use of paints, coating, stains or other surface treatments is not an *approved* method of protection as required by this section.		Updates to treated wood requirements.
	R802.1.5.3 Testing. For ~~wood products produced by other means during manufacture, other than a pressure process, all sides~~fire-retardant-treated wood products, the front and back faces of the wood product shall be tested in accordance with and produce the results required in **Section R802.1.5**. ~~Testing of only the front and back faces of wood structural panels shall be permitted.~~		Updates to wood product testing requirements.
	R802.1.5.3.1 Fire testing of wood structural panels. *Wood structural panels* shall be tested with a ripped or cut longitudinal gap of 1/8 inch (3.2 mm).		New fire testing requirements for wood panels.
	R802.1.5.4 Labeling. ~~Fire-retardant-treated~~ In addition to the labels required by Section 802.1.1 for sawn lumber and Section 803.2.1 for wood structural panels, each piece of *fire-retardant-treated* lumber and wood structural panel shall be *labeled*. The *label* shall contain: 1. The identification *mark* of an *approved agency* in accordance with Section 1703.5 of the *International Building Code*. 2. Identification of the treating manufacturer. 3. The name of the fire-retardant treatment. 4. The species of wood treated. 5. Flame spread index and smoke-developed index. 6. Method of drying after treatment. 7. Conformance to applicable standards in accordance with Sections R802.1.5.5 through R802.1.5.10. 8. For FRTW exposed to weather, or a damp or wet location, the words "No increase in the listed classification when subjected to the Standard Rain Test" (ASTM D 2898).		Minor updates to labeling requirements.
	R802.1.8 Prefabricated wood I-joists. Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D5055.		New requirements for prefab wood i-joists.
	R802.2 Design and construction. The ~~framing details required in Section R802 apply to roofs having a minimum slope of three units vertical in 12 units horizontal (25 percent slope) or greater. Roof ceilings~~roof and ceiling assembly shall provide continuous ties across the structure to prevent roof thrust from being applied to the supporting walls. The assembly shall be designed and constructed in accordance with the provisions of this chapter and Figures		Updated requirements for design and construction of roof ceiling assemblies.

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	R606.11(1), R606.11(2) and R606.11(3) or in accordance with AWC NDS. Components of roof-ceilings shall be fastened in accordance with Table R602.3(1).		
	R802.3 ~~Framing details~~Ridge. ~~Rafters shall be framed not more than 1 1/2 inches (38 mm) offset from each other to ridge board or directly opposite from each other with a gusset plate as a tie. Ridge board shall be not less than 1-inch (25 mm) nominal thickness and not less in depth than the cut end of the rafter. At valleys and hips there shall be a valley or hip rafter not less than 2-inch (51 mm) nominal thickness and not less in depth than the cut end of the rafter. Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point. Where the roof pitch is less than three units vertical in 12 units horizontal (25-percent slope), structural members that support rafters and ceiling joists, such as ridge beams, hips and valleys, shall be designed as beams.~~ A ridge board used to connect opposing rafters shall be not less than 1 inch (25 mm) nominal thickness and not less in depth than the cut end of the rafter. Where ceiling joist or rafter ties do not provide continuous ties across the structure, as required by Section R802.5.2, the ~~a~~ ridge shall be supported by a wall or ridge beam designed in accordance with accepted engineering practice ~~shall be provided~~ and supported on each end by a wall or column~~-girder~~.		Framing detail requirements relocated to Section 802.4, new ridge requirements added to code and updated.
	~~**R802.3.1 Ceiling joist and rafter connections.** Ceiling joists and rafters shall be nailed to each other in accordance with Table R802.5.1(9), and the rafter shall be nailed to the top wall plate in accordance with Table R602.3(1). Ceiling joists shall be continuous or securely joined in accordance with Table R802.5.1(9) where they meet over interior partitions and are nailed to adjacent rafters to provide a continuous tie across the building where such joists are parallel to the rafters.~~ ~~Where ceiling joists are not connected to the rafters at the top wall plate, joists connected higher in the *attic* shall be installed as rafter ties, or rafter ties shall be installed to provide a continuous tie. Where ceiling joists are not parallel to rafters, rafter ties shall be installed. Rafter ties shall be not less than 2 inches by 4 inches (51 mm by 102 mm) (nominal), installed in accordance with the connection requirements in Table R802.5.1(9), or connections of equivalent capacities shall be provided. Where ceiling joists or rafter ties are not provided, the ridge formed by these rafters shall be supported by a wall or girder designed in accordance with accepted engineering practice.~~ ~~Collar ties or ridge straps to resist wind uplift shall be connected in the upper third of the *attic* space in accordance with Table R602.3(1).~~ ~~Collar ties shall be not less than 1 inch by 4 inches (25 mm by 102 mm) (nominal), spaced not more than 4 feet (1219 mm) on center.~~		Base code section relocated to Section 802.5.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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	~~**R802.3.2 Ceiling joists lapped.** Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table R802.5.1(9) and butted joists shall be tied together in a manner to resist such thrust. Joists that do not resist thrust shall be permitted to be nailed in accordance with Table R602.3(1).~~		Base code section relocated to Section 802.5.
	~~**R802.3.3 Blocking.** Blocking shall be a minimum of utility grade lumber.~~		Base code section relocated to Section 802.5.
	R802.4 ~~Allowable ceiling joist spans~~Rafters. ~~Spans for ceiling joists shall be in accordance with Tables R802.4(1) and R802.4(2). For other grades and species and for other loading conditions, refer to the AWC STJR~~Rafters shall be in accordance with this section.		Ceiling joist span requirements moved to tables in R802.5, new section for rafter requirements.

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~~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~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~
		~~Maximum ceiling joist spans~~			
		~~(feet—inches)~~	~~(feet—inches)~~	~~(feet—inches)~~	~~(feet—inches)~~
~~12~~	~~Douglas fir-larch SS~~	~~13-2~~	~~20-8~~	~~Note a~~	~~Note a~~
	~~Douglas fir-larch #1~~	~~12-8~~	~~19-11~~	~~Note a~~	~~Note a~~
	~~Douglas fir-larch #2~~	~~12-5~~	~~19-6~~	~~25-8~~	~~Note a~~
	~~Douglas fir-larch #3~~	~~11-1~~	~~16-3~~	~~20-7~~	~~25-2~~
	~~Hem-fir SS~~	~~12-5~~	~~19-6~~	~~25-8~~	~~Note a~~
	~~Hem-fir #1~~	~~12-2~~	~~19-1~~	~~25-2~~	~~Note a~~
	~~Hem-fir #2~~	~~11-7~~	~~18-2~~	~~24-0~~	~~Note a~~
	~~Hem-fir #3~~	~~10-10~~	~~15-10~~	~~20-1~~	~~24-6~~
	~~Southern pine SS~~	~~12-11~~	~~20-3~~	~~Note a~~	~~Note a~~
	~~Southern pine #1~~	~~12-5~~	~~19-6~~	~~25-8~~	~~Note a~~
	~~Southern pine #2~~	~~11-10~~	~~18-8~~	~~24-7~~	~~Note a~~
	~~Southern pine #3~~	~~10-1~~	~~14-11~~	~~18-9~~	~~22-9~~
	~~Spruce-pine-fir SS~~	~~12-2~~	~~19-1~~	~~25-2~~	~~Note a~~
	~~Spruce-pine-fir #1~~	~~11-10~~	~~18-8~~	~~24-7~~	~~Note a~~
	~~Spruce-pine-fir #2~~	~~11-10~~	~~18-8~~	~~24-7~~	~~Note a~~
	~~Spruce-pine-fir #3~~	~~10-10~~	~~15-10~~	~~20-1~~	~~24-6~~
~~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~~

Table relocated to Section R802.5.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
16	Douglas fir-larch	SS	11-3	17-8	23-3	Note a
	Douglas fir-larch	#1	10-10	17-0	22-5	Note a
	Douglas fir-larch	#2	10-7	16-8	21-4	26-0
	Douglas fir-larch	#3	8-9	12-10	16-3	19-10
	Hem-fir	SS	10-7	16-8	21-11	Note a
	Hem-fir	#1	10-4	16-4	21-6	Note a
	Hem-fir	#2	9-11	15-7	20-6	25-3
	Hem-fir	#3	8-7	12-6	15-10	19-5
	Southern pine	SS	11-0	17-4	22-10	Note a
	Southern pine	#1	10-7	16-8	22-0	Note a
	Southern pine	#2	10-2	15-7	19-8	23-5
	Southern pine	#3	8-0	11-9	14-10	18-0
	Spruce-pine-fir	SS	10-4	16-4	21-6	Note a
	Spruce-pine-fir	#1	10-2	15-11	21-0	25-8
	Spruce-pine-fir	#2	10-2	15-11	21-0	25-8
	Spruce-pine-fir	#3	8-7	12-6	15-10	19-5
19.2	Douglas fir-larch	SS	10-5	16-4	21-7	Note a
	Douglas fir-larch	#1	10-0	15-9	20-1	24-6
	Douglas fir-larch	#2	9-10	15-0	19-1	23-3
	Douglas fir-larch	#3	7-10	11-6	14-7	17-9
	Hem-fir	SS	9-10	15-6	20-5	Note a
	Hem-fir	#1	9-8	15-2	19-10	24-3
	Hem-fir	#2	9-2	14-5	18-6	22-7
	Hem-fir	#3	7-8	11-2	14-2	17-4
	Southern pine	SS	10-3	16-1	21-2	Note a
	Southern pine	#1	9-10	15-6	20-5	24-0
	Southern pine	#2	9-3	13-11	17-7	20-11
	Southern pine	#3	7-2	10-6	13-3	16-1
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir	#1	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#2	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#3	7-8	11-2	14-2	17-4
24	Douglas fir-larch	SS	9-10	15-0	19-1	23-3
	Douglas fir-larch	#1	9-5	14-3	18-1	22-1
	Douglas fir-larch	#2	8-11	13-7	17-3	21-1
	Douglas fir-larch	#3	6-8	10-2	12-11	15-9
	Hem-fir	SS	9-4	14-8	19-4	Note a
	Hem-fir	#1	9-2	14-4	18-10	23-0
	Hem-fir	#2	8-8	13-8	17-6	21-5
	Hem-fir	#3	6-8	10-2	12-11	15-9
	Southern pine	SS	9-8	15-3	20-1	Note a
	Southern pine	#1	9-4	14-8	19-4	23-8
	Southern pine	#2	8-10	13-2	16-8	19-10
	Southern pine	#3	6-10	9-11	12-7	15-3
	Spruce-pine-fir	SS	9-2	14-5	18-10	24-1
	Spruce-pine-fir	#1	8-11	13-11	17-9	21-8
	Spruce-pine-fir	#2	8-11	13-11	17-9	21-8
	Spruce-pine-fir	#3	6-8	10-2	12-11	15-9

~~Check sources for availability of lumber in lengths greater than 20 feet.~~
~~For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.~~
~~a. Span exceeds 26 feet in length.~~

Redline Note: Rafter span and Ceiling Joist span tables have been relocated and renumbered resulting in strike through and underline not necessarily due to revision in requirements. For detailed revisions reference should be made to other Code Council resources such as "Complete Revision History" (available in 2018) or "Significant Changes" publications.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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~~TABLE R802.4(2)~~
~~CEILING JOIST SPANS FOR COMMON LUMBER SPECIES~~
~~(Uninhabitable attics with limited storage, live load = 20 psf, L/Δ = 240)~~

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)
12	Douglas fir-larch	SS	10-5	16-4	21-7	Note a
	Douglas fir-larch	#1	10-0	15-9	20-1	24-6
	Douglas fir-larch	#2	9-10	15-0	19-1	23-3
	Douglas fir-larch	#3	7-10	11-6	14-7	17-9
	Hem-fir	SS	9-10	15-6	20-5	Note a
	Hem-fir	#1	9-8	15-2	19-10	24-3
	Hem-fir	#2	9-2	14-5	18-6	22-7
	Hem-fir	#3	7-8	11-2	14-2	17-4
	Southern pine	SS	10-3	16-1	21-2	Note a
	Southern pine	#1	9-10	15-6	20-5	24-0
	Southern pine	#2	9-3	13-11	17-7	20-11
	Southern pine	#3	7-2	10-6	13-3	16-1
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir	#1	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#2	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#3	7-8	11-2	14-2	17-4
16	Douglas fir-larch	SS	9-6	14-11	19-7	25-0
	Douglas fir-larch	#1	9-1	13-9	17-5	21-3
	Douglas fir-larch	#2	8-11	13-0	16-6	20-2
	Douglas fir-larch	#3	6-10	9-11	12-7	15-5
	Hem-fir	SS	8-11	14-1	18-6	23-8
	Hem-fir	#1	8-9	13-7	17-2	21-0
	Hem-fir	#2	8-4	12-8	16-0	19-7
	Hem-fir	#3	6-8	9-8	12-4	15-0
	Southern pine	SS	9-4	14-7	19-3	24-7
	Southern pine	#1	8-11	14-0	17-9	20-9
	Southern pine	#2	8-0	12-0	15-3	18-1
	Southern pine	#3	6-2	9-2	11-6	14-0
	Spruce-pine-fir	SS	8-9	13-9	18-1	23-1
	Spruce-pine-fir	#1	8-7	12-10	16-3	19-10
	Spruce-pine-fir	#2	8-7	12-10	16-3	19-10
	Spruce-pine-fir	#3	6-8	9-8	12-4	15-0

Table relocated to Section R802.5.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf 2 × 4 Maximum ceiling joist spans (feet - inches)	2 × 6 (feet - inches)	2 × 8 (feet - inches)	2 × 10 (feet - inches)
19.2	Douglas fir-larch	SS	8-11	14-0	18-5	23-7
	Douglas fir-larch	#1	8-7	12-6	15-10	19-5
	Douglas fir-larch	#2	8-2	11-11	15-1	18-5
	Douglas fir-larch	#3	6-2	9-1	11-6	14-1
	Hem-fir	SS	8-5	13-3	17-5	22-3
	Hem-fir	#1	8-3	12-4	15-8	19-2
	Hem-fir	#2	7-10	11-7	14-8	17-10
	Hem-fir	#3	6-1	8-10	11-3	13-8
	Southern pine	SS	8-9	13-9	18-2	23-1
	Southern pine	#1	8-5	12-9	16-2	18-11
	Southern pine	#2	7-4	11-0	13-11	16-6
	Southern pine	#3	5-8	8-4	10-6	12-9
	Spruce-pine-fir	SS	8-3	12-11	17-1	21-8
	Spruce-pine-fir	#1	8-0	11-9	14-10	18-2
	Spruce-pine-fir	#2	8-0	11-9	14-10	18-2
	Spruce-pine-fir	#3	6-1	8-10	11-3	13-8
24	Douglas fir-larch	SS	8-3	13-0	17-2	21-3
	Douglas fir-larch	#1	7-8	11-2	14-2	17-4
	Douglas fir-larch	#2	7-3	10-8	13-6	16-5
	Douglas fir-larch	#3	5-7	8-1	10-3	12-7
	Hem-fir	SS	7-10	12-3	16-2	20-6
	Hem-fir	#1	7-7	11-1	14-0	17-1
	Hem-fir	#2	7-1	10-4	13-1	16-0
	Hem-fir	#3	5-5	7-11	10-0	12-3
	Southern pine	SS	8-1	12-9	16-10	21-6
	Southern pine	#1	7-8	11-5	14-6	16-11
	Southern pine	#2	6-7	9-10	12-6	14-9
	Southern pine	#3	5-1	7-5	9-5	11-5
	Spruce-pine-fir	SS	7-8	12-0	15-10	19-5
	Spruce-pine-fir	#1	7-2	10-6	13-3	16-3
	Spruce-pine-fir	#2	7-2	10-6	13-3	16-3
	Spruce-pine-fir	#3	5-5	7-11	10-0	12-3

~~Check sources for availability of lumber in lengths greater than 20 feet.~~
~~For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.~~
~~a. Span exceeds 26 feet in length.~~

R802.4.1 Rafter size. Rafters shall be sized based on the rafter spans in Tables R802.4.1(1) through R802.4.1(8). Rafter spans shall be measured along the horizontal projection of the rafter. For other grades and species and for other loading conditions, refer to the AWC STJR.

New section and requirements for rafter size.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(1)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Roof live load = 20 psf, ceiling not attached to rafters, L/Δ = 180)

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	11-6	18-0	23-9	Note b	Note b	11-6	18-0	23-9	Note b	Note b
	Douglas fir-larch	#1	11-1	17-4	22-5	Note b	Note b	10-6	15-4	19-5	23-9	Note b
	Douglas fir-larch	#2	10-10	16-10	21-4	26-0	Note b	10-0	14-7	18-5	22-6	26-0
	Douglas fir-larch	#3	8-9	12-10	16-3	19-10	23-0	7-7	11-1	14-1	17-2	19-11
	Hem-fir	SS	10-10	17-0	22-5	Note b	Note b	10-10	17-0	22-5	Note b	Note b
	Hem-fir	#1	10 -7	16-8	22-0	Note b	Note b	10-4	15-2	19-2	23-5	Note b
	Hem-fir	#2	10-1	15-11	20-8	25-3	Note b	9-8	14-2	17-11	21-11	25-5
	Hem-fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern pine	SS	11-3	17-8	23-4	Note b	Note b	11-3	17-8	23-4	Note b	Note b
	Southern pine	#1	10-10	17-0	22-5	Note b	Note b	10-6	15-8	19-10	23-2	Note b
	Southern pine	#2	10-4	15-7	19-8	23-5	Note b	9-0	13-6	17-1	20-3	23-10
	Southern pine	#3	8-0	11-9	14-10	18-0	21-4	6-11	10-2	12-10	15-7	18-6
	Spruce-pine-fir	SS	10-7	16-8	21-11	Note b	Note b	10-7	16-8	21-9	Note b	Note b
	Spruce-pine-fir	#1	10-4	16-3	21-0	25-8	Note b	9-10	14-4	18-2	22-3	25-9
	Spruce-pine-fir	#2	10-4	16-3	21-0	25-8	Note b	9-10	14-4	18-2	22-3	25-9
	Spruce-pine-fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
16	Douglas fir-larch	SS	10-5	16-4	21-7	Note b	Note b	10-5	16-3	20-7	25-2	Note b
	Douglas fir-larch	#1	10-0	15-4	19-5	23-9	Note b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch	#2	9-10	14-7	18-5	22-6	26-0	8-7	12-7	16-0	19-6	22-7
	Douglas fir-larch	#3	7-7	11-1	14-1	17-2	19-11	6-7	9-8	12-12	14-11	17-3
	Hem-fir	SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	19-11	24-4	Note b
	Hem-fir	#1	9-8	15-2	19-2	23-5	Note b	9-0	13-1	16-7	20-4	23-7
	Hem-fir	#2	9-2	14-2	17-11	21-11	25-5	8-5	12-3	15-6	18-11	22-0
	Hem-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern pine	SS	10-3	16-1	21-2	Note b	Note b	10-3	16-1	21-2	25-7	Note b
	Southern pine	#1	9-10	15-6	19-10	23-2	Note b	9-1	13-7	17-2	20-1	23-10
	Southern pine	#2	9-0	13-6	17-1	20-3	23-10	7-9	11-8	14-9	17-6	20-8
	Southern pine	#3	6-11	10-2	12-10	15-7	18-6	6-0	8-10	11-2	13-6	16-0
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5	Note b	9-8	14-10	18-10	23-9	Note b
	Spruce-pine-fir	#1	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#2	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
19.2	Douglas fir-larch	SS	9-10	15-5	20-4	25-11	Note b	9-10	14-10	18-10	23-9	Note b
	Douglas fir-larch	#1	9-5	14-0	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas fir-larch	#2	9-1	13-3	16-10	20-7	23-10	7-10	11-6	14-7	17-10	20-8
	Douglas fir-larch	#3	6-11	10-2	12-10	15-8	18-3	6-0	8-9	11-2	12-7	15-9
	Hem-fir	SS	9-3	14-7	19-2	24-6	Note b	9-3	14-4	18-2	22-3	25-9
	Hem-fir	#1	9-1	13-10	17-6	21-5	24-10	8-2	12-0	15-2	18-6	21-6
	Hem-fir	#2	8-8	12-11	16-4	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern pine	SS	9-8	15-2	19-11	25-5	Note b	9-8	15-2	19-7	23-4	Note b
	Southern pine	#1	9-3	14-3	18-1	21-2	25-2	8-4	12-4	15-8	18-4	21-9
	Southern pine	#2	8-2	12-3	15-7	18-6	21-9	7-1	10-8	13-6	16-0	18-10
	Southern pine	#3	6-4	9-4	11-9	14-3	16-10	5-6	8-1	10-2	12-4	14-7
	Spruce-pine-fir	SS	9-1	14-3	18-8	23-11	Note b	9-1	13-7	17-2	21-0	24-4
	Spruce-pine-fir	#1	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#2	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5

New table for rafter span requirements.

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	9-1	14-4	18-10	23-9	Note b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch #1	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch #2	8-2	11-11	15-1	18-5	21-4	7-0	10-4	13-0	15-11	18-6
	Douglas fir-larch #3	6-2	9-1	11-6	14-1	16-3	5-4	7-10	10-0	12-2	14-1
	Hem-fir SS	8-7	13-6	17-10	22-9	Note b	8-7	12-10	16-3	19-10	23-0
	Hem-fir #1	8-5	12-4	15-8	19-2	22-2	7-4	10-9	13-7	16-7	19-3
	Hem-fir #2	7-11	11-7	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-fir #3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern pine SS	8-11	14-1	18-6	23-8	Note b	8-11	13-10	17-6	20-10	24-8
	Southern pine #1	8-7	12-9	16-2	18-11	22-6	7-5	11-1	14-0	16-5	19-6
	Southern pine #2	7-4	11-0	13-11	16-6	19-6	6-4	9-6	12-1	14-4	16-10
	Southern pine #3	5-8	8-4	10-6	12-9	15-1	4-11	7-3	9-1	11-0	13-1
	Spruce-pine-fir SS	8-5	13-3	17-5	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Spruce-pine-fir #1	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir #2	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir #3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space, or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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TABLE R802.4.1(2)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Roof live load = 20 psf, ceiling attached to rafters, L/Δ = 240)

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	10-5	16-4	21-7	Note b	Note b	10-5	16-4	21-7	Note b	Note b
	Douglas fir-larch	#1	10-0	15-9	20-10	Note b	Note b	10-0	15-4	19-5	23-9	Note b
	Douglas fir-larch	#2	9-10	15-6	20-5	26-0	Note b	9-10	14-7	18-5	22-6	26-0
	Douglas fir-larch	#3	8-9	12-10	16-3	19-10	23-0	7-7	11-1	14-1	17-2	19-11
	Hem-fir	SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	20-5	Note b	Note b
	Hem-fir	#1	9-8	15-2	19-11	25-5	Note b	9-8	15-2	19-2	23-5	Note b
	Hem-fir	#2	9-2	14-5	19-0	24-3	Note b	9-2	14-2	17-11	21-11	25-5
	Hem-fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern pine	SS	10-3	16-1	21-2	Note b	Note b	10-3	16-1	21-2	Note b	Note b
	Southern pine	#1	9-10	15-6	20-5	Note b	Note b	9-10	15-6	19-10	23-2	Note b
	Southern pine	#2	9-5	14-9	19-6	23-5	Note b	9-0	13-6	17-1	20-3	23-10
	Southern pine	#3	8-0	11-9	14-10	18-0	21-4	6-11	10-2	12-10	15-7	18-6
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5	Note b	9-8	15-2	19-11	25-5	Note b
	Spruce-pine-fir	#1	9-5	14-9	19-6	24-10	Note b	9-5	14-4	18-2	22-3	25-9
	Spruce-pine-fir	#2	9-5	14-9	19-6	24-10	Note b	9-5	14-4	18-2	22-3	25-9
	Spruce-pine-fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
16	Douglas fir-larch	SS	9-6	14-11	19-7	25-0	Note b	9-6	14-11	19-7	25-0	Note b
	Douglas fir-larch	#1	9-1	14-4	18-11	23-9	Note b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch	#2	8-11	14-1	18-5	22-6	26-0	8-7	12-7	16-0	19-6	22-7
	Douglas fir-larch	#3	7-7	11-1	14-1	17-2	19-11	6-7	9-8	12-2	14-11	17-3
	Hem-fir	SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-6	23-8	Note b
	Hem-fir	#1	8-9	13-9	18-1	23-1	Note b	8-9	13-1	16-7	20-4	23-7
	Hem-fir	#2	8-4	13-1	17-3	21-11	25-5	8-4	12-3	15-6	18-11	22-0
	Hem-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern pine	SS	9-4	14-7	19-3	24-7	Note b	9-4	14-7	19-3	24-7	Note b
	Southern pine	#1	8-11	14-1	18-6	23-2	Note b	8-11	13-7	17-2	20-1	23-10
	Southern pine	#2	8-7	13-5	17-1	20-3	23-10	7-9	11-8	14-9	17-6	20-8
	Southern pine	#3	6-11	10-2	12-10	15-7	18-6	6-0	8-10	11-2	13-6	16-0
	Spruce-pine-fir	SS	8-9	13-9	18-1	23-1	Note b	8-9	13-9	18-1	23-0	Note b
	Spruce-pine-fir	#1	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#2	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
19.2	Douglas fir-larch	SS	8-11	14-0	18-5	23-7	Note b	8-11	14-0	18-5	23-0	Note b
	Douglas fir-larch	#1	8-7	13-6	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas fir-larch	#2	8-5	13-3	16-10	20-7	23-10	7-10	11-6	14-7	17-10	20-8
	Douglas fir-larch	#3	6-11	10-2	12-10	15-8	18-3	6-0	8-9	11-2	13-7	15-9
	Hem-fir	SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	17-5	22-3	25-9
	Hem-fir	#1	8-3	12-11	17-1	21-5	24-10	8-2	12-0	15-2	18-6	21-6
	Hem-fir	#2	7-10	12-4	16-3	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5

New table for rafter span requirements.

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Southern pine	SS	8-9	13-9	18-2	23-1	Note b	8-9	13-9	18-2	23-1	Note b
	Southern pine	#1	8-5	13-3	17-5	21-2	25-2	8-4	12-4	15-8	18-4	21-9
	Southern pine	#2	8-1	12-3	15-7	18-6	21-9	7-1	10-8	13-6	16-0	18-10
	Southern pine	#3	6-4	9-4	11-9	14-3	16-10	5-6	8-1	10-2	12-4	14-7
	Spruce-pine-fir	SS	8-3	12-11	17-1	21-9	Note b	8-3	12-11	17-1	21-0	24-4
	Spruce-pine-fir	#1	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#2	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
16	Douglas fir-larch	SS	8-3	13-0	17-2	21-10	Note b	8-3	13-0	16-10	20-7	23-10
	Douglas fir-larch	#1	8-0	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch	#2	7-10	11-11	15-1	18-5	21-4	7-0	10-4	13-0	15-11	18-6
	Douglas fir-larch	#3	6-2	9-1	11-6	14-1	16-3	5-4	7-10	10-0	12-2	14-1
	Hem-fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-10	23-0
	Hem-fir	#1	7-8	12-0	15-8	19-2	22-2	7-4	10-9	13-7	16-7	19-3
	Hem-fir	#2	7-3	11-5	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern pine	SS	8-1	12-9	16-10	21-6	Note b	8-1	12-9	16-10	20-10	24-8
	Southern pine	#1	7-10	12-3	16-2	18-11	22-6	7-5	11-1	14-0	16-5	19-6
	Southern pine	#2	7-4	11-0	13-11	16-6	19-6	6-4	9-6	12-1	14-4	16-10
	Southern pine	#3	5-8	8-4	10-6	12-9	15-1	4-11	7-3	9-1	11-0	13-1
	Spruce-pine-fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-4	18-9	21-9
	Spruce-pine-fir	#1	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#2	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
19.2	Southern pine	SS	8-9	13-9	18-2	23-1	Note b	8-9	13-9	18-2	23-1	Note b
	Southern pine	#1	8-5	13-3	17-5	21-2	25-2	8-4	12-4	15-8	18-4	21-9
	Southern pine	#2	8-1	12-3	15-7	18-6	21-9	7-1	10-8	13-6	16-0	18-10
	Southern pine	#3	6-4	9-4	11-9	14-3	16-10	5-6	8-1	10-2	12-4	14-7
	Spruce-pine-fir	SS	8-3	12-11	17-1	21-9	Note b	8-3	12-11	17-1	21-0	24-4
	Spruce-pine-fir	#1	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#2	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
24	Douglas fir-larch	SS	8-3	13-0	17-2	21-10	Note b	8-3	13-0	16-10	20-7	23-10
	Douglas fir-larch	#1	8-0	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch	#2	7-10	11-11	15-1	18-5	21-4	7-0	10-4	13-0	15-11	18-6
	Douglas fir-larch	#3	6-2	9-1	11-6	14-1	16-3	5-4	7-10	10-0	12-2	14-1
	Hem-fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-10	23-0
	Hem-fir	#1	7-8	12-0	15-8	19-2	22-2	7-4	10-9	13-7	16-7	19-3
	Hem-fir	#2	7-3	11-5	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern pine	SS	8-1	12-9	16-10	21-6	Note b	8-1	12-9	16-10	20-10	24-8
	Southern pine	#1	7-10	12-3	16-2	18-11	22-6	7-5	11-1	14-0	16-5	19-6
	Southern pine	#2	7-4	11-0	13-11	16-6	19-6	6-4	9-6	12-1	14-4	16-10
	Southern pine	#3	5-8	8-4	10-6	12-9	15-1	4-11	7-3	9-1	11-0	13-1
	Spruce-pine-fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-4	18-9	21-9
	Spruce-pine-fir	#1	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#2	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(3)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 30 psf, ceiling not attached to rafters, L/Δ = 180)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	10-0	15-9	20-9	Note b	Note b	10-0	15-9	20-5	24-11	Note b
	Douglas fir-larch #1	9-8	14-9	18-8	22-9	Note b	9-0	13-2	16-8	20-4	23-7
	Douglas fir-larch #2	9-6	14-0	17-8	21-7	25-1	8-6	12-6	15-10	19-4	22-5
	Douglas fir-larch #1/#2	7-3	10-8	13-6	16-6	19-2	6-6	9-6	12-1	14-9	17-1
	Hem-fir SS	9-6	14-10	19-7	25-0	Note b	9-6	14-10	19-7	24-1	Note b
	Hem-fir #1	9-3	14-6	18-5	22-6	26-0	8-11	13-0	16-6	20-1	23-4
	Hem-fir #2	8-10	13-7	17-2	21-0	24-4	8-4	12-2	15-4	18-9	21-9
	Hem-fir #1/#2	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern pine SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	20-5	25-4	Note b
	Southern pine #1	9-6	14-10	19-0	22-3	Note b	9-0	13-5	17-0	19-11	23-7
	Southern pine #2	8-7	12-11	16-4	19-5	22-10	7-8	11-7	14-8	17-4	20-5
	Southern pine #1/#2	6-7	9-9	12-4	15-0	17-9	5-11	8-9	11-0	13-5	15-10
	Spruce-pine-fir SS	9-3	14-7	19-2	24-6	Note b	9-3	14-7	18-8	22-9	Note b

New table for rafter span requirements.

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	Spruce-pine-fir	#1	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-pine-fir	#2	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-pine-fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas-fir-larch	SS	9-1	14-4	18-10	24-1	Note b	9-1	14-0	17-8	21-7	25-1
	Douglas-fir-larch	#1	8-9	12-9	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas-fir-larch	#2	8-3	12-1	15-4	18-9	21-8	7-5	10-10	13-8	16-9	19-5
	Douglas-fir-larch	#3	6-4	9-3	11-8	14-3	16-7	5-8	8-3	10-6	12-9	14-10
	Hem-fir	SS	8-7	13-6	17-10	22-9	Note b	8-7	13-6	17-1	20-10	24-2
	Hem-fir	#1	8-5	12-7	15-11	19-6	22-7	7-8	11-3	14-3	17-5	20-2
	Hem-fir	#2	8-0	11-9	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern pine	SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-5	1-11	25-11
	Southern pine	#1	8-7	13-0	16-6	19-3	22-10	7-10	11-7	14-9	17-3	20-5
	Southern pine	#2	7-6	11-2	14-2	16-10	19-10	6-8	10-0	12-8	15-1	17-9
	Southern pine	#3	5-9	8-6	10-8	13-0	15-4	5-2	7-7	9-7	11-7	13-9
	Spruce-pine-fir	SS	8-5	13-3	17-5	22-1	25-7	8-5	12-9	16-2	19-9	22-10
	Spruce-pine-fir	#1	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#2	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
19.2	Douglas-fir-larch	SS	8-7	13-6	17-9	22-1	25-7	8-7	12-9	16-2	19-9	22-10
	Douglas-fir-larch	#1	7-11	11-8	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Douglas-fir-larch	#2	7-7	11-0	14-0	17-1	19-10	6-9	9-10	12-6	15-3	17-9
	Douglas-fir-larch	#3	5-9	8-5	10-8	13-1	15-2	5-2	7-7	9-7	11-8	13-6
	Hem-fir	SS	8-1	12-9	16-9	21-4	24-8	8-1	12-4	15-7	19-1	22-1
	Hem-fir	#1	7-10	11-6	14-7	17-9	20-7	7-0	10-3	13-0	15-11	18-5
	Hem-fir	#2	7-4	10-9	13-7	16-7	19-3	6-7	9-7	12-2	14-10	17-3
	Hem-fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
19.2	Southern pine SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	16-10	20-0	23-7
	Southern pine #1	8-0	11-10	15-1	17-7	20-11	7-1	10-7	13-5	15-9	18-8
	Southern pine #2	6-10	10-2	12-11	15-4	18-1	6-1	9-2	11-7	13-9	16-2
	Southern pine #3	5-3	7-9	9-9	11-10	14-0	4-8	6-11	8-9	10-7	12-6
	Spruce-pine-fir SS	7-11	12-5	16-5	20-2	23-4	7-11	11-8	14-9	18-0	20-11
	Spruce-pine-fir #1	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #2	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
24	Douglas fir-larch SS	8-0	12-6	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas fir-larch #1	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch #2	6-9	9-10	12-6	15-3	17-9	6-0	8-10	11-2	13-8	15-10
	Douglas fir-larch #3	5-2	7-7	9-7	11-8	13-6	4-7	6-9	8-7	10-5	12-1
	Hem-fir SS	7-6	11-10	15-7	19-1	22-1	7-6	11-0	13-11	17-0	19-9
	Hem-fir #1	7-0	10-3	13-0	15-11	18-5	6-3	9-2	11-8	14-3	16-6
	Hem-fir #2	6-7	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern pine SS	7-10	12-3	16-2	20-0	23-7	7-10	11-10	15-0	17-11	21-2
	Southern pine #1	7-1	10-7	13-5	15-9	18-8	6-4	9-6	12-0	14-1	16-8
	Southern pine #2	6-1	9-2	11-7	13-9	16-2	5-5	8-2	10-4	12-3	14-6
	Southern pine #3	4-8	6-11	8-9	10-7	12-6	4-2	6-2	7-10	9-6	11-2
	Spruce-pine-fir SS	7-4	11-7	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Spruce-pine-fir #1	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(4)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 30 psf, ceiling attached to rafters, L/Δ = 240)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	9-1	14-4	18-10	24-1	Note b	9-1	14-4	18-10	24-1	Note b
	Douglas fir-larch	#1	8-9	13-9	18-2	22-9	Note b	8-9	13-2	16-8	20-4	23-7
	Douglas fir-larch	#2	8-7	13-6	17-8	21-7	25-1	8-6	12-6	15-10	19-4	22-5
	Douglas fir-larch	#3	7-3	10-8	13-6	16-6	19-2	6-6	9-6	12-1	14-9	17-1
	Hem-fir	SS	8-7	13-6	17-10	22-9	Note b	8-7	13-6	17-10	22-9	Note b
	Hem-fir	#1	8-5	13-3	17-5	22-3	26-0	8-5	13-0	16-6	20-1	23-4
	Hem-fir	#2	8-0	12-7	16-7	21-0	24-4	8-0	12-2	15-4	18-9	21-9
	Hem-fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern pine	SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-6	23-8	Note b
	Southern pine	#1	8-7	13-6	17-10	22-3	Note b	8-7	13-5	17-0	19-11	23-7
	Southern pine	#2	8-3	12-11	16-4	19-5	22-10	7-8	11-7	14-8	17-4	20-5
	Southern pine	#3	6-7	9-9	12-4	15-0	17-9	5-11	8-9	11-0	13-5	15-10
	Spruce-pine-fir	SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	17-5	22-3	Note b
	Spruce-pine-fir	#1	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1

New table for rafter span requirements.

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	Spruce-pine-fir	#2	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1
	Spruce-pine-fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas fir-larch	SS	8-3	13-0	17-2	21-10	Note b	8-3	13-0	17-2	21-7	25-1
	Douglas fir-larch	#1	8-0	12-6	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas fir-larch	#2	7-10	12-1	15-4	18-9	21-8	7-5	10-10	13-8	16-9	19-5
	Douglas fir-larch	#3	6-4	9-3	11-8	14-3	16-7	5-8	8-3	10-6	12-9	14-10
	Hem-fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	20-8	24-2
	Hem-fir	#1	7-8	12-0	15-10	19-6	22-7	7-8	11-3	14-3	17-5	20-2
	Hem-fir	#2	7-3	11-5	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern pine	SS	8-1	12-9	16-10	21-6	Note b	8-1	12-9	16-10	21-6	25-11
	Southern pine	#1	7-10	12-3	16-2	19-3	22-10	7-10	11-7	14-9	17-3	20-5
	Southern pine	#2	7-6	11-2	14-2	16-10	19-10	6-8	10-0	12-8	15-1	17-9
	Southern pine	#3	5-9	8-6	10-8	13-0	15-4	5-2	7-7	9-7	11-7	13-9
	Spruce-pine-fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-10	19-9	22-10
	Spruce-pine-fir	#1	7-6	11-9	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#2	7-6	11-9	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
19.2	Douglas fir-larch	SS	7-9	12-3	16-1	20-7	25-0	7-9	12-3	16-1	19-9	22-10
	Douglas fir-larch	#1	7-6	11-8	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Douglas fir-larch	#2	7-4	11-0	14-0	17-1	19-10	6-9	9-1	12-6	15-3	17-9
	Douglas fir-larch	#3	5-9	8-5	10-8	13-1	15-2	5-2	7-7	9-7	11-8	13-6
	Hem-fir	SS	7-4	11-7	15-3	19-5	23-7	7-4	11-7	15-3	19-1	22-1
	Hem-fir	#1	7-2	11-4	14-7	17-9	20-7	7-0	16-3	13-0	15-11	18-5
	Hem-fir	#2	6-10	10-9	13-7	16-7	19-3	6-7	9-7	12-2	14-10	17-3
	Hem-fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)	(feet – inches)
19.2	Southern pine SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-10	20-0	23-7
	Southern pine #1	7-4	11-7	15-1	17-7	20-11	7-1	10-7	13-5	15-9	18-8
	Southern pine #2	6-10	10-2	12-11	15-4	18-1	6-1	9-2	11-7	13-9	16-2
	Southern pine #3	5-3	7-9	9-9	11-10	14-0	4-8	6-11	8-9	10-7	12-6
	Spruce-pine-fir SS	7-2	11-4	14-11	19-0	23-1	7-2	11-4	14-9	18-0	20-11
	Spruce-pine-fir #1	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #2	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
24	Douglas fir-larch SS	7-3	11-4	15-0	19-1	22-10	7-3	11-4	14-5	17-8	20-5
	Douglas fir-larch #1	7-0	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch #2	6-9	9-10	12-6	15-3	17-9	6-0	8-10	11-2	13-8	15-10
	Douglas fir-larch #3	5-2	7-7	9-7	11-8	13-6	4-7	6-9	8-7	10-5	12-1
	Hem-fir SS	6-10	10-9	14-2	18-0	21-11	6-10	10-9	13-11	17-0	19-9
	Hem-fir #1	6-8	10-3	13-0	15-11	18-5	6-3	9-2	11-8	14-3	16-6
	Hem-fir #2	6-4	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern pine SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	17-11	21-2
	Southern pine #1	6-10	10-7	13-5	15-9	18-8	6-4	9-6	12-0	14-1	16-8
	Southern pine #2	6-1	9-2	11-7	13-9	16-2	5-5	8-2	10-4	12-3	14-6
	Southern pine #3	4-8	6-11	8-9	10-7	12-6	4-2	6-2	7-10	9-6	11-2
	Spruce-pine-fir SS	6-8	10-6	13-10	17-8	20-11	6-8	10-5	13-2	16-1	18-8
	Spruce-pine-fir #1	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #2	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(5)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 50 psf, ceiling not attached to rafters, L/Δ = 180)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	8-5	13-3	17-6	22-4	26-0	8-5	13-3	17-3	21-1	24-5
	Douglas fir-larch #1	8-2	12-0	15-3	18-7	21-7	7-7	11-2	14-1	17-3	20-0
	Douglas fir-larch #2	7-10	11-5	14-5	17-8	20-5	7-3	10-7	13-4	16-4	18-11
	Douglas fir-larch #3	6-0	8-9	11-0	13-6	15-7	5-6	8-1	10-3	12-6	14-6
	Hem-fir SS	8-0	12-6	16-6	21-1	25-6	8-0	12-6	16-6	20-4	23-7
	Hem-fir #1	7-10	11-10	15-0	18-4	21-3	7-6	11-0	13-11	17-0	19-9
	Hem-fir #2	7-5	11-1	14-0	17-2	19-11	7-0	10-3	13-0	15-10	18-5
	Hem-fir #3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern pine SS	8-4	13-1	17-2	21-11	Note b	8-4	13-1	17-2	21-5	25-3
	Southern pine #1	8-0	12-3	15-6	18-2	21-7	7-7	11-4	14-5	16-10	20-0
	Southern pine #2	7-0	10-6	13-4	15-10	18-8	6-6	9-9	12-4	14-8	17-3
	Southern #3	5-5	8-0	10-1	12-3	14-6	5-0	7-5	9-4	11-4	13-5

New table for rafter span requirements.

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021
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	Spruce-pine-fir	SS	7-10	12-3	16-2	20-8	24-1	7-10	12-3	15-9	19-3	22-4
	Spruce-pine-fir	#1	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#2	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas fir-larch	SS	7-8	12-1	15-11	19-9	22-10	7-8	11-10	14-11	18-3	21-2
	Douglas fir-larch	#1	7-1	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch	#2	6-9	9-10	12-6	15-3	17-9	6-3	9-2	11-7	14-2	16-5
	Douglas fir-larch	#3	5-2	7-7	9-7	11-18	13-6	4-9	7-0	8-10	10-10	12-6
	Hem-fir	SS	7-3	11-5	15-0	19-1	22-1	7-3	11-5	14-5	17-8	20-5
	Hem-fir	#1	7-0	10-3	13-0	15-11	18-5	6-6	9-6	12-1	14-9	17-1
	Hem-fir	#2	6-7	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern pine	SS	7-6	11-10	15-7	19-11	23-7	7-6	11-10	15-7	18-6	21-10
	Southern pine	#1	7-1	10-7	13-5	15-9	18-8	6-7	9-10	12-5	14-7	17-3
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-8	8-5	10-9	12-9	15-0
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-4	6-5	8-1	9-10	11-7
	Spruce-pine-fir	SS	7-1	11-2	14-8	18-0	20-11	7-1	10-9	13-8	15-11	19-4
	Spruce-pine-fir	#1	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#2	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
19.2	Douglas fir-larch	SS	7-3	11-4	14-9	18-0	20-11	7-3	10-9	13-8	16-8	19-4
	Douglas fir-larch	#1	6-6	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas fir-larch	#2	6-2	9-0	11-5	13-11	16-2	5-8	8-4	10-9	12-11	15-0
	Douglas fir-larch	#3	4-8	6-11	8-9	10-8	12-4	4-4	6-4	8-1	9-10	11-5
	Hem-fir	SS	6-10	10-9	14-2	17-5	20-2	6-10	10-5	13-2	16-1	18-8
	Hem-fir	#1	6-5	9-5	11-11	14-6	16-10	8-11	8-8	11-0	13-5	15-7
	Hem-fir	#2	6-0	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Southern pine SS	7-1	11-2	14-8	18-3	21-7	7-1	11-2	14-2	16-11	20-0
	Southern pine #1 #2 #3	6-6	9-8	12-3	14-4	17-1	6-0	9-0	11-4	13-4	15-9
	Southern pine #2 #3	5-7	8-4	10-7	12-6	14-9	5-2	7-9	9-9	11-7	13-8
	Southern pine #3	4-3	6-4	8-0	9-8	11-5	4-0	5-10	7-4	8-11	10-7
	Spruce-pine-fir SS	6-8	10-6	13-5	16-5	19-1	6-8	9-10	12-5	15-3	17-8
	Spruce-pine-fir #1 #1	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
16	Douglas fir-larch SS	6-8	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch #1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas fir-larch #2	5-6	8-1	10-3	12-6	14-6	5-1	7-6	9-5	11-7	13-5
	Douglas fir-larch #3	4-3	6-2	7-10	9-6	11-1	3-11	5-8	7-3	8-10	10-3
	Hem-fir SS	6-4	9-11	12-9	15-7	18-0	6-4	9-4	11-9	14-5	16-8
	Hem-fir #1 #2	5-9	8-5	10-8	13-0	15-1	8-4	7-9	9-10	12-0	13-11
	Hem-fir #3	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-fir	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern pine SS	6-7	10-4	13-8	16-4	19-3	6-7	10-0	12-8	15-2	17-10
	Southern pine #1 #2	5-10	8-8	11-0	12-10	15-3	5-5	8-0	10-2	11-11	14-1
	Southern pine #3	5-0	7-5	9-5	11-3	13-2	4-7	6-11	8-9	10-5	12-3
	Southern pine	3-10	5-8	7-1	8-8	10-3	3-6	5-3	6-7	8-0	9-6
	Spruce-pine-fir SS	6-2	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Spruce-pine-fir #1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
19.2	Southern pine SS	7-1	11-2	14-8	18-3	21-7	7-1	11-2	14-2	16-11	20-0
	Southern pine #1 #2	6-6	9-8	12-3	14-4	17-1	6-0	9-0	11-4	13-4	15-9
	Southern pine #2	5-7	8-4	10-7	12-6	14-9	5-2	7-9	9-9	11-7	13-8
	Southern pine #3	4-3	6-4	8-0	9-8	11-5	4-0	5-10	7-4	8-11	10-7
	Spruce-pine-fir SS	6-8	10-6	13-5	16-5	19-1	6-8	9-10	12-5	15-3	17-8
	Spruce-pine-fir #1 #1	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
24	Douglas fir-larch SS	6-8	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch #1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas fir-larch #2	5-6	8-1	10-3	12-6	14-6	5-1	7-6	9-5	11-7	13-5
	Douglas fir-larch #3	4-3	6-2	7-10	9-6	11-1	3-11	5-8	7-3	8-10	10-3
	Hem-fir SS	6-4	9-11	12-9	15-7	18-0	6-4	9-4	11-9	14-5	16-8
	Hem-fir #1 #2	5-9	8-5	10-8	13-0	15-1	8-4	7-9	9-10	12-0	13-11
	Hem-fir #3	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-fir	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern pine SS	6-7	10-4	13-8	16-4	19-3	6-7	10-0	12-8	15-2	17-10
	Southern pine #1 #2	5-10	8-8	11-0	12-10	15-3	5-5	8-0	10-2	11-11	14-1
	Southern pine #3	5-0	7-5	9-5	11-3	13-2	4-7	6-11	8-9	10-5	12-3
	Southern pine	3-10	5-8	7-1	8-8	10-3	3-6	5-3	6-7	8-0	9-6
	Spruce-pine-fir SS	6-2	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Spruce-pine-fir #1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space, or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(6)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 50 psf, ceiling attached to rafters, L/Δ = 240)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Douglas fir-larch	SS	7-8	12-1	15-11	20-3	24-8	7-8	12-1	15-11	20-3	24-5
	Douglas fir-larch	#1	7-5	11-7	15-3	18-7	21-7	7-5	11-2	14-1	17-3	20-0
	Douglas fir-larch	#2	7-3	11-5	14-5	17-8	20-5	7-3	10-7	13-4	16-4	18-11
	Douglas fir-larch	#3	6-0	8-9	11-0	13-6	15-7	5-6	8-1	10-3	12-6	14-6
	Hem-fir	SS	7-3	11-5	15-0	19-2	23-4	7-3	11-5	15-0	19-2	23-4
	Hem-fir	#1	7-1	11-2	14-8	18-4	21-3	7-1	11-0	13-11	17-0	19-9
	Hem-fir	#2	6-9	10-8	14-0	17-2	19-11	6-9	10-3	13-0	15-10	18-5
	Hem-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern pine	SS	7-6	11-10	15-7	19-11	24-3	7-6	11-10	15-7	19-11	24-3
	Southern pine	#1	7-3	11-5	15-0	18-2	21-7	7-3	11-4	14-5	16-10	20-0
	Southern pine	#2	6-11	10-6	13-4	15-10	18-8	6-6	9-9	12-4	14-8	17-3
	Southern	#	5-5	8-0	10-1	12-3	14-6	5-0	7-5	9-4	11-4	13-5

New table for rafter span requirements.

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	pine											
	Spruce-pine-fir	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-4
	Spruce-pine-fir	#1	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#2	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas fir-larch	SS	7-0	11-0	14-5	18-5	22-5	7-0	11-0	14-5	18-3	21-2
	Douglas fir-larch	#1	6-9	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch	#2	6-7	9-10	12-6	15-3	17-9	6-3	9-2	11-7	14-2	16-5
	Douglas fir-larch	#3	5-2	7-7	9-7	11-8	13-6	4-9	7-0	8-10	10-10	12-6
	Hem-fir	SS	6-7	10-4	13-8	17-5	21-2	6-7	10-4	13-8	17-5	20-5
	Hem-fir	#1	6-5	10-2	13-0	15-11	18-5	6-5	9-6	12-1	14-9	17-1
	Hem-fir	#2	6-2	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern pine	SS	6-10	10-9	14-2	18-1	22-0	6-10	10-9	14-2	18-1	21-10
	Southern pine	#1	6-7	10-4	13-5	15-9	18-8	6-7	9-10	12-5	14-7	17-3
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-8	8-5	10-9	12-9	15-0
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-4	6-5	8-1	9-10	11-7
	Spruce-pine-fir	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-8	19-4
	Spruce-pine-fir	#1	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#2	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
19.2	Douglas fir-larch	SS	6-7	10-4	13-7	17-4	20-11	6-7	10-4	13-7	16-8	19-4
	Douglas fir-larch	#1	6-4	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas fir-larch	#2	6-2	9-0	11-5	13-11	16-2	5-8	8-4	10-7	12-11	15-0
	Douglas fir-larch	#3	4-8	6-11	8-9	10-8	12-4	4-4	6-4	8-1	9-10	11-5
	Hem-fir	SS	6-2	9-9	12-10	16-5	19-11	6-2	9-9	12-10	16-1	18-8
	Hem-fir	#1	6-1	9-5	11-11	14-6	16-10	5-11	8-8	11-0	13-5	15-7
	Hem-fir	#2	5-9	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
19.2	Southern pine SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-11	20-0
	Southern pine #1	6-2	9-8	12-3	14-4	17-1	6-0	9-0	11-4	13-4	15-9
	Southern pine #2	5-7	8-4	10-7	12-6	14-9	5-2	7-9	9-9	11-7	13-8
	Southern pine #3	4-3	6-4	8-0	9-8	11-5	4-0	5-10	7-4	8-11	10-7
	Spruce-pine-fir SS	6-1	9-6	12-7	16-0	19-1	6-1	9-6	12-5	15-3	17-8
	Spruce-pine-fir #1	5-11	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #2	5-11	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir #3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
24	Douglas fir-larch SS	6-1	9-7	12-7	16-1	18-8	6-1	9-7	12-2	14-11	17-3
	Douglas fir-larch #1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas fir-larch #2	5-6	8-1	10-3	12-6	14-6	5-1	7-6	9-5	11-7	13-5
	Douglas fir-larch #3	4-3	6-2	7-10	9-6	11-1	3-11	5-8	7-3	8-10	10-3
	Hem-fir SS	5-9	9-1	11-11	15-2	18-0	5-9	9-1	11-9	14-5	15-11
	Hem-fir #1	5-8	8-5	10-8	13-0	15-1	5-4	7-9	9-10	12-0	13-11
	Hem-fir #2	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-fir #3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern pine SS	6-0	9-5	12-5	15-10	19-3	6-0	9-5	12-5	15-2	17-10
	Southern pine #1	5-9	8-8	11-0	12-10	15-3	5-5	8-0	10-2	11-11	14-1
	Southern pine #2	5-0	7-5	9-5	11-3	13-2	4-7	6-11	8-9	10-5	12-3
	Southern pine #3	3-10	5-8	7-1	8-8	10-3	3-6	5-3	6-7	8-0	9-6
	Spruce-pine-fir SS	5-8	8-10	11-8	14-8	17-1	5-8	8-10	11-2	13-7	15-9
	Spruce-pine-fir #1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-pine-fir #3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.
H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | **Grey Text** = Previous COH Amendment Brought Forward to 2021

~~**Yellow Strikethrough**~~ = Text Deleted from the Code by COH | **Green Text** = NEW or Modified Text by COH in 2021 | **Magenta** = New or modified Text by ICC in 2018

TABLE R802.4.1(7)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 70 psf, ceiling not attached to rafters, L/Δ = 180)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum Rafter Spans[a]									
		(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Douglas fir-larch SS	7-7	11-10	15-8	19-9	22-10	7-7	11-10	15-3	18-7	21-7
	Douglas fir-larch #1	7-1	10-5	13-2	16-1	18-8	6-8	9-10	12-5	15-2	17-7
	Douglas fir-larch #2	6-9	9-10	12-6	15-3	17-9	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch #3	5-2	7-7	9-7	11-8	13-6	4-10	7-1	9-0	11-0	12-9
	Hem-fir SS	7-2	11-3	14-9	18-10	22-1	7-2	11-3	14-8	18-0	20-10
	Hem-fir #1	7-0	10-3	13-0	15-11	18-5	6-7	9-8	12-3	15-0	17-5
	Hem-fir #2	6-7	9-7	12-2	14-10	17-3	6-2	9-1	11-5	14-0	16-3
	Hem-fir #3	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Southern pine SS	7-5	11-8	15-4	19-7	23-7	7-5	11-8	15-4	18-10	22-3
	Southern pine #1	7-1	10-7	13-5	15-9	18-8	6-9	10-0	12-8	14-10	17-7
	Southern pine #2	6-1	9-2	11-7	13-9	16-2	5-9	8-7	10-11	12-11	15-3
	Southern #	4-8	6-11	8-9	10-7	12-6	4-5	6-6	8-3	10-0	11-10

New table for rafter span requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	pine	SS	7-0	11-0	14-6	18-0	20-11	7-0	11-0	13-11	17-0	19-8
	Spruce-pine-fir	#1	6-8	9-9	12-4	15-1	17-6	6-3	9-2	11-8	14-2	16-6
	Spruce-pine-fir	#2	6-8	9-9	12-4	15-1	17-6	6-3	9-2	11-8	14-2	16-6
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
16	Douglas fir-larch	SS	6-10	10-9	14-0	17-1	19-10	6-10	10-5	13-2	16-1	18-8
	Douglas fir-larch	#1	6-2	9-0	11-5	13-11	16-2	5-10	8-6	10-9	13-2	15-3
	Douglas fir-larch	#2	5-10	8-7	10-10	13-3	15-4	5-6	8-1	10-3	12-6	14-6
	Douglas fir-larch	#3	4-6	6-6	8-3	10-1	11-9	4-3	6-2	7-10	9-6	11-1
	Hem-fir	SS	6-6	10-2	13-5	16-6	19-2	6-6	10-1	12-9	15-7	18-0
	Hem-fir	#1	6-1	8-11	11-3	13-9	16-0	5-9	8-5	10-8	13-0	15-1
	Hem-fir	#2	5-8	8-4	10-6	12-10	14-11	5-4	7-10	9-11	12-1	14-1
	Hem-fir	#3	4-4	6-4	8-1	9-10	11-5	4-1	6-0	7-7	9-4	10-9
	Southern pine	SS	6-9	10-7	14-0	17-4	20-5	6-9	10-7	13-9	16-4	19-3
	Southern pine	#1	6-2	9-2	11-8	13-8	16-2	5-10	8-8	11-0	12-10	15-3
	Southern pine	#2	5-3	7-11	10-0	11-11	14-0	5-0	7-5	9-5	11-3	13-2
	Southern pine	#3	4-1	6-0	7-7	9-2	10-10	3-10	5-8	7-1	8-8	10-3
	Spruce-pine-fir	SS	6-4	10-0	12-9	15-7	18-1	6-4	9-6	12-0	14-8	17-1
	Spruce-pine-fir	#1	5-9	8-5	10-8	13-1	15-2	5-5	7-11	10-1	12-4	14-3
	Spruce-pine-fir	#2	5-9	8-5	10-8	13-1	15-2	5-5	7-11	10-1	12-4	14-3
	Spruce-pine-fir	#3	4-4	6-4	8-1	9-10	11-5	4-1	6-0	7-7	9-4	10-9
19.2	Douglas fir-larch	SS	6-6	10-1	12-9	15-7	18-1	6-6	9-6	12-0	14-8	17-1
	Douglas fir-larch	#1	5-7	8-3	10-5	12-9	14-9	5-4	7-9	9-10	12-0	13-11
	Douglas fir-larch	#2	5-4	7-10	9-11	12-1	14-0	5-0	7-4	9-4	11-5	13-2
	Douglas fir-larch	#3	4-1	6-0	7-7	9-3	10-8	3-10	5-7	7-1	8-8	10-1
	Hem-fir	SS	6-1	9-7	12-4	15-1	17-4	6-1	9-2	11-8	14-2	15-5
	Hem-fir	#1	5-7	8-2	10-3	12-7	14-7	5-3	7-8	9-8	11-10	13-9
	Hem-fir	#2	5-2	7-7	9-7	11-9	13-7	4-11	7-2	9-1	11-1	12-10
	Hem-fir	#3	4-0	5-10	7-4	9-0	10-5	3-9	5-6	6-11	8-6	9-10

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum Rafter Spans[a]									
		(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
19.2	Southern pine SS	6-4	10-0	13-2	15-10	18-8	6-4	9-10	12-6	14-11	17-7
	Southern pine #1	5-8	8-5	10-8	12-5	14-9	5-4	7-11	10-0	11-9	13-11
	Southern pine #2	4-10	7-3	9-2	10-10	12-9	4-6	6-10	8-8	10-3	12-1
	Southern pine #3	3-8	5-6	6-11	8-4	9-11	3-6	5-2	6-6	7-11	9-4
	Spruce-pine-fir SS	6-0	9-2	11-8	14-3	16-6	5-11	8-8	11-0	13-5	15-7
	Spruce-pine-fir #1	5-3	7-8	9-9	11-11	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir #2	5-3	7-8	9-9	11-11	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir #3	4-0	5-10	7-4	9-0	10-5	3-9	5-6	6-11	8-6	9-10
24	Douglas fir-larch SS	6-0	9-0	11-5	13-11	16-2	5-10	8-6	10-9	13-2	15-3
	Douglas fir-larch #1	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Douglas fir-larch #2	4-9	7-0	8-10	10-10	12-6	4-6	6-7	8-4	10-2	11-10
	Douglas fir-larch #3	3-8	5-4	6-9	8-3	9-7	3-5	5-0	6-4	7-9	9-10
	Hem-fir SS	5-8	8-8	11-0	13-6	13-11	5-7	8-3	10-5	12-4	12-4
	Hem-fir #1	5-0	7-3	9-2	11-3	13-0	4-8	6-10	8-8	10-7	12-4
	Hem-fir #2	4-8	6-9	8-7	10-6	12-2	4-4	6-5	8-1	9-11	11-6
	Hem-fir #3	3-7	5-2	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10
	Southern pine SS	5-11	9-3	11-11	14-2	16-8	5-11	8-10	11-2	13-4	15-9
	Southern pine #1	5-0	7-6	9-6	11-1	13-2	4-9	7-1	9-0	10-6	12-5
	Southern pine #2	4-4	6-5	8-2	9-9	11-5	4-1	6-1	7-9	9-2	10-9
	Southern pine #3	3-4	4-11	6-2	7-6	8-10	3-1	4-7	5-10	7-1	8-4
	Spruce-pine-fir SS	5-6	8-3	10-5	12-9	14-9	5-4	7-9	9-10	12-0	12-11
	Spruce-pine-fir #1	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir #2	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir #3	3-7	5-2	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space, or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.4.1(8)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 70 psf, ceiling attached to rafters, L/Δ = 240)

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	6-10	10-9	14-3	18-2	22-1	6-10	10-9	14-3	18-2	21-7
	Douglas fir-larch	#1	6-7	10-5	13-2	16-1	18-8	6-7	9-10	12-5	15-2	17-7
	Douglas fir-larch	#2	6-6	9-10	12-6	15-3	17-9	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch	#3	5-2	7-7	9-7	11-8	13-6	4-10	7-1	9-0	11-0	12-9
	Hem-fir	SS	6-6	10-2	13-5	17-2	20-10	6-6	10-2	13-5	17-2	20-10
	Hem-fir	#1	6-4	10-0	13-0	15-11	18-5	6-4	9-8	12-3	15-0	17-5
	Hem-fir	#2	6-1	9-6	12-2	14-10	17-3	6-1	9-1	11-5	14-0	16-3
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Southern pine	SS	6-9	10-7	14-0	17-10	21-8	6-9	10-7	14-0	17-10	21-8
	Southern pine	#1	6-6	10-2	13-5	15-9	18-8	6-6	10-0	12-8	14-10	17-7
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-9	8-7	10-11	12-11	15-3
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-5	6-6	8-3	10-0	11-10

New table for rafter span requirements.

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	Spruce-pine-fir	SS	6-4	10-0	13-2	16-9	20-5	6-4	10-0	13-2	16-9	19-8
	Spruce-pine-fir	#1	6-2	9-9	12-4	15-1	17-6	6-2	9-2	11-8	14-2	16-6
	Spruce-pine-fir	#2	6-2	9-9	12-4	15-1	17-6	6-2	9-2	11-8	14-2	16-6
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Douglas fir-larch	SS	6-3	9-10	12-11	16-6	19-10	6-3	9-10	12-11	16-1	18-8
	Douglas fir-larch	#1	6-0	9-0	11-5	13-11	16-2	5-10	8-6	10-9	13-2	15-3
	Douglas fir-larch	#2	5-10	8-7	10-10	13-3	15-4	5-6	8-1	10-3	12-6	14-6
	Douglas fir-larch	#3	4-6	6-6	8-3	10-1	11-9	4-3	6-2	7-10	9-6	11-1
	Hem-fir	SS	5-11	9-3	12-2	15-7	18-11	5-11	9-3	12-2	15-7	18-0
	Hem-fir	#1	5-9	8-11	11-3	13-9	16-0	5-9	8-5	10-8	13-0	15-1
	Hem-fir	#2	5-6	8-4	10-6	12-10	14-11	5-4	7-10	9-11	12-1	14-1
	Hem-fir	#3	4-4	6-4	8-1	9-10	11-5	4-1	6-0	7-7	9-4	10-9
16	Southern pine	SS	6-1	9-7	12-8	16-2	19-8	6-1	9-7	12-8	16-2	19-3
	Southern pine	#1	5-11	9-2	11-8	13-8	16-2	5-10	8-8	11-0	12-10	15-3
	Southern pine	#2	5-3	7-11	10-0	11-11	14-0	5-0	7-5	9-5	11-3	13-2
	Southern pine	#3	4-1	6-0	7-7	9-2	10-10	3-10	5-8	7-1	8-8	10-3
	Spruce-pine-fir	SS	5-9	9-1	11-11	15-3	18-1	5-9	9-1	11-11	14-8	17-1
	Spruce-pine-fir	#1	5-8	8-5	10-8	13-1	15-2	5-5	7-11	10-1	12-4	14-3
	Spruce-pine-fir	#2	5-8	8-5	10-8	13-1	15-2	5-5	7-11	10-1	12-4	14-3
	Spruce-pine-fir	#3	4-4	6-4	8-1	9-10	11-5	4-1	6-0	7-7	9-4	10-9
	Douglas fir-larch	SS	5-10	9-3	12-2	15-6	18-1	5-10	9-3	12-0	14-8	17-1
	Douglas fir-larch	#1	5-7	8-3	10-5	12-9	14-9	5-4	7-9	9-10	12-0	13-11
	Douglas fir-larch	#2	5-4	7-10	9-11	12-1	14-0	5-0	7-4	9-4	11-5	13-2
	Douglas fir-larch	#3	4-1	6-0	7-7	9-3	10-8	3-10	5-7	7-1	8-8	10-1
19.2	Hem-fir	SS	5-6	8-8	11-6	14-8	17-4	5-6	8-8	11-6	14-2	15-5
	Hem-fir	#1	5-5	8-2	10-3	12-7	14-7	5-3	7-8	9-8	11-10	13-9
	Hem-fir	#2	5-2	7-7	9-7	11-9	13-7	4-11	7-2	9-1	11-1	12-10
	Hem-fir	#3	4-0	5-10	7-4	9-0	10-5	3-9	5-6	6-11	8-6	9-10

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RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
		Maximum rafter spans[a]									
		(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)	(feet = inches)
19.2	Southern pine SS	5-9	9-1	11-11	15-3	18-6	5-9	9-1	11-11	14-11	17-7
	Southern pine #1	5-6	8-5	10-8	12-5	14-9	5-4	7-11	10-0	11-9	13-11
	Southern pine #2	4-10	7-3	9-2	10-10	12-9	4-6	6-10	8-8	10-3	12-1
	Southern pine #3	3-8	5-6	6-11	8-4	9-11	3-6	5-2	6-6	7-11	9-4
	Spruce-pine-fir SS	5-5	8-6	11-3	14-3	16-6	5-5	8-6	11-0	13-5	15-7
	Spruce-pine-fir #1	5-3	7-8	9-9	11-11	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir #2	5-3	7-8	9-9	11-11	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir #3	4-0	5-10	7-4	9-0	10-5	3-9	5-6	6-11	8-6	9-10
24	Douglas fir-larch SS	5-5	8-7	11-3	13-11	16-2	5-5	8-6	10-9	13-2	15-3
	Douglas fir-larch #1	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Douglas fir-larch #2	4-9	7-0	8-10	10-10	12-6	4-6	6-7	8-4	10-2	11-10
	Douglas fir-larch #3	3-8	5-4	6-9	8-3	9-7	3-5	5-0	6-4	7-9	9-0
	Hem-fir SS	5-2	8-1	10-8	13-6	13-11	5-2	8-1	10-5	12-4	12-4
	Hem-fir #1	5-0	7-3	9-2	11-3	13-0	4-8	6-10	8-8	10-7	12-4
	Hem-fir #2	4-8	6-9	8-7	10-6	12-2	4-4	6-5	8-1	9-11	11-6
	Hem-fir #3	3-7	5-2	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10
	Southern pine SS	5-4	8-5	11-1	14-2	16-8	5-4	8-5	11-1	13-4	15-9
	Southern pine #1	5-0	7-6	9-6	11-1	13-2	4-9	7-1	9-0	10-6	12-5
	Southern pine #2	4-4	6-5	8-2	9-9	11-5	4-1	6-1	7-9	9-2	10-9
	Southern pine #3	3-4	4-11	6-2	7-6	8-10	3-1	4-7	5-10	7-1	8-4
	Spruce-pine-fir SS	5-0	7-11	10-5	12-9	14-9	5-0	7-9	9-10	12-0	12-11
	Spruce-pine-fir #1	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir #2	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir #3	3-7	5-2	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space, or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

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	TABLE R802.4.1(9) **RAFTER SPAN ADJUSTMENT FACTOR** H_C/H_R[a] | RAFTER SPAN ADJUSTMENT FACTOR 1/3 | 0.67 1/4 | 0.76 1/5 | 0.83 1/6 | 0.90 1/7.5 or less | 1.00 a. H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls; H_R = Height of roof ridge measured vertically above the top of the rafter support walls.		New table for rafter span requirements.
	R802.4.2 Framing details. Rafters shall be framed opposite from each other to a ridge board, shall not be offset more than 1 1/2 inches (38 mm) ~~offset from each other to a ridge board or directly opposite from each other~~ and shall be connected with a collar tie, gusset plate or ridge strap in accordance with Table R602.3(1). Rafters shall be nailed to the top wall plates in accordance with Section R802.4.6 or directly opposite from each other to a gusset plate in accordance with Table R602.3(1) unless the roof assembly is required to comply with the uplift requirements of Section R802.11.		New section and requirements for rafter construction.
	R802.4.3 Hips and valleys. Hip and valley rafters shall be not less than 2 inches (51 mm) nominal in thickness and not less in depth than the cut end of the rafter. Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point.		New section and requirements for rafter construction.
	R802.4.4 Rafter supports. Where the roof pitch is less than 3:12 (25-percent slope), structural members that support rafters, such as ridges, hips and valleys, shall be designed as beams, and bearing shall be provided for rafters in accordance with Section R802.6.		New section and requirements for rafter construction.
	R802.4.5 Purlins. Installation of purlins to reduce the span of rafters is permitted as shown in Figure R802.4.5. Purlins shall be sized not less than the required size of the rafters that they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch (51 mm by 102 mm) braces installed to bearing walls at a slope not less than 45 degrees (0.79 rad) from the horizontal. The braces shall be spaced not more than 4 feet (1219 mm) on center and the unbraced length of braces shall not exceed 8 feet (2438 mm).		New section and requirements for rafter construction.

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	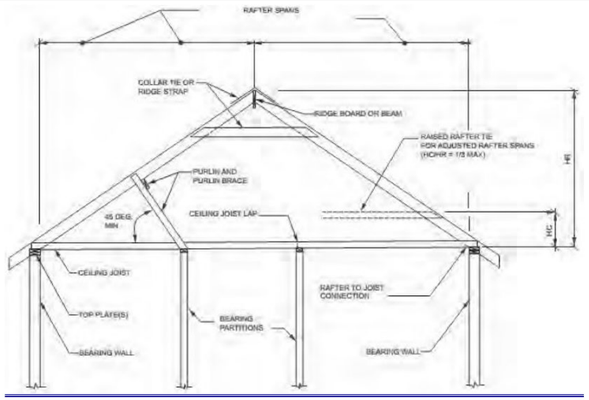 **For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 degree = 0.018 rad.** ***HC* = Height of ceiling joists or rafter ties measured vertically above the top of rafter support walls.** ***HR* = Height of roof ridge measured vertically above the top of the rafter support walls.** **FIGURE R802.4.5** **BRACED RAFTER CONSTRUCTION**		New figure for rafter construction.
	R802.4.6 Collar ties. Where collar ties are used to connect opposing rafters, they shall be located in the upper third of the attic space and fastened in accordance with Table R602.3(1). Collar ties shall be not less than 1 inch by 4 inches (25 mm × 102 mm) nominal, spaced not more than 4 feet (1220 mm) on center. Ridge straps ~~in accordance with TABLE R602.3(1)~~ in accordance with Table R602.3(1) shall be permitted to replace collar ties. Ridge straps shall be not less than $1^1/_4$-inch (32 mm) × 20 gage and shall be nailed to the top edge of each rafter with not fewer than three 10d common (3″ × 0.148″) nails with the closest nail not closer than $2^3/_8$ inches (60.3 mm) from the end of the rafter.		New section and requirements for rafter construction.
	R802.5 ~~Allowable rafter spans~~ **Ceiling joists.** ~~Spans for rafters shall be in accordance with Tables R802.5.1(1) through R802.5.1(8). For other grades and species and for other loading conditions, refer to the AWC STJR. The span of each rafter shall be measured along the horizontal projection of the rafter~~ Ceiling joists shall be continuous across the structure or securely joined where they meet over interior partitions in accordance with ~~TABLE R802.5.2(1)~~ **Section R802.5.2.1**. Ceiling joists shall be fastened to the top plate in accordance with **Table R602.3(1)**.		Ceiling joists requirements relocated from Section R802.4, minor updates.
	R802.5.1 ~~Purlins~~ **Ceiling joist size.** ~~Installation of purlins to reduce the span of rafters is permitted as shown in Figure R802.5.1. Purlins shall be sized not less than the required size of the rafters that they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch (51 mm by 102 mm) braces installed to bearing walls at a slope not less than 45 degrees (0.79 rad) from the horizontal. The braces shall be spaced not more than 4 feet (1219 mm) on center and the unbraced length of braces shall not exceed 8 feet (2438 mm)~~ Ceiling joists shall be sized based on the joist spans in Tables		Ceiling joists requirements relocated from Section R802.4.

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	R802.5.1(1) and R802.5.1(2). For other grades and species and for other loading conditions, refer to the AWC STJR.		
	R802.5.2 Ceiling joist and rafter connections. Where ceiling joists run parallel to rafters and are located ~~they shall be connected to rafters at the top wall plate in accordance with TABLE R802.5.2(1). Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed~~ in the bottom third of the rafter height, they shall be installed in accordance with **Figure R802.4.5** and fastened to rafters in accordance with **Table R802.5.2(1)**. Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be designed as a beam in accordance with **Section R802.3**. Where ceiling joists do not run parallel to rafters, ~~the ceiling joists shall be connected to top plates in accordance with TABLE R602.3(1). Each~~ rafters shall be tied across the structure with a rafter tie in accordance with **Section R802.5.2.2**, or the ridge shall be designed as a beam in accordance with **Section R802.3**. ~~or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to TABLE R802.5.2(1).~~		Minor updates to ceiling joist/rafter connection requirements.

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~~TABLE R802.5.1(1)~~
~~RAFTER SPANS FOR COMMON LUMBER SPECIES~~
~~(Roof live load = 20 psf, ceiling not attached to rafters, L/Δ = 180)~~

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
		Maximum rafter spans[a]									
		(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Douglas-fir-larch SS	11-6	18-0	23-9	Note b	Note b	11-6	18-0	23-9	Note b	Note b
	Douglas-fir-larch #1	11-1	17-4	22-5	Note b	Note b	10-6	15-4	19-5	23-9	Note b
	Douglas-fir-larch #2	10-10	16-0	21-4	26-0	Note b	10-0	14-7	18-5	22-6	26-0
	Douglas-fir-larch #3	8-9	12-0	16-3	19-10	23-0	7-7	11-1	14-1	17-2	19-11
	Hem-fir SS	10-10	17-0	22-5	Note b	Note b	10-10	17-0	22-5	Note b	Note b
	Hem-fir #1	10-7	16-8	22-0	Note b	Note b	10-4	15-2	19-2	23-5	Note b
	Hem-fir #2	10-1	15-11	20-8	25-3	Note b	9-8	14-2	17-11	21-11	25-5
	Hem-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern pine SS	11-3	17-8	23-4	Note b	Note b	11-3	17-8	23-4	Note b	Note b
	Southern pine #1	10-10	17-0	22-5	Note b	Note b	10-6	15-8	19-10	23-2	Note b
	Southern pine #2	10-4	15-7	19-8	23-5	Note b	9-0	13-6	17-1	20-3	23-10
	Southern pine #3	8-0	11-9	14-10	18-0	21-4	6-11	10-2	12-10	15-7	18-6
	Spruce-pine-fir SS	10-7	16-8	21-11	Note b	Note b	10-7	16-8	21-9	Note b	Note b
	Spruce-pine-fir #1	10-4	16-3	21-0	25-8	Note b	9-10	14-4	18-2	22-3	25-9
	Spruce-pine-fir #2	10-4	16-3	21-0	25-8	Note b	9-10	14-4	18-2	22-3	25-9
	Spruce-pine-fir #3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
16	Douglas-fir-larch SS	10-5	16-4	21-7	Note b	Note b	10-5	16-3	20-7	25-2	Note b
	Douglas-fir-larch #1	10-0	15-4	19-5	23-9	Note b	9-1	13-3	16-10	20-7	23-10
	Douglas-fir-larch #2	9-10	14-7	18-5	22-6	26-0	8-7	12-7	16-0	19-6	22-7
	Douglas-fir-larch #3	7-7	11-1	14-1	17-2	19-11	6-7	9-8	12-2	14-11	17-3
	Hem-fir SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	19-1	24-4	Note b

Base code rafter table relocated to R802.4.

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	Hem-fir	#1	9-8	15-2	19-2	23-5	Note b	9-0	13-1	16-7	20-4	23-7
	Hem-fir	#2	9-2	14-2	17-11	21-11	25-5	8-5	12-3	15-6	18-11	22-0
	Hem-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern pine	SS	10-3	16-1	21-2	Note b	Note b	10-3	16-1	21-2	25-7	Note b
	Southern pine	#1	9-10	15-6	19-10	23-2	Note b	9-1	13-7	17-2	20-1	23-10
	Southern pine	#2	9-0	13-6	17-1	20-3	23-10	7-9	11-8	14-9	17-6	20-8
	Southern pine	#3	6-11	10-2	12-10	15-7	18-6	6-0	8-10	11-2	13-6	16-0
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5	Note b	9-8	14-10	18-10	23-0	Note b
	Spruce-pine-fir	#1	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#2	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-pine-fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
10.2	Douglas-fir-larch	SS	9-10	15-5	20-4	25-11	Note b	9-10	14-10	18-10	23-0	Note b
	Douglas-fir-larch	#1	9-5	14-0	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas-fir-larch	#2	9-1	13-3	16-10	20-7	23-10	7-10	11-6	14-7	17-10	20-8
	Douglas-fir-larch	#3	6-11	10-2	12-10	15-8	18-3	6-0	8-9	11-2	12-7	15-9
	Hem-fir	SS	9-3	14-7	19-2	24-6	Note b	9-3	14-4	18-2	22-3	25-9
	Hem-fir	#1	9-1	13-10	17-6	21-5	24-10	8-2	12-0	15-2	18-6	21-6
	Hem-fir	#2	8-8	12-11	16-4	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-fir	#3	6-9	9-11	12-7	15-4	17-9	6-10	8-7	10-10	13-3	15-5
	Southern pine	SS	9-8	15-2	19-11	25-5	Note b	9-8	15-2	19-7	23-4	Note b
	Southern pine	#1	9-3	14-3	18-1	21-2	25-2	8-4	12-4	15-8	18-4	21-9
	Southern pine	#2	8-2	12-3	15-7	18-6	21-9	7-1	10-8	13-6	16-0	18-10
	Southern pine	#3	6-4	9-4	11-9	14-3	16-10	5-6	8-1	10-3	12-4	14-7
	Spruce-pine-fir	SS	9-1	14-3	18-9	23-11	Note b	9-1	13-7	17-3	21-0	24-4
	Spruce-pine-fir	#1	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#2	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-pine-fir	#3	6-9	9-11	12-7	15-4	17-9	6-10	8-7	10-10	13-3	15-5

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			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
24	Douglas fir-larch	SS	9-1	14-4	18-10	23-9	Note b	9-1	13-3	16-10	20-7	23-10
	Douglas fir-larch	#1	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas fir-larch	#2	8-2	11-10	15-1	18-5	21-4	7-0	10-4	13-0	15-11	18-6
	Douglas fir-larch	#3	6-2	9-1	11-6	14-1	16-3	5-4	7-10	10-0	12-2	14-1
	Hem-fir	SS	8-7	13-6	17-10	22-9	Note b	8-7	12-10	16-3	19-10	23-0
	Hem-fir	#1	8-5	12-4	15-8	19-2	22-2	7-4	10-9	13-7	16-7	19-3
	Hem-fir	#2	7-10	11-7	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-fir	#3	6-1	8-10	11-3	13-8	15-10	5-3	7-8	9-9	11-10	13-9
	Southern pine	SS	8-10	14-1	18-6	23-8	Note b	8-11	13-10	17-6	20-10	24-8
	Southern pine	#1	8-7	12-9	16-2	18-10	22-6	7-5	11-1	14-0	16-5	19-6
	Southern pine	#2	7-4	11-0	13-10	16-6	19-6	6-4	9-6	12-1	14-4	16-10
	Southern pine	#3	5-8	8-4	10-6	12-9	15-1	4-11	7-3	9-1	11-0	13-1
	Spruce-pine-fir	SS	8-5	13-3	17-5	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Spruce-pine-fir	#1	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#2	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-pine-fir	#3	6-1	8-10	11-3	13-8	15-10	5-3	7-8	9-9	11-10	13-9

~~Check sources for availability of lumber in lengths greater than 20 feet.~~
~~For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.~~
~~a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:~~

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

~~where:~~
~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~
~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~
~~b. Span exceeds 26 feet in length.~~

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~~TABLE R802.5.1(2)~~
~~RAFTER SPANS FOR COMMON LUMBER SPECIES~~
~~(Roof live load = 20 psf, ceiling attached to rafters, L/Δ = 240)~~

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans~~									
		~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~
~~12~~	~~Douglas fir-larch~~	~~SS~~	~~10-5~~	~~16-4~~	~~21-7~~	~~Note b~~	~~Note b~~	~~10-5~~	~~16-4~~	~~21-7~~	~~Note b~~
	~~Douglas fir-larch~~	~~#1~~	~~10-0~~	~~15-9~~	~~20-10~~	~~Note b~~	~~Note b~~	~~10-0~~	~~15-4~~	~~19-5~~	~~23-9~~
	~~Douglas fir-larch~~	~~#2~~	~~9-10~~	~~15-6~~	~~20-5~~	~~26-0~~	~~Note b~~	~~9-10~~	~~14-7~~	~~18-5~~	~~22-6~~
	~~Douglas fir-larch~~	~~#3~~	~~8-9~~	~~12-10~~	~~16-3~~	~~19-10~~	~~23-0~~	~~7-7~~	~~11-1~~	~~14-1~~	~~17-2~~
	~~Hem-fir~~	~~SS~~	~~9-10~~	~~15-6~~	~~20-5~~	~~Note b~~	~~Note b~~	~~9-10~~	~~15-6~~	~~20-5~~	~~Note b~~
	~~Hem-fir~~	~~#1~~	~~9-8~~	~~15-2~~	~~19-11~~	~~25-5~~	~~Note b~~	~~9-8~~	~~15-2~~	~~19-2~~	~~23-5~~
	~~Hem-fir~~	~~#2~~	~~9-2~~	~~14-5~~	~~19-0~~	~~24-3~~	~~Note b~~	~~9-2~~	~~14-2~~	~~17-11~~	~~21-11~~
	~~Hem-fir~~	~~#3~~	~~8-7~~	~~12-6~~	~~15-10~~	~~19-5~~	~~22-6~~	~~7-5~~	~~10-10~~	~~13-9~~	~~16-9~~
	~~Southern pine~~	~~SS~~	~~10-3~~	~~16-1~~	~~21-2~~	~~Note b~~	~~Note b~~	~~10-3~~	~~16-1~~	~~21-2~~	~~Note b~~
	~~Southern pine~~	~~#1~~	~~9-10~~	~~15-6~~	~~20-5~~	~~Note b~~	~~Note b~~	~~9-10~~	~~15-6~~	~~19-10~~	~~23-2~~
	~~Southern pine~~	~~#2~~	~~9-5~~	~~14-9~~	~~19-6~~	~~23-5~~	~~Note b~~	~~9-0~~	~~13-6~~	~~17-1~~	~~20-3~~
	~~Southern pine~~	~~#3~~	~~8-0~~	~~11-9~~	~~14-10~~	~~18-0~~	~~21-4~~	~~6-11~~	~~10-2~~	~~12-10~~	~~15-7~~
	~~Spruce-pine-fir~~	~~SS~~	~~9-8~~	~~15-2~~	~~19-11~~	~~25-5~~	~~Note b~~	~~9-8~~	~~15-2~~	~~19-11~~	~~25-5~~
	~~Spruce-pine-fir~~	~~#1~~	~~9-5~~	~~14-9~~	~~19-6~~	~~24-10~~	~~Note b~~	~~9-5~~	~~14-4~~	~~18-3~~	~~22-3~~
	~~Spruce-pine-fir~~	~~#2~~	~~9-5~~	~~14-9~~	~~19-6~~	~~24-10~~	~~Note b~~	~~9-5~~	~~14-4~~	~~18-3~~	~~22-3~~
	~~Spruce-pine-fir~~	~~#3~~	~~8-7~~	~~12-6~~	~~15-10~~	~~19-5~~	~~22-6~~	~~7-5~~	~~10-10~~	~~13-9~~	~~16-9~~
~~16~~	~~Douglas fir-larch~~	~~SS~~	~~9-6~~	~~14-11~~	~~19-7~~	~~25-0~~	~~Note b~~	~~9-6~~	~~14-11~~	~~19-7~~	~~25-0~~
	~~Douglas fir-larch~~	~~#1~~	~~9-1~~	~~14-4~~	~~18-11~~	~~23-9~~	~~Note b~~	~~9-1~~	~~13-3~~	~~16-10~~	~~20-7~~
	~~Douglas fir-larch~~	~~#2~~	~~8-11~~	~~14-1~~	~~18-5~~	~~22-6~~	~~26-0~~	~~8-7~~	~~12-7~~	~~16-0~~	~~19-6~~
	~~Douglas fir-larch~~	~~#3~~	~~7-7~~	~~11-1~~	~~14-1~~	~~17-2~~	~~19-11~~	~~6-7~~	~~9-8~~	~~12-2~~	~~14-11~~
	~~Hem-fir~~	~~SS~~	~~8-11~~	~~14-1~~	~~18-6~~	~~23-8~~	~~Note b~~	~~8-11~~	~~14-1~~	~~18-6~~	~~23-8~~
	~~Hem-fir~~	~~#1~~	~~8-9~~	~~13-9~~	~~18-1~~	~~23-1~~	~~Note b~~	~~8-9~~	~~13-1~~	~~16-7~~	~~20-4~~
	~~Hem-fir~~	~~#2~~	~~8-4~~	~~13-1~~	~~17-3~~	~~21-11~~	~~25-5~~	~~8-4~~	~~12-3~~	~~15-6~~	~~18-11~~
	~~Hem-fir~~	~~#3~~	~~7-5~~	~~10-10~~	~~13-9~~	~~16-9~~	~~19-6~~	~~6-5~~	~~9-5~~	~~11-11~~	~~14-6~~
~~19.2~~	~~Southern pine~~	~~SS~~	~~9-4~~	~~14-7~~	~~19-3~~	~~24-7~~	~~Note b~~	~~9-4~~	~~14-7~~	~~19-3~~	~~24-7~~
	~~Southern pine~~	~~#1~~	~~8-11~~	~~14-1~~	~~18-6~~	~~23-2~~	~~Note b~~	~~8-11~~	~~13-7~~	~~17-2~~	~~20-1~~
	~~Southern pine~~	~~#2~~	~~8-7~~	~~13-5~~	~~17-1~~	~~20-3~~	~~23-10~~	~~7-9~~	~~11-8~~	~~14-9~~	~~17-6~~
	~~Southern pine~~	~~#3~~	~~6-11~~	~~10-2~~	~~12-10~~	~~15-7~~	~~18-6~~	~~6-0~~	~~8-10~~	~~11-2~~	~~13-6~~
	~~Spruce-pine-fir~~	~~SS~~	~~8-9~~	~~13-9~~	~~18-1~~	~~23-1~~	~~Note b~~	~~8-9~~	~~13-9~~	~~18-1~~	~~23-0~~
	~~Spruce-pine-fir~~	~~#1~~	~~8-7~~	~~13-5~~	~~17-9~~	~~22-3~~	~~25-9~~	~~8-6~~	~~12-5~~	~~15-9~~	~~19-3~~
	~~Spruce-pine-fir~~	~~#2~~	~~8-7~~	~~13-5~~	~~17-9~~	~~22-3~~	~~25-9~~	~~8-6~~	~~12-5~~	~~15-9~~	~~19-3~~
	~~Spruce-pine-fir~~	~~#3~~	~~7-5~~	~~10-10~~	~~13-9~~	~~16-9~~	~~19-6~~	~~6-5~~	~~9-5~~	~~11-11~~	~~14-6~~
~~24~~	~~Douglas fir-larch~~	~~SS~~	~~8-11~~	~~14-0~~	~~18-5~~	~~23-7~~	~~Note b~~	~~8-11~~	~~14-0~~	~~18-5~~	~~23-0~~
	~~Douglas fir-larch~~	~~#1~~	~~8-7~~	~~13-6~~	~~17-9~~	~~21-8~~	~~25-2~~	~~8-4~~	~~12-2~~	~~15-4~~	~~18-9~~
	~~Douglas fir-larch~~	~~#2~~	~~8-5~~	~~12-3~~	~~16-1~~	~~20-7~~	~~23-10~~	~~7-10~~	~~11-6~~	~~14-7~~	~~17-10~~
	~~Douglas fir-larch~~	~~#3~~	~~6-11~~	~~10-2~~	~~12-10~~	~~15-8~~	~~18-3~~	~~6-0~~	~~8-9~~	~~11-2~~	~~13-7~~
	~~Hem-fir~~	~~SS~~	~~8-5~~	~~12-3~~	~~17-5~~	~~22-3~~	~~Note b~~	~~8-5~~	~~12-3~~	~~17-5~~	~~22-3~~
	~~Hem-fir~~	~~#1~~	~~8-3~~	~~12-1~~	~~17-1~~	~~21-5~~	~~24-10~~	~~8-2~~	~~12-0~~	~~15-2~~	~~18-6~~
	~~Hem-fir~~	~~#2~~	~~7-10~~	~~12-4~~	~~16-3~~	~~20-0~~	~~23-2~~	~~7-8~~	~~11-2~~	~~14-2~~	~~17-4~~
	~~Hem-fir~~	~~#3~~	~~6-9~~	~~9-11~~	~~12-7~~	~~15-4~~	~~17-9~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans~~									
		~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~
~~19.2~~	~~Southern pine~~ ~~SS~~	~~8-9~~	~~13-9~~	~~18-2~~	~~23-1~~	~~Note b~~	~~8-9~~	~~13-9~~	~~18-2~~	~~23-1~~	~~Note b~~
	~~Southern pine~~ ~~#1~~	~~8-5~~	~~13-3~~	~~17-5~~	~~21-2~~	~~25-2~~	~~8-4~~	~~12-4~~	~~15-8~~	~~18-4~~	~~21-9~~
	~~Southern pine~~ ~~#2~~	~~8-1~~	~~12-3~~	~~15-7~~	~~18-6~~	~~21-9~~	~~7-1~~	~~10-8~~	~~13-6~~	~~16-0~~	~~18-10~~
	~~Southern pine~~ ~~#3~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-3~~	~~16-10~~	~~5-6~~	~~8-1~~	~~10-2~~	~~12-4~~	~~14-7~~
	~~Spruce-pine-fir~~ ~~SS~~	~~8-3~~	~~12-11~~	~~17-1~~	~~21-9~~	~~Note b~~	~~8-3~~	~~12-11~~	~~17-1~~	~~21-0~~	~~24-4~~
	~~Spruce-pine-fir~~ ~~#1~~	~~8-1~~	~~12-8~~	~~16-7~~	~~20-3~~	~~23-6~~	~~7-9~~	~~11-4~~	~~14-4~~	~~17-7~~	~~20-4~~
	~~Spruce-pine-fir~~ ~~#2~~	~~8-1~~	~~12-8~~	~~16-7~~	~~20-3~~	~~23-6~~	~~7-9~~	~~11-4~~	~~14-4~~	~~17-7~~	~~20-4~~
	~~Spruce-pine-fir~~ ~~#3~~	~~6-9~~	~~9-11~~	~~12-7~~	~~15-4~~	~~17-9~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~	~~15-5~~
~~24~~	~~Douglas fir-larch~~ ~~SS~~	~~8-3~~	~~13-0~~	~~17-2~~	~~21-10~~	~~Note b~~	~~8-3~~	~~13-0~~	~~16-10~~	~~20-7~~	~~23-10~~
	~~Douglas fir-larch~~ ~~#1~~	~~8-0~~	~~12-6~~	~~15-10~~	~~19-5~~	~~22-6~~	~~7-5~~	~~10-10~~	~~13-9~~	~~16-9~~	~~19-5~~
	~~Douglas fir-larch~~ ~~#2~~	~~7-10~~	~~11-11~~	~~15-1~~	~~18-5~~	~~21-4~~	~~7-0~~	~~10-4~~	~~13-0~~	~~15-11~~	~~18-6~~
	~~Douglas fir-larch~~ ~~#3~~	~~6-2~~	~~9-1~~	~~11-6~~	~~14-1~~	~~16-3~~	~~5-4~~	~~7-10~~	~~10-0~~	~~12-2~~	~~14-1~~
	~~Hem-fir~~ ~~SS~~	~~7-10~~	~~12-3~~	~~16-2~~	~~20-8~~	~~25-1~~	~~7-10~~	~~12-3~~	~~16-2~~	~~19-10~~	~~23-0~~
	~~Hem-fir~~ ~~#1~~	~~7-8~~	~~12-0~~	~~15-8~~	~~19-2~~	~~22-2~~	~~7-4~~	~~10-9~~	~~13-7~~	~~16-7~~	~~19-3~~
	~~Hem-fir~~ ~~#2~~	~~7-3~~	~~11-5~~	~~14-8~~	~~17-10~~	~~20-9~~	~~6-10~~	~~10-0~~	~~12-8~~	~~15-6~~	~~17-11~~
	~~Hem-fir~~ ~~#3~~	~~6-1~~	~~8-10~~	~~11-3~~	~~13-8~~	~~15-11~~	~~5-3~~	~~7-8~~	~~9-9~~	~~11-10~~	~~13-9~~
	~~Southern pine~~ ~~SS~~	~~8-1~~	~~12-9~~	~~16-10~~	~~21-6~~	~~Note b~~	~~8-1~~	~~12-9~~	~~16-10~~	~~20-10~~	~~24-8~~
	~~Southern pine~~ ~~#1~~	~~7-10~~	~~12-3~~	~~16-2~~	~~18-11~~	~~22-6~~	~~7-5~~	~~11-1~~	~~14-0~~	~~16-5~~	~~19-6~~
	~~Southern pine~~ ~~#2~~	~~7-4~~	~~11-0~~	~~13-11~~	~~16-6~~	~~19-6~~	~~6-4~~	~~9-6~~	~~12-1~~	~~14-4~~	~~16-10~~
	~~Southern pine~~ ~~#3~~	~~5-8~~	~~8-4~~	~~10-6~~	~~12-9~~	~~15-1~~	~~4-11~~	~~7-3~~	~~9-1~~	~~11-0~~	~~13-1~~
	~~Spruce-pine-fir~~ ~~SS~~	~~7-8~~	~~12-0~~	~~15-10~~	~~20-2~~	~~24-7~~	~~7-8~~	~~12-0~~	~~15-4~~	~~18-9~~	~~21-9~~
	~~Spruce-pine-fir~~ ~~#1~~	~~7-6~~	~~11-9~~	~~14-10~~	~~18-2~~	~~21-0~~	~~6-11~~	~~10-2~~	~~12-10~~	~~15-8~~	~~18-3~~
	~~Spruce-pine-fir~~ ~~#2~~	~~7-6~~	~~11-9~~	~~14-10~~	~~18-2~~	~~21-0~~	~~6-11~~	~~10-2~~	~~12-10~~	~~15-8~~	~~18-3~~
	~~Spruce-pine-fir~~ ~~#3~~	~~6-1~~	~~8-10~~	~~11-3~~	~~13-8~~	~~15-11~~	~~5-3~~	~~7-8~~	~~9-9~~	~~11-10~~	~~13-9~~

~~Check sources for availability of lumber in lengths greater than 20 feet.~~
~~For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.~~

~~a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:~~

~~H_C/H_R~~	~~Rafter Span Adjustment Factor~~
~~1/3~~	~~0.67~~
~~1/4~~	~~0.76~~
~~1/5~~	~~0.83~~
~~1/6~~	~~0.90~~
~~1/7.5 or less~~	~~1.00~~

~~where:~~
~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~
~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~

~~b. Span exceeds 26 feet in length.~~

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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~~TABLE R802.5.1(3)~~
~~RAFTER SPANS FOR COMMON LUMBER SPECIES~~
~~(Ground snow load = 30 psf, ceiling not attached to rafters, L/Δ = 180)~~

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans[a]~~									
		~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~
~~12~~	~~Douglas fir-larch~~	~~SS~~	~~10-0~~	~~15-9~~	~~20-9~~	~~Note b~~	~~Note b~~	~~10-0~~	~~15-9~~	~~20-5~~	~~24-11~~
	~~Douglas fir-larch~~	~~#1~~	~~9-8~~	~~14-9~~	~~18-8~~	~~22-9~~	~~Note b~~	~~9-0~~	~~13-2~~	~~16-8~~	~~20-4~~
	~~Douglas fir-larch~~	~~#2~~	~~9-6~~	~~14-0~~	~~17-8~~	~~21-7~~	~~25-1~~	~~8-6~~	~~12-6~~	~~15-10~~	~~19-4~~
	~~Douglas fir-larch~~	~~#3~~	~~7-3~~	~~10-8~~	~~13-6~~	~~16-6~~	~~19-2~~	~~6-6~~	~~9-6~~	~~12-1~~	~~14-9~~
	~~Hem-fir~~	~~SS~~	~~9-6~~	~~14-10~~	~~19-7~~	~~25-0~~	~~Note b~~	~~9-6~~	~~14-10~~	~~19-7~~	~~24-1~~
	~~Hem-fir~~	~~#1~~	~~9-3~~	~~14-6~~	~~18-5~~	~~22-6~~	~~26-0~~	~~8-11~~	~~13-0~~	~~16-6~~	~~20-1~~
	~~Hem-fir~~	~~#2~~	~~8-10~~	~~13-7~~	~~17-3~~	~~21-0~~	~~24-4~~	~~8-4~~	~~12-2~~	~~15-4~~	~~18-9~~
	~~Hem-fir~~	~~#3~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~
	~~Southern pine~~	~~SS~~	~~9-10~~	~~15-6~~	~~20-5~~	~~Note b~~	~~Note b~~	~~9-10~~	~~15-6~~	~~20-5~~	~~26-4~~
	~~Southern pine~~	~~#1~~	~~9-6~~	~~14-10~~	~~19-0~~	~~23-3~~	~~Note b~~	~~9-0~~	~~13-5~~	~~17-0~~	~~19-11~~
	~~Southern pine~~	~~#2~~	~~8-7~~	~~12-11~~	~~16-4~~	~~19-5~~	~~22-10~~	~~7-8~~	~~11-7~~	~~14-8~~	~~17-4~~
	~~Southern pine~~	~~#3~~	~~6-7~~	~~9-9~~	~~12-4~~	~~15-0~~	~~17-9~~	~~5-11~~	~~8-9~~	~~11-0~~	~~13-5~~
	~~Spruce-pine-fir~~	~~SS~~	~~9-3~~	~~14-7~~	~~19-2~~	~~24-6~~	~~Note b~~	~~9-3~~	~~14-7~~	~~18-8~~	~~22-9~~
	~~Spruce-pine-fir~~	~~#1~~	~~9-1~~	~~13-9~~	~~17-5~~	~~21-4~~	~~24-8~~	~~8-5~~	~~12-4~~	~~15-7~~	~~19-1~~
	~~Spruce-pine-fir~~	~~#2~~	~~9-1~~	~~13-9~~	~~17-5~~	~~21-4~~	~~24-8~~	~~8-5~~	~~12-4~~	~~15-7~~	~~19-1~~
	~~Spruce-pine-fir~~	~~#3~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~
~~16~~	~~Douglas fir-larch~~	~~SS~~	~~9-1~~	~~14-4~~	~~18-10~~	~~24-1~~	~~Note b~~	~~9-1~~	~~14-0~~	~~17-8~~	~~21-7~~
	~~Douglas fir-larch~~	~~#1~~	~~8-9~~	~~12-9~~	~~16-2~~	~~19-9~~	~~22-10~~	~~7-10~~	~~11-5~~	~~14-5~~	~~17-8~~
	~~Douglas fir-larch~~	~~#2~~	~~8-3~~	~~12-1~~	~~15-4~~	~~18-9~~	~~21-8~~	~~7-5~~	~~10-10~~	~~13-8~~	~~16-9~~
	~~Douglas fir-larch~~	~~#3~~	~~6-4~~	~~9-3~~	~~11-8~~	~~14-3~~	~~16-7~~	~~5-8~~	~~8-3~~	~~10-6~~	~~12-9~~
	~~Hem-fir~~	~~SS~~	~~8-7~~	~~13-6~~	~~17-10~~	~~22-9~~	~~Note b~~	~~8-7~~	~~13-6~~	~~17-1~~	~~20-10~~
	~~Hem-fir~~	~~#1~~	~~8-5~~	~~12-7~~	~~15-11~~	~~19-6~~	~~22-7~~	~~7-8~~	~~11-3~~	~~14-3~~	~~17-5~~
	~~Hem-fir~~	~~#2~~	~~8-0~~	~~11-9~~	~~14-11~~	~~18-2~~	~~21-1~~	~~7-2~~	~~10-6~~	~~13-4~~	~~16-3~~
	~~Hem-fir~~	~~#3~~	~~6-2~~	~~9-0~~	~~11-5~~	~~13-11~~	~~16-2~~	~~5-6~~	~~8-1~~	~~10-3~~	~~12-6~~
	~~Southern pine~~	~~SS~~	~~8-11~~	~~14-1~~	~~18-6~~	~~23-8~~	~~Note b~~	~~8-11~~	~~14-1~~	~~18-5~~	~~1-11~~
	~~Southern pine~~	~~#1~~	~~8-7~~	~~13-0~~	~~16-6~~	~~19-3~~	~~22-10~~	~~7-10~~	~~11-7~~	~~14-9~~	~~17-3~~
	~~Southern pine~~	~~#2~~	~~7-6~~	~~11-2~~	~~14-2~~	~~16-10~~	~~19-10~~	~~6-8~~	~~10-0~~	~~12-8~~	~~15-1~~
	~~Southern pine~~	~~#3~~	~~5-9~~	~~8-6~~	~~10-8~~	~~13-0~~	~~15-4~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-7~~
	~~Spruce-pine-fir~~	~~SS~~	~~8-5~~	~~13-3~~	~~17-5~~	~~22-1~~	~~25-7~~	~~8-5~~	~~12-9~~	~~16-2~~	~~19-9~~
	~~Spruce-pine-fir~~	~~#1~~	~~8-2~~	~~11-11~~	~~15-1~~	~~18-5~~	~~21-5~~	~~7-3~~	~~10-8~~	~~13-6~~	~~16-6~~
	~~Spruce-pine-fir~~	~~#2~~	~~8-2~~	~~11-11~~	~~15-1~~	~~18-5~~	~~21-5~~	~~7-3~~	~~10-8~~	~~13-6~~	~~16-6~~
	~~Spruce-pine-fir~~	~~#3~~	~~6-2~~	~~9-0~~	~~11-5~~	~~13-11~~	~~16-2~~	~~5-6~~	~~8-1~~	~~10-3~~	~~12-6~~
~~19.2~~	~~Douglas fir-larch~~	~~SS~~	~~8-7~~	~~13-6~~	~~17-9~~	~~22-1~~	~~25-7~~	~~8-7~~	~~12-9~~	~~16-2~~	~~19-9~~
	~~Douglas fir-larch~~	~~#1~~	~~7-11~~	~~11-8~~	~~14-9~~	~~18-0~~	~~20-11~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~
	~~Douglas fir-larch~~	~~#2~~	~~7-7~~	~~11-0~~	~~14-0~~	~~17-1~~	~~19-10~~	~~6-9~~	~~9-10~~	~~12-6~~	~~15-3~~
	~~Douglas fir-larch~~	~~#3~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-1~~	~~15-3~~	~~5-3~~	~~7-7~~	~~9-7~~	~~11-8~~
	~~Hem-fir~~	~~SS~~	~~8-1~~	~~12-9~~	~~16-9~~	~~21-4~~	~~24-8~~	~~8-1~~	~~12-4~~	~~15-7~~	~~19-1~~
	~~Hem-fir~~	~~#1~~	~~7-10~~	~~11-6~~	~~14-7~~	~~17-9~~	~~20-7~~	~~7-0~~	~~10-3~~	~~13-0~~	~~15-11~~
	~~Hem-fir~~	~~#2~~	~~7-4~~	~~10-9~~	~~13-7~~	~~16-7~~	~~19-3~~	~~6-7~~	~~9-7~~	~~12-3~~	~~14-10~~
	~~Hem-fir~~	~~#3~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans[a]~~									
		~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~	~~(feet - inches)~~
~~12~~	~~Southern pine SS~~	~~8-5~~	~~13-3~~	~~17-5~~	~~22-3~~	~~Note b~~	~~8-5~~	~~13-3~~	~~16-10~~	~~20-0~~	~~23-7~~
	~~Southern pine #1~~	~~8-0~~	~~11-10~~	~~15-1~~	~~17-7~~	~~20-4~~	~~7-1~~	~~10-7~~	~~13-5~~	~~15-9~~	~~18-8~~
	~~Southern pine #2~~	~~6-10~~	~~10-2~~	~~12-11~~	~~15-4~~	~~18-1~~	~~6-1~~	~~9-2~~	~~11-7~~	~~13-9~~	~~16-3~~
	~~Southern pine #3~~	~~5-3~~	~~7-9~~	~~9-9~~	~~11-10~~	~~14-0~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-7~~	~~12-6~~
	~~Spruce-pine-fir SS~~	~~7-11~~	~~12-5~~	~~16-5~~	~~20-2~~	~~23-4~~	~~7-11~~	~~11-8~~	~~14-9~~	~~18-0~~	~~20-11~~
	~~Spruce-pine-fir #1~~	~~7-5~~	~~10-11~~	~~13-9~~	~~16-10~~	~~19-6~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~
	~~Spruce-pine-fir #2~~	~~7-5~~	~~10-11~~	~~13-9~~	~~16-10~~	~~19-6~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~
	~~Spruce-pine-fir #3~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-3~~
~~16~~	~~Douglas-fir-larch SS~~	~~8-0~~	~~12-6~~	~~16-2~~	~~19-9~~	~~22-10~~	~~7-10~~	~~11-5~~	~~14-5~~	~~17-8~~	~~20-5~~
	~~Douglas-fir-larch #1~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~	~~16-8~~
	~~Douglas-fir-larch #2~~	~~6-9~~	~~9-10~~	~~12-6~~	~~15-3~~	~~17-9~~	~~6-0~~	~~8-10~~	~~11-2~~	~~13-8~~	~~15-10~~
	~~Douglas-fir-larch #3~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-8~~	~~13-6~~	~~4-7~~	~~6-9~~	~~8-7~~	~~10-5~~	~~12-1~~
	~~Hem-fir SS~~	~~7-6~~	~~11-0~~	~~15-7~~	~~19-1~~	~~22-1~~	~~7-6~~	~~11-0~~	~~13-11~~	~~17-0~~	~~19-9~~
	~~Hem-fir #1~~	~~7-0~~	~~10-3~~	~~13-0~~	~~15-11~~	~~18-5~~	~~6-3~~	~~9-2~~	~~11-8~~	~~14-3~~	~~16-6~~
	~~Hem-fir #2~~	~~6-7~~	~~9-7~~	~~12-2~~	~~14-10~~	~~17-3~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~	~~15-5~~
	~~Hem-fir #3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-6~~	~~6-7~~	~~8-4~~	~~10-2~~	~~11-10~~
	~~Southern pine SS~~	~~7-10~~	~~12-3~~	~~16-2~~	~~20-0~~	~~23-7~~	~~7-10~~	~~11-10~~	~~15-0~~	~~17-11~~	~~21-2~~
	~~Southern pine #1~~	~~7-1~~	~~10-7~~	~~13-5~~	~~15-9~~	~~18-8~~	~~6-4~~	~~9-6~~	~~12-0~~	~~14-1~~	~~16-8~~
	~~Southern pine #2~~	~~6-1~~	~~9-2~~	~~11-7~~	~~13-9~~	~~16-2~~	~~5-5~~	~~8-2~~	~~10-4~~	~~12-3~~	~~14-6~~
	~~Southern pine #3~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-7~~	~~12-6~~	~~4-2~~	~~6-2~~	~~7-10~~	~~9-6~~	~~11-2~~
	~~Spruce-pine-fir SS~~	~~7-4~~	~~11-7~~	~~14-9~~	~~18-0~~	~~20-11~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~
	~~Spruce-pine-fir #1~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~5-11~~	~~8-8~~	~~11-0~~	~~13-6~~	~~15-7~~
	~~Spruce-pine-fir #2~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~5-11~~	~~8-8~~	~~11-0~~	~~13-6~~	~~15-7~~
	~~Spruce-pine-fir #3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-6~~	~~6-7~~	~~8-4~~	~~10-2~~	~~11-10~~
~~24~~	~~Douglas-fir-larch SS~~	~~8-0~~	~~12-6~~	~~16-2~~	~~19-9~~	~~22-10~~	~~7-10~~	~~11-5~~	~~14-5~~	~~17-8~~	~~20-5~~
	~~Douglas-fir-larch #1~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~	~~16-8~~
	~~Douglas-fir-larch #2~~	~~6-9~~	~~9-10~~	~~12-6~~	~~15-3~~	~~17-9~~	~~6-0~~	~~8-10~~	~~11-2~~	~~13-8~~	~~15-10~~
	~~Douglas-fir-larch #3~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-8~~	~~13-6~~	~~4-7~~	~~6-9~~	~~8-7~~	~~10-5~~	~~12-1~~
	~~Hem-fir SS~~	~~7-6~~	~~11-0~~	~~15-7~~	~~19-1~~	~~22-1~~	~~7-6~~	~~11-0~~	~~13-11~~	~~17-0~~	~~19-9~~
	~~Hem-fir #1~~	~~7-0~~	~~10-3~~	~~13-0~~	~~15-11~~	~~18-5~~	~~6-3~~	~~9-2~~	~~11-8~~	~~14-3~~	~~16-6~~
	~~Hem-fir #2~~	~~6-7~~	~~9-7~~	~~12-2~~	~~14-10~~	~~17-3~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~	~~15-5~~
	~~Hem-fir #3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-6~~	~~6-7~~	~~8-4~~	~~10-2~~	~~11-10~~
	~~Southern pine SS~~	~~7-10~~	~~12-3~~	~~16-2~~	~~20-0~~	~~23-7~~	~~7-10~~	~~11-10~~	~~15-0~~	~~17-11~~	~~21-2~~
	~~Southern pine #1~~	~~7-1~~	~~10-7~~	~~13-5~~	~~15-9~~	~~18-8~~	~~6-4~~	~~9-6~~	~~12-0~~	~~14-1~~	~~16-8~~
	~~Southern pine #2~~	~~6-1~~	~~9-2~~	~~11-7~~	~~13-9~~	~~16-2~~	~~5-5~~	~~8-2~~	~~10-4~~	~~12-3~~	~~14-6~~
	~~Southern pine #3~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-7~~	~~12-6~~	~~4-2~~	~~6-2~~	~~7-10~~	~~9-6~~	~~11-2~~
	~~Spruce-pine-fir SS~~	~~7-4~~	~~11-7~~	~~14-9~~	~~18-0~~	~~20-11~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~
	~~Spruce-pine-fir #1~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~5-11~~	~~8-8~~	~~11-0~~	~~13-6~~	~~15-7~~
	~~Spruce-pine-fir #2~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~5-11~~	~~8-8~~	~~11-0~~	~~13-6~~	~~15-7~~
	~~Spruce-pine-fir #3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-6~~	~~6-7~~	~~8-4~~	~~10-2~~	~~11-10~~

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

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

~~a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:~~

~~H_C/H_R~~	~~Rafter Span Adjustment Factor~~
~~1/3~~	~~0.67~~
~~1/4~~	~~0.76~~
~~1/5~~	~~0.83~~
~~1/6~~	~~0.90~~
~~1/7.5 or less~~	~~1.00~~

~~where:~~

~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~

~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~

~~b. Span exceeds 26 feet in length.~~

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~~TABLE R802.5.1(4)~~
~~RAFTER SPANS FOR COMMON LUMBER SPECIES~~
~~(Ground snow load = 50 psf, ceiling not attached to rafters, L/Δ = 180)~~

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	8-5	13-3	17-6	22-4	26-0	8-5	13-3	17-3	21-1	24-5
	Douglas fir-larch	#1	8-2	12-0	15-3	18-7	21-7	7-7	11-2	14-1	17-3	20-0
	Douglas fir-larch	#2	7-10	11-5	14-5	17-8	20-5	7-3	10-7	13-4	16-4	18-11
	Douglas fir-larch	#3	6-0	8-9	11-0	13-6	15-7	5-6	8-1	10-3	12-6	14-6
	Hem-fir	SS	8-0	12-6	16-6	21-1	25-6	8-0	12-6	16-6	20-4	23-7
	Hem-fir	#1	7-10	11-10	15-0	18-4	21-3	7-6	11-0	13-11	17-0	19-9
	Hem-fir	#2	7-5	11-1	14-0	17-2	19-11	7-0	10-3	13-0	15-10	18-5
	Hem-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern pine	SS	8-4	13-1	17-3	21-11	Note b	8-4	13-1	17-2	21-5	25-3
	Southern pine	#1	8-0	12-3	15-6	18-2	21-7	7-7	11-4	14-5	16-10	20-0
	Southern pine	#2	7-0	10-6	13-4	15-10	18-8	6-6	9-9	12-4	14-8	17-3
	Southern pine	#3	5-5	8-0	10-1	12-3	14-6	5-0	7-5	9-4	11-4	13-5
	Spruce pine-fir	SS	7-10	12-3	16-2	20-8	24-1	7-10	12-3	15-9	19-3	22-4
	Spruce pine-fir	#1	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce pine-fir	#2	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce pine-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas fir-larch	SS	7-8	12-1	15-11	19-9	22-10	7-8	11-10	14-11	18-3	21-2
	Douglas fir-larch	#1	7-1	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch	#2	6-9	9-10	12-6	15-3	17-9	6-3	9-2	11-7	14-2	16-5
	Douglas fir-larch	#3	5-2	7-7	9-7	11-10	13-6	4-9	7-0	8-10	10-10	12-6
	Hem-fir	SS	7-3	11-5	15-0	19-1	22-1	7-3	11-5	14-5	17-8	20-5
	Hem-fir	#1	7-0	10-3	13-0	15-11	18-5	6-6	9-6	12-1	14-9	17-1
	Hem-fir	#2	6-7	9-7	12-3	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern pine	SS	7-6	11-10	15-7	19-11	23-7	7-6	11-10	15-7	18-6	21-10
	Southern pine	#1	7-1	10-7	13-5	15-9	18-8	6-7	9-10	12-5	14-7	17-3
	Southern pine	#2	6-1	9-2	11-7	13-8	16-2	5-8	8-5	10-9	12-8	15-0
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-4	6-5	8-1	9-10	11-7
	Spruce pine-fir	SS	7-1	11-2	14-8	18-0	20-11	7-1	10-9	13-8	15-11	18-4
	Spruce pine-fir	#1	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce pine-fir	#2	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
19.2	Douglas fir-larch	SS	7-3	11-4	14-9	18-0	20-11	7-3	10-9	13-8	16-8	19-4
	Douglas fir-larch	#1	6-6	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas fir-larch	#2	6-2	9-0	11-5	13-11	16-2	5-8	8-4	10-9	12-11	15-0
	Douglas fir-larch	#3	4-8	6-11	8-9	10-8	12-4	4-4	6-4	8-1	9-10	11-5
	Hem-fir	SS	6-10	10-9	14-2	17-5	20-2	6-10	10-5	13-2	16-1	18-8
	Hem-fir	#1	6-5	9-5	11-11	14-6	16-10	5-11	8-8	11-0	13-5	15-7
	Hem-fir	#2	6-0	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

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~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans~~									
		~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~	~~(feet–inches)~~
~~12~~	~~Southern pine SS~~	~~7-1~~	~~11-2~~	~~14-8~~	~~18-3~~	~~21-7~~	~~7-1~~	~~11-2~~	~~14-2~~	~~16-11~~	~~20-0~~
	~~Southern pine #1~~	~~6-6~~	~~9-8~~	~~12-3~~	~~14-4~~	~~17-1~~	~~6-0~~	~~9-0~~	~~11-4~~	~~13-4~~	~~15-9~~
	~~Southern pine #2~~	~~5-7~~	~~8-4~~	~~10-7~~	~~12-6~~	~~14-9~~	~~5-2~~	~~7-9~~	~~9-9~~	~~11-7~~	~~13-8~~
	~~Southern pine #3~~	~~4-3~~	~~6-4~~	~~8-0~~	~~9-8~~	~~11-5~~	~~4-0~~	~~5-10~~	~~7-4~~	~~8-11~~	~~10-7~~
	~~Spruce-pine-fir SS~~	~~6-8~~	~~10-6~~	~~13-5~~	~~16-5~~	~~19-1~~	~~6-8~~	~~9-10~~	~~12-5~~	~~15-3~~	~~17-8~~
	~~Spruce-pine-fir #1~~	~~6-1~~	~~8-11~~	~~11-3~~	~~13-9~~	~~15-11~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~
	~~Spruce-pine-fir #2~~	~~6-1~~	~~8-11~~	~~11-3~~	~~13-9~~	~~15-11~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~
	~~Spruce-pine-fir #3~~	~~4-7~~	~~6-9~~	~~8-6~~	~~10-5~~	~~12-1~~	~~4-3~~	~~6-3~~	~~7-11~~	~~9-7~~	~~11-2~~
~~24~~	~~Douglas fir-larch SS~~	~~6-8~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-7~~	~~9-8~~	~~12-2~~	~~14-11~~	~~17-3~~
	~~Douglas fir-larch #1~~	~~5-10~~	~~8-6~~	~~10-9~~	~~13-2~~	~~15-3~~	~~5-5~~	~~7-10~~	~~10-0~~	~~12-2~~	~~14-1~~
	~~Douglas fir-larch #2~~	~~5-6~~	~~8-1~~	~~10-3~~	~~12-6~~	~~14-6~~	~~5-1~~	~~7-6~~	~~9-5~~	~~11-7~~	~~13-5~~
	~~Douglas fir-larch #3~~	~~4-3~~	~~6-2~~	~~7-10~~	~~9-6~~	~~11-1~~	~~3-11~~	~~5-8~~	~~7-3~~	~~8-10~~	~~10-3~~
	~~Hem-fir SS~~	~~6-4~~	~~9-11~~	~~12-9~~	~~15-7~~	~~18-0~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~	~~16-8~~
	~~Hem-fir #1~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-0~~	~~15-1~~	~~8-4~~	~~7-9~~	~~9-10~~	~~12-0~~	~~13-11~~
	~~Hem-fir #2~~	~~5-4~~	~~7-10~~	~~9-11~~	~~12-1~~	~~14-1~~	~~4-11~~	~~7-3~~	~~9-2~~	~~11-3~~	~~13-0~~
	~~Hem-fir #3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~	~~3-10~~	~~5-7~~	~~7-1~~	~~8-7~~	~~10-0~~
	~~Southern pine SS~~	~~6-7~~	~~10-4~~	~~13-8~~	~~16-4~~	~~19-3~~	~~6-7~~	~~10-0~~	~~12-8~~	~~15-2~~	~~17-10~~
	~~Southern pine #1~~	~~5-10~~	~~8-8~~	~~11-0~~	~~12-10~~	~~15-3~~	~~5-5~~	~~8-0~~	~~10-2~~	~~11-11~~	~~14-1~~
	~~Southern pine #2~~	~~5-0~~	~~7-5~~	~~9-5~~	~~11-3~~	~~13-2~~	~~4-7~~	~~6-11~~	~~8-9~~	~~10-5~~	~~12-3~~
	~~Southern pine #3~~	~~3-10~~	~~5-8~~	~~7-1~~	~~8-8~~	~~10-3~~	~~3-6~~	~~5-3~~	~~6-7~~	~~8-0~~	~~9-6~~
	~~Spruce-pine-fir SS~~	~~6-2~~	~~9-6~~	~~12-0~~	~~14-8~~	~~17-1~~	~~6-0~~	~~8-10~~	~~11-2~~	~~13-7~~	~~15-9~~
	~~Spruce-pine-fir #1~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~
	~~Spruce-pine-fir #2~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~
	~~Spruce-pine-fir #3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~	~~3-10~~	~~5-7~~	~~7-1~~	~~8-7~~	~~10-0~~

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

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

~~a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:~~

~~H_C/H_R~~	~~Rafter Span Adjustment Factor~~
~~1/3~~	~~0.67~~
~~1/4~~	~~0.76~~
~~1/5~~	~~0.83~~
~~1/6~~	~~0.90~~
~~1/7.5 or less~~	~~1.00~~

~~where:~~

~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~

~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~

~~b. Span exceeds 26 feet in length.~~

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | **Grey Text** = Previous COH Amendment Brought Forward to 2021

~~**Yellow Strikethrough**~~ = Text Deleted from the Code by COH | **Green Text** = NEW or Modified Text by COH in 2021 | **Magenta** = New or modified Text by ICC in 2018

~~**TABLE R802.5.1(5)**~~
~~**RAFTER SPANS FOR COMMON LUMBER SPECIES**~~
~~**(Ground snow load = 30 psf, ceiling attached to rafters, L/Δ = 240)**~~

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans*									
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	9-1	14-4	18-10	24-1	Note b	9-1	14-4	18-10	24-1	Note b
	Douglas fir-larch	#1	8-9	13-9	18-2	22-9	Note b	8-9	13-2	16-8	20-4	23-7
	Douglas fir-larch	#2	8-7	13-6	17-8	21-7	25-1	8-6	12-6	15-10	19-4	22-5
	Douglas fir-larch	#3	7-3	10-8	13-6	16-6	19-2	6-6	9-6	12-1	14-9	17-1
	Hem-fir	SS	8-7	13-6	17-10	22-9	Note b	8-7	13-6	17-10	22-9	Note b
	Hem-fir	#1	8-5	13-3	17-5	22-3	26-0	8-5	13-0	16-6	20-1	23-4
	Hem-fir	#2	8-0	12-7	16-7	21-0	24-4	8-0	12-2	15-4	18-9	21-9
	Hem-fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern pine	SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-6	23-8	Note b
	Southern pine	#1	8-7	13-6	17-10	22-3	Note b	8-7	13-5	17-0	19-11	23-7
	Southern pine	#2	8-3	12-11	16-4	19-5	22-10	7-8	11-7	14-8	17-4	20-5
	Southern pine	#3	6-7	9-9	12-4	15-0	17-9	5-11	8-9	11-0	13-5	15-10
	Spruce pine-fir	SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	17-5	22-3	Note b
	Spruce pine-fir	#1	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1
	Spruce pine-fir	#2	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1
	Spruce pine-fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas fir-larch	SS	8-3	13-0	17-2	21-10	Note b	8-3	13-0	17-2	21-7	25-1
	Douglas fir-larch	#1	8-0	12-6	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas fir-larch	#2	7-10	12-1	15-4	18-9	21-8	7-5	10-10	13-8	16-9	19-5
	Douglas fir-larch	#3	6-4	9-3	11-8	14-3	16-7	5-8	8-3	10-6	12-9	14-10
	Hem-fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	20-8	24-2
	Hem-fir	#1	7-8	12-0	15-10	19-6	22-7	7-8	11-3	14-3	17-5	20-2
	Hem-fir	#2	7-3	11-5	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern pine	SS	8-1	12-9	16-10	21-6	Note b	8-1	12-9	16-10	21-6	25-11
	Southern pine	#1	7-10	12-3	16-2	19-3	22-10	7-10	11-7	14-9	17-3	20-5
	Southern pine	#2	7-6	11-2	14-2	16-10	19-10	6-8	10-0	12-8	15-1	17-9
	Southern pine	#3	5-9	8-6	10-8	13-0	15-4	5-2	7-7	9-7	11-7	13-9
	Spruce pine-fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-10	19-9	22-10

Base code rafter table relocated to R802.4.

	Spruce-pine-fir	#1	7-6	11-0	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#2	7-6	11-0	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
19.2	Douglas-fir-larch	SS	7-9	12-3	16-1	20-7	25-0	7-9	12-3	16-1	19-9	22-10
	Douglas-fir-larch	#1	7-6	11-8	14-9	18-0	20-11	7-1	10-5	13-3	16-1	18-8
	Douglas-fir-larch	#2	7-4	11-0	14-0	17-1	19-10	6-9	9-1	12-6	15-3	17-9
	Douglas-fir-larch	#3	5-9	8-5	10-8	13-1	15-2	5-2	7-7	9-7	11-8	13-6
	Hem-fir	SS	7-4	11-7	15-3	19-5	23-7	7-4	11-7	15-3	19-1	22-1
	Hem-fir	#1	7-2	11-4	14-7	17-9	20-7	7-0	10-3	13-0	15-11	18-5
	Hem-fir	#2	6-10	10-9	13-7	16-7	19-3	6-7	9-7	12-3	14-10	17-3
	Hem-fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans[a]									
			(feet-inches)									
19.2	Southern pine	SS	7-8	12-0	15-10	20-3	24-7	7-8	12-0	15-10	20-0	23-7
	Southern pine	#1	7-4	11-7	15-1	17-7	20-11	7-1	10-7	13-5	15-9	18-8
	Southern pine	#2	6-10	10-2	12-11	15-4	18-1	6-1	9-3	11-7	13-9	16-2
	Southern pine	#3	5-3	7-9	9-9	11-10	14-0	4-8	6-11	8-9	10-7	12-6
	Spruce-pine-fir	SS	7-2	11-4	14-11	19-0	23-1	7-2	11-4	14-9	18-0	20-11
	Spruce-pine-fir	#1	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir	#2	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
24	Douglas-fir-larch	SS	7-3	11-4	15-0	19-1	22-10	7-3	11-1	14-5	17-8	20-5
	Douglas-fir-larch	#1	7-0	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas-fir-larch	#2	6-9	9-10	12-6	15-3	17-9	6-0	8-10	11-2	13-8	15-10
	Douglas-fir-larch	#3	5-2	7-7	9-7	11-8	13-6	4-7	6-9	8-7	10-5	12-1
	Hem-fir	SS	6-10	10-9	14-2	18-0	21-11	6-10	10-9	13-11	17-0	19-9
	Hem-fir	#1	6-8	10-3	13-0	15-11	18-5	6-3	9-3	11-8	14-3	16-6
	Hem-fir	#2	6-4	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern pine	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	17-11	21-2
	Southern pine	#1	6-10	10-7	13-5	15-9	18-8	6-4	9-6	12-0	14-1	16-8
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-5	8-2	10-4	12-3	14-6
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-2	6-2	7-10	9-6	11-2
	Spruce-pine-fir	SS	6-8	10-6	13-10	17-8	20-11	6-8	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#1	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir	#2	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:
H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.
H_R = Height of roof ridge measured vertically above the top of the rafter support walls.
b. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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~~TABLE R802.5.1(6)~~
~~RAFTER SPANS FOR COMMON LUMBER SPECIES~~
~~(Ground snow load = 50 psf, ceiling attached to rafters, L/Δ = 240)~~

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans*									
			(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Douglas fir-larch	SS	7-8	12-1	15-4	20-3	24-8	7-8	12-1	15-4	20-3	24-5
	Douglas fir-larch	#1	7-5	11-7	15-3	18-7	21-7	7-5	11-2	14-1	17-3	20-0
	Douglas fir-larch	#2	7-3	11-5	14-5	17-8	20-5	7-3	10-7	13-4	16-4	18-14
	Douglas fir-larch	#3	6-0	8-9	11-0	13-6	15-7	5-5	8-1	10-3	12-5	14-6
	Hem-fir	SS	7-3	11-5	15-0	19-2	23-4	7-3	11-5	15-0	19-2	23-4
	Hem-fir	#1	7-1	11-2	14-8	18-4	21-3	7-1	11-0	13-14	17-0	19-9
	Hem-fir	#2	6-9	10-8	14-0	17-2	19-14	6-9	10-3	13-0	15-10	18-5
	Hem-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-3	14-1
	Southern pine	SS	7-6	11-10	15-7	19-14	24-3	7-6	11-10	15-7	19-14	24-3
	Southern pine	#1	7-3	11-5	15-0	18-2	21-7	7-3	11-4	14-5	16-10	20-0
	Southern pine	#2	6-11	10-6	13-4	15-10	18-8	6-6	9-9	12-4	14-8	17-3
	Southern pine	#3	5-5	8-0	10-1	12-3	14-6	5-0	7-5	9-4	11-4	13-5
	Spruce-pine-fir	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-4
	Spruce-pine-fir	#1	6-11	10-14	14-3	17-5	20-3	6-11	10-5	13-2	16-1	18-5
	Spruce-pine-fir	#2	6-11	10-14	14-3	17-5	20-3	6-11	10-5	13-2	16-1	18-5
	Spruce-pine-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-3	14-1
16	Douglas fir-larch	SS	7-0	11-0	14-5	18-5	22-5	7-0	11-0	14-5	18-3	21-3
	Douglas fir-larch	#1	6-9	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-14	17-3
	Douglas fir-larch	#2	6-7	9-10	12-6	15-3	17-9	6-3	9-2	11-7	14-2	16-5
	Douglas fir-larch	#3	5-2	7-7	9-7	11-8	13-6	4-9	7-0	8-10	10-10	12-6
	Hem-fir	SS	6-7	10-4	13-8	17-5	21-2	6-7	10-4	13-8	17-5	20-5
	Hem-fir	#1	6-5	10-2	13-0	15-14	18-5	6-5	9-6	12-1	14-9	17-1
	Hem-fir	#2	6-2	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-14
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern pine	SS	6-10	10-9	14-2	18-1	22-0	6-10	10-9	14-2	18-1	21-10
	Southern pine	#1	6-7	10-4	13-5	15-9	18-8	6-7	9-10	12-5	14-7	17-3
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-8	8-5	10-9	12-9	15-0
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-4	6-5	8-1	9-10	11-7
	Spruce-pine-fir	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-8	19-4
	Spruce-pine-fir	#1	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-14	16-2
	Spruce-pine-fir	#2	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-14	16-2
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
19.2	Douglas fir-larch	SS	6-7	10-4	13-7	17-4	20-14	6-7	10-4	13-7	16-8	19-4
	Douglas fir-larch	#1	6-4	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas fir-larch	#2	6-2	9-0	11-5	13-14	16-2	5-8	8-4	10-7	12-14	15-0
	Douglas fir-larch	#3	4-8	6-11	8-9	10-8	12-4	4-4	6-4	8-1	9-10	11-5
	Hem-fir	SS	6-2	9-9	12-10	16-5	19-14	6-2	9-9	12-10	16-1	18-8
	Hem-fir	#1	6-1	9-5	11-14	14-6	16-10	5-11	8-8	11-0	13-5	15-7
	Hem-fir	#2	5-9	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans[a]									
			(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Southern pine	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-1 1/4	20-0
	Southern pine	#1	6-2	9-8	12-3	14-4	17-1	6-0	9-0	11-4	13-4	15-9
	Southern pine	#2	5-7	8-4	10-7	12-6	14-9	5-2	7-8	9-9	11-7	13-8
	Southern pine	#3	4-3	6-4	8-0	9-8	11-5	4-0	5-10	7-4	8-11	10-7
	Spruce-pine-fir	SS	6-1	9-6	12-7	16-0	19-1	6-1	9-6	12-5	15-3	17-8
	Spruce-pine-fir	#1	5-11	8-11	11-3	13-9	15-1 1/4	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir	#2	5-11	8-11	11-3	13-9	15-1 1/4	5-7	8-3	10-5	12-9	14-9
	Spruce-pine-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-3
16	Douglas-fir-larch	SS	6-1	9-7	12-7	16-1	18-8	6-1	9-7	12-2	14-1 1/4	17-3
	Douglas-fir-larch	#1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas-fir-larch	#2	5-6	8-1	10-3	12-6	14-6	5-1	7-6	9-5	11-7	13-5
	Douglas-fir-larch	#3	4-3	6-2	7-10	9-6	11-1	3-11	5-8	7-3	8-10	10-3
	Hem-fir	SS	5-9	9-1	11-1 1/4	15-2	18-0	5-9	9-1	11-9	14-5	15-1 1/4
	Hem-fir	#1	5-8	8-5	10-8	13-0	15-1	5-4	7-9	9-10	12-0	13-1 1/4
	Hem-fir	#2	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern pine	SS	6-0	9-5	12-5	15-1 0	19-3	6-0	9-5	12-5	15-2	17-1 0
	Southern pine	#1	5-9	8-8	11-0	12-1 0	15-3	5-5	8-0	10-2	11-1 1/4	14-1
	Southern pine	#2	5-0	7-5	9-5	11-3	13-2	4-7	6-11	8-9	10-5	12-3
	Southern pine	#3	3-10	5-5	7-1	8-8	10-3	3-6	5-3	6-7	8-0	9-6
	Spruce-pine-fir	SS	5-5	8-10	11-8	14-8	17-1	5-5	8-10	11-2	12-7	15-9
	Spruce-pine-fir	#1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-3
	Spruce-pine-fir	#2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-3
	Spruce-pine-fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0

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

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0478 kPa.

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

~~TABLE R802.5.1(7)~~
~~RAFTER SPANS FOR 70 PSF GROUND SNOW LOAD~~
~~(Ceiling not attached to rafters, L/Δ = 180)~~

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum Rafter Spans~~									
		~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~
~~12~~	~~Douglas fir-larch~~ ~~SS~~	~~7-7~~	~~11-10~~	~~15-8~~	~~19-9~~	~~22-10~~	~~7-7~~	~~11-10~~	~~15-3~~	~~18-7~~	~~21-7~~
	~~Douglas fir-larch~~ ~~#1~~	~~7-1~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-8~~	~~9-10~~	~~12-5~~	~~15-2~~	~~17-7~~
	~~Douglas fir-larch~~ ~~#2~~	~~6-9~~	~~9-10~~	~~12-6~~	~~15-3~~	~~17-9~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~	~~16-8~~
	~~Douglas fir-larch~~ ~~#3~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-8~~	~~13-6~~	~~4-10~~	~~7-1~~	~~9-0~~	~~11-0~~	~~12-9~~
	~~Hem-fir~~ ~~SS~~	~~7-2~~	~~11-3~~	~~14-9~~	~~18-10~~	~~22-1~~	~~7-2~~	~~11-3~~	~~14-8~~	~~18-0~~	~~20-10~~
	~~Hem-fir~~ ~~#1~~	~~7-0~~	~~10-3~~	~~13-0~~	~~15-11~~	~~18-5~~	~~6-7~~	~~9-8~~	~~12-3~~	~~15-0~~	~~17-5~~
	~~Hem-fir~~ ~~#2~~	~~6-7~~	~~9-7~~	~~12-2~~	~~14-10~~	~~17-3~~	~~6-2~~	~~9-1~~	~~11-5~~	~~14-0~~	~~16-3~~
	~~Hem-fir~~ ~~#3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-9~~	~~6-11~~	~~8-9~~	~~10-9~~	~~12-5~~
	~~Southern pine~~ ~~SS~~	~~7-5~~	~~11-8~~	~~15-4~~	~~19-7~~	~~23-7~~	~~7-5~~	~~11-8~~	~~15-4~~	~~18-10~~	~~22-3~~
	~~Southern pine~~ ~~#1~~	~~7-1~~	~~10-7~~	~~13-5~~	~~15-9~~	~~18-8~~	~~6-9~~	~~10-0~~	~~12-8~~	~~14-10~~	~~17-7~~
	~~Southern pine~~ ~~#2~~	~~6-1~~	~~9-2~~	~~11-7~~	~~13-9~~	~~16-2~~	~~5-9~~	~~8-7~~	~~10-11~~	~~12-11~~	~~15-3~~
	~~Southern pine~~ ~~#3~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-7~~	~~12-6~~	~~4-5~~	~~6-6~~	~~8-3~~	~~10-0~~	~~11-10~~
	~~Spruce-pine-fir~~ ~~SS~~	~~7-0~~	~~11-0~~	~~14-6~~	~~18-0~~	~~20-11~~	~~7-0~~	~~11-0~~	~~13-11~~	~~17-0~~	~~19-8~~
	~~Spruce-pine-fir~~ ~~#1~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~6-3~~	~~9-2~~	~~11-8~~	~~14-2~~	~~16-6~~
	~~Spruce-pine-fir~~ ~~#2~~	~~6-8~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~6-3~~	~~9-2~~	~~11-8~~	~~14-2~~	~~16-6~~
	~~Spruce-pine-fir~~ ~~#3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-9~~	~~6-11~~	~~8-9~~	~~10-9~~	~~12-5~~
~~16~~	~~Douglas fir-larch~~ ~~SS~~	~~6-10~~	~~10-9~~	~~14-0~~	~~17-1~~	~~19-10~~	~~6-10~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~
	~~Douglas fir-larch~~ ~~#1~~	~~6-3~~	~~9-6~~	~~11-5~~	~~13-11~~	~~16-2~~	~~5-10~~	~~8-6~~	~~10-9~~	~~13-2~~	~~15-3~~
	~~Douglas fir-larch~~ ~~#2~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~	~~15-4~~	~~5-6~~	~~8-1~~	~~10-3~~	~~12-6~~	~~14-6~~
	~~Douglas fir-larch~~ ~~#3~~	~~4-6~~	~~6-6~~	~~8-3~~	~~10-1~~	~~11-9~~	~~4-3~~	~~6-3~~	~~7-10~~	~~9-6~~	~~11-1~~
	~~Hem-fir~~ ~~SS~~	~~6-6~~	~~10-2~~	~~13-5~~	~~16-6~~	~~19-2~~	~~6-6~~	~~10-1~~	~~12-9~~	~~15-7~~	~~18-0~~
	~~Hem-fir~~ ~~#1~~	~~6-1~~	~~8-11~~	~~11-3~~	~~13-9~~	~~16-0~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-0~~	~~15-1~~
	~~Hem-fir~~ ~~#2~~	~~5-8~~	~~8-4~~	~~10-6~~	~~12-10~~	~~14-11~~	~~5-4~~	~~7-10~~	~~9-11~~	~~12-1~~	~~14-1~~
	~~Hem-fir~~ ~~#3~~	~~4-4~~	~~6-4~~	~~8-1~~	~~9-10~~	~~11-5~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~
	~~Southern pine~~ ~~SS~~	~~6-9~~	~~10-7~~	~~14-0~~	~~17-4~~	~~20-5~~	~~6-9~~	~~10-7~~	~~13-9~~	~~16-4~~	~~18-3~~
	~~Southern pine~~ ~~#1~~	~~6-3~~	~~9-3~~	~~11-8~~	~~13-8~~	~~16-2~~	~~5-10~~	~~8-8~~	~~11-0~~	~~12-10~~	~~15-3~~
	~~Southern pine~~ ~~#2~~	~~5-3~~	~~7-11~~	~~10-0~~	~~11-11~~	~~14-0~~	~~5-0~~	~~7-5~~	~~9-5~~	~~11-3~~	~~13-2~~
	~~Southern pine~~ ~~#3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-2~~	~~10-10~~	~~3-10~~	~~5-8~~	~~7-1~~	~~8-8~~	~~10-3~~
	~~Spruce-pine-fir~~ ~~SS~~	~~6-4~~	~~10-0~~	~~13-0~~	~~15-7~~	~~18-1~~	~~6-4~~	~~9-6~~	~~12-0~~	~~14-8~~	~~17-1~~
	~~Spruce-pine-fir~~ ~~#1~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-1~~	~~15-2~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~
	~~Spruce-pine-fir~~ ~~#2~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-1~~	~~15-2~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~
	~~Spruce-pine-fir~~ ~~#3~~	~~4-4~~	~~6-4~~	~~8-1~~	~~9-10~~	~~11-5~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~
~~19.2~~	~~Douglas fir-larch~~ ~~SS~~	~~6-6~~	~~10-1~~	~~13-9~~	~~16-7~~	~~18-1~~	~~6-6~~	~~9-6~~	~~12-0~~	~~14-8~~	~~17-1~~
	~~Douglas fir-larch~~ ~~#1~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~	~~5-4~~	~~7-9~~	~~9-10~~	~~12-0~~	~~13-11~~
	~~Douglas fir-larch~~ ~~#2~~	~~5-4~~	~~7-10~~	~~9-11~~	~~12-1~~	~~14-0~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~
	~~Douglas fir-larch~~ ~~#3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-3~~	~~10-8~~	~~3-10~~	~~5-7~~	~~7-1~~	~~8-8~~	~~10-1~~
	~~Hem-fir~~ ~~SS~~	~~6-1~~	~~9-7~~	~~12-4~~	~~15-1~~	~~17-4~~	~~6-1~~	~~9-3~~	~~11-8~~	~~14-3~~	~~15-5~~
	~~Hem-fir~~ ~~#1~~	~~5-7~~	~~8-3~~	~~10-3~~	~~12-7~~	~~14-7~~	~~5-3~~	~~7-8~~	~~9-8~~	~~11-10~~	~~13-9~~
	~~Hem-fir~~ ~~#2~~	~~5-3~~	~~7-7~~	~~9-7~~	~~11-9~~	~~13-7~~	~~4-11~~	~~7-3~~	~~9-1~~	~~11-1~~	~~12-10~~
	~~Hem-fir~~ ~~#3~~	~~4-0~~	~~5-10~~	~~7-4~~	~~9-0~~	~~10-5~~	~~3-9~~	~~5-6~~	~~6-11~~	~~8-6~~	~~9-10~~

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | **Grey Text** = Previous COH Amendment Brought Forward to 2021

~~**Yellow Strikethrough**~~ = Text Deleted from the Code by COH | **Green Text** = NEW or Modified Text by COH in 2021 | **Magenta** = New or modified Text by ICC in 2018

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum Rafter Spans[a]									
			(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
19.2	Southern pine	SS	6-4	10-0	13-2	15-10	18-8	6-4	9-10	12-6	14-14	17-7
	Southern pine	#1	5-8	8-5	10-8	12-5	14-9	5-4	7-11	10-0	11-9	13-14
	Southern pine	#2	4-10	7-3	9-2	10-10	12-9	4-6	6-10	8-8	10-3	12-1
	Southern pine	#3	3-8	5-6	6-11	8-4	9-11	3-6	5-2	6-6	7-11	9-4
	Spruce-pine-fir	SS	6-0	9-2	11-8	14-3	16-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir	#1	5-3	7-8	9-9	11-14	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir	#2	5-3	7-8	9-9	11-14	13-10	5-0	7-3	9-2	11-3	13-0
	Spruce-pine-fir	#3	4-0	5-10	7-4	9-0	10-5	3-9	5-6	6-11	8-5	9-10
24	Douglas fir-larch	SS	6-0	9-0	11-5	13-14	16-2	5-10	8-5	10-9	13-2	15-3
	Douglas fir-larch	#1	5-0	7-4	9-4	11-5	13-2	4-9	6-11	8-9	10-9	12-5
	Douglas fir-larch	#2	4-9	7-0	8-10	10-10	12-6	4-6	6-7	8-4	10-2	11-10
	Douglas fir-larch	#3	3-8	5-4	6-9	8-3	9-7	3-5	5-0	6-4	7-9	9-10
	Hem-fir	SS	5-8	8-8	11-0	13-6	13-14	5-7	8-3	10-5	12-4	12-4
	Hem-fir	#1	5-0	7-3	9-2	11-3	13-0	4-8	6-10	8-8	10-7	12-4
	Hem-fir	#2	4-8	6-9	8-7	10-6	12-2	4-4	6-5	8-1	9-11	11-6
	Hem-fir	#3	3-7	5-3	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10
	Southern pine	SS	5-11	9-3	11-14	14-2	16-8	5-11	8-10	11-2	13-4	15-9
	Southern pine	#1	5-0	7-6	9-6	11-1	13-2	4-9	7-1	9-0	10-6	12-5
	Southern pine	#2	4-4	6-5	8-2	9-9	11-5	4-1	6-1	7-9	9-2	10-9
	Southern pine	#3	3-4	4-11	6-2	7-6	8-10	3-1	4-7	5-10	7-1	8-4
	Spruce-pine-fir	SS	5-6	8-3	10-5	12-9	14-9	5-4	7-9	9-10	12-0	12-14
	Spruce-pine-fir	#1	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir	#2	4-8	6-11	8-9	10-8	12-4	4-5	6-6	8-3	10-0	11-8
	Spruce-pine-fir	#3	3-7	5-2	6-7	8-1	9-4	3-4	4-11	6-3	7-7	8-10

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

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

H_C/H_R	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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~~TABLE R802.5.1(8)~~
~~RAFTER SPANS FOR 70 PSF GROUND SNOW LOAD~~
~~(Ceiling attached to rafters, L/Δ = 240)~~

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~		~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
			~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
			~~Maximum rafter spans[a]~~									
			~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~	~~(feet-inches)~~
~~12~~	~~Douglas fir-larch~~	~~SS~~	~~6-10~~	~~10-9~~	~~14-3~~	~~18-2~~	~~22-1~~	~~6-10~~	~~10-9~~	~~14-3~~	~~18-2~~	~~21-7~~
	~~Douglas fir-larch~~	~~#1~~	~~6-7~~	~~10-5~~	~~13-2~~	~~16-1~~	~~18-8~~	~~6-7~~	~~9-10~~	~~12-5~~	~~15-2~~	~~17-7~~
	~~Douglas fir-larch~~	~~#2~~	~~6-5~~	~~9-10~~	~~12-6~~	~~15-3~~	~~17-9~~	~~6-4~~	~~9-4~~	~~11-9~~	~~14-5~~	~~16-8~~
	~~Douglas fir-larch~~	~~#3~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-8~~	~~13-6~~	~~4-10~~	~~7-1~~	~~9-0~~	~~11-0~~	~~12-9~~
	~~Hem-fir~~	~~SS~~	~~6-6~~	~~10-2~~	~~13-5~~	~~17-2~~	~~20-10~~	~~6-6~~	~~10-2~~	~~13-5~~	~~17-2~~	~~20-10~~
	~~Hem-fir~~	~~#1~~	~~6-4~~	~~10-0~~	~~13-0~~	~~15-11~~	~~18-5~~	~~6-4~~	~~9-8~~	~~12-3~~	~~15-0~~	~~17-5~~
	~~Hem-fir~~	~~#2~~	~~6-1~~	~~9-6~~	~~12-2~~	~~14-10~~	~~17-3~~	~~6-1~~	~~9-1~~	~~11-5~~	~~14-0~~	~~16-3~~
	~~Hem-fir~~	~~#3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-9~~	~~12-5~~
	~~Southern pine~~	~~SS~~	~~6-9~~	~~10-7~~	~~14-0~~	~~17-10~~	~~21-8~~	~~6-9~~	~~10-7~~	~~14-0~~	~~17-10~~	~~21-8~~
	~~Southern pine~~	~~#1~~	~~6-6~~	~~10-2~~	~~13-5~~	~~16-9~~	~~18-8~~	~~6-6~~	~~10-0~~	~~12-8~~	~~14-10~~	~~17-7~~
	~~Southern pine~~	~~#2~~	~~6-1~~	~~9-2~~	~~11-7~~	~~13-9~~	~~16-2~~	~~5-9~~	~~8-7~~	~~10-11~~	~~12-11~~	~~15-3~~
	~~Southern pine~~	~~#3~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-7~~	~~12-6~~	~~4-5~~	~~6-5~~	~~8-3~~	~~10-0~~	~~11-10~~
	~~Spruce-pine-fir~~	~~SS~~	~~6-4~~	~~10-0~~	~~13-2~~	~~16-9~~	~~20-5~~	~~6-4~~	~~10-0~~	~~13-2~~	~~16-9~~	~~19-5~~
	~~Spruce-pine-fir~~	~~#1~~	~~6-2~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~6-2~~	~~9-2~~	~~11-8~~	~~14-2~~	~~16-6~~
	~~Spruce-pine-fir~~	~~#2~~	~~6-2~~	~~9-9~~	~~12-4~~	~~15-1~~	~~17-6~~	~~6-2~~	~~9-2~~	~~11-8~~	~~14-2~~	~~16-6~~
	~~Spruce-pine-fir~~	~~#3~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-9~~	~~12-5~~
~~16~~	~~Douglas fir-larch~~	~~SS~~	~~6-3~~	~~9-10~~	~~12-11~~	~~16-6~~	~~19-10~~	~~6-3~~	~~9-10~~	~~12-11~~	~~16-1~~	~~18-8~~
	~~Douglas fir-larch~~	~~#1~~	~~6-0~~	~~9-0~~	~~11-5~~	~~13-11~~	~~16-2~~	~~5-10~~	~~8-6~~	~~10-9~~	~~13-2~~	~~15-3~~
	~~Douglas fir-larch~~	~~#2~~	~~5-10~~	~~8-7~~	~~10-10~~	~~13-3~~	~~15-4~~	~~5-6~~	~~8-1~~	~~10-3~~	~~12-6~~	~~14-6~~
	~~Douglas fir-larch~~	~~#3~~	~~4-6~~	~~6-6~~	~~8-3~~	~~10-1~~	~~11-9~~	~~4-3~~	~~6-2~~	~~7-10~~	~~9-6~~	~~11-1~~
	~~Hem-fir~~	~~SS~~	~~5-11~~	~~9-3~~	~~12-2~~	~~15-7~~	~~18-11~~	~~5-11~~	~~9-3~~	~~12-2~~	~~15-7~~	~~18-0~~
	~~Hem-fir~~	~~#1~~	~~5-9~~	~~8-11~~	~~11-3~~	~~13-9~~	~~16-0~~	~~5-9~~	~~8-5~~	~~10-8~~	~~13-0~~	~~15-1~~
	~~Hem-fir~~	~~#2~~	~~5-6~~	~~8-4~~	~~10-6~~	~~12-10~~	~~14-11~~	~~5-4~~	~~7-10~~	~~9-11~~	~~12-1~~	~~14-1~~
	~~Hem-fir~~	~~#3~~	~~4-4~~	~~6-4~~	~~8-1~~	~~9-10~~	~~11-5~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~
	~~Southern pine~~	~~SS~~	~~6-1~~	~~9-7~~	~~12-8~~	~~16-2~~	~~19-8~~	~~6-1~~	~~9-7~~	~~12-8~~	~~16-2~~	~~19-3~~
	~~Southern pine~~	~~#1~~	~~5-11~~	~~9-2~~	~~11-8~~	~~13-8~~	~~16-2~~	~~5-10~~	~~8-8~~	~~11-0~~	~~12-10~~	~~15-3~~
	~~Southern pine~~	~~#2~~	~~5-3~~	~~7-11~~	~~10-0~~	~~11-11~~	~~14-0~~	~~5-0~~	~~7-5~~	~~9-5~~	~~11-3~~	~~13-2~~
	~~Southern pine~~	~~#3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-2~~	~~10-10~~	~~3-10~~	~~5-8~~	~~7-1~~	~~8-8~~	~~10-3~~
	~~Spruce-pine-fir~~	~~SS~~	~~5-9~~	~~9-1~~	~~11-11~~	~~15-3~~	~~18-1~~	~~5-9~~	~~9-1~~	~~11-11~~	~~14-8~~	~~17-1~~
	~~Spruce-pine-fir~~	~~#1~~	~~5-5~~	~~8-5~~	~~10-8~~	~~13-1~~	~~15-2~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~
	~~Spruce-pine-fir~~	~~#2~~	~~5-5~~	~~8-5~~	~~10-8~~	~~13-1~~	~~15-2~~	~~5-5~~	~~7-11~~	~~10-1~~	~~12-4~~	~~14-3~~
	~~Spruce-pine-fir~~	~~#3~~	~~4-4~~	~~6-4~~	~~8-1~~	~~9-10~~	~~11-5~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-4~~	~~10-9~~
~~19.2~~	~~Douglas fir-larch~~	~~SS~~	~~6-10~~	~~9-3~~	~~12-2~~	~~15-6~~	~~18-1~~	~~6-10~~	~~9-3~~	~~12-0~~	~~14-8~~	~~17-1~~
	~~Douglas fir-larch~~	~~#1~~	~~5-7~~	~~8-3~~	~~10-5~~	~~12-9~~	~~14-9~~	~~5-4~~	~~7-9~~	~~9-10~~	~~12-0~~	~~13-11~~
	~~Douglas fir-larch~~	~~#2~~	~~5-4~~	~~7-10~~	~~9-11~~	~~12-1~~	~~14-0~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~
	~~Douglas fir-larch~~	~~#3~~	~~4-1~~	~~6-0~~	~~7-7~~	~~9-3~~	~~10-8~~	~~3-10~~	~~5-7~~	~~7-1~~	~~8-8~~	~~10-1~~
	~~Hem-fir~~	~~SS~~	~~5-6~~	~~8-5~~	~~11-6~~	~~14-8~~	~~17-4~~	~~5-6~~	~~8-5~~	~~11-6~~	~~14-2~~	~~16-5~~
	~~Hem-fir~~	~~#1~~	~~5-5~~	~~8-2~~	~~10-3~~	~~12-7~~	~~14-7~~	~~5-3~~	~~7-8~~	~~9-8~~	~~11-10~~	~~13-9~~
	~~Hem-fir~~	~~#2~~	~~5-2~~	~~7-7~~	~~9-7~~	~~11-9~~	~~13-7~~	~~4-11~~	~~7-2~~	~~9-1~~	~~11-1~~	~~12-10~~
	~~Hem-fir~~	~~#3~~	~~4-0~~	~~5-10~~	~~7-4~~	~~9-0~~	~~10-5~~	~~3-9~~	~~5-6~~	~~6-11~~	~~8-6~~	~~9-10~~

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

~~RAFTER SPACING (inches)~~	~~SPECIES AND GRADE~~	~~DEAD LOAD = 10 psf~~					~~DEAD LOAD = 20 psf~~				
		~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~	~~2 × 4~~	~~2 × 6~~	~~2 × 8~~	~~2 × 10~~	~~2 × 12~~
		~~Maximum rafter spans[a]~~									
		~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~	~~(feet – inches)~~
~~12~~	~~Southern pine~~ ~~SS~~	~~5-9~~	~~9-1~~	~~11-11~~	~~15-3~~	~~18-6~~	~~5-9~~	~~9-1~~	~~11-11~~	~~14-11~~	~~17-7~~
	~~Southern pine #1~~	~~5-6~~	~~8-5~~	~~10-8~~	~~13-5~~	~~14-9~~	~~5-4~~	~~7-11~~	~~10-0~~	~~11-9~~	~~13-11~~
	~~Southern pine #2~~	~~4-10~~	~~7-3~~	~~9-2~~	~~10-10~~	~~12-9~~	~~4-6~~	~~6-10~~	~~8-8~~	~~10-3~~	~~12-1~~
	~~Southern pine #3~~	~~3-8~~	~~5-6~~	~~6-11~~	~~8-4~~	~~9-11~~	~~3-6~~	~~5-2~~	~~6-6~~	~~7-11~~	~~9-4~~
	~~Spruce-pine-fir SS~~	~~5-5~~	~~8-6~~	~~11-3~~	~~14-3~~	~~16-6~~	~~5-5~~	~~8-6~~	~~11-0~~	~~13-5~~	~~15-7~~
	~~Spruce-pine-fir #1~~	~~5-3~~	~~7-8~~	~~9-9~~	~~11-11~~	~~13-10~~	~~5-0~~	~~7-3~~	~~9-2~~	~~11-3~~	~~13-0~~
	~~Spruce-pine-fir #2~~	~~5-3~~	~~7-8~~	~~9-9~~	~~11-11~~	~~13-10~~	~~5-0~~	~~7-3~~	~~9-2~~	~~11-3~~	~~13-0~~
	~~Spruce-pine-fir #3~~	~~4-0~~	~~5-10~~	~~7-4~~	~~9-0~~	~~10-5~~	~~3-9~~	~~5-6~~	~~6-11~~	~~8-6~~	~~9-10~~
~~16~~	~~Douglas fir-larch SS~~	~~5-5~~	~~8-7~~	~~11-3~~	~~13-11~~	~~16-2~~	~~5-5~~	~~8-6~~	~~10-9~~	~~13-2~~	~~15-3~~
	~~Douglas fir-larch #1~~	~~5-0~~	~~7-4~~	~~9-4~~	~~11-5~~	~~13-2~~	~~4-9~~	~~6-11~~	~~8-9~~	~~10-9~~	~~12-5~~
	~~Douglas fir-larch #2~~	~~4-9~~	~~7-0~~	~~8-10~~	~~10-10~~	~~12-6~~	~~4-6~~	~~6-7~~	~~8-4~~	~~10-2~~	~~11-10~~
	~~Douglas fir-larch #3~~	~~3-8~~	~~5-4~~	~~6-9~~	~~8-3~~	~~9-7~~	~~3-5~~	~~5-0~~	~~6-4~~	~~7-9~~	~~9-0~~
	~~Hem-fir SS~~	~~5-2~~	~~8-1~~	~~10-8~~	~~13-6~~	~~13-11~~	~~5-2~~	~~8-1~~	~~10-5~~	~~12-4~~	~~12-4~~
	~~Hem-fir #1~~	~~5-0~~	~~7-3~~	~~9-3~~	~~11-3~~	~~13-0~~	~~4-8~~	~~6-10~~	~~8-8~~	~~10-7~~	~~12-4~~
	~~Hem-fir #2~~	~~4-8~~	~~6-8~~	~~8-7~~	~~10-6~~	~~12-2~~	~~4-4~~	~~6-5~~	~~8-1~~	~~9-11~~	~~11-6~~
	~~Hem-fir #3~~	~~3-7~~	~~5-3~~	~~6-7~~	~~8-1~~	~~9-4~~	~~3-4~~	~~4-11~~	~~6-3~~	~~7-7~~	~~8-10~~
	~~Southern pine SS~~	~~5-4~~	~~8-5~~	~~11-1~~	~~14-2~~	~~16-8~~	~~5-4~~	~~8-5~~	~~11-1~~	~~13-4~~	~~15-9~~
	~~Southern pine #1~~	~~5-0~~	~~7-6~~	~~9-6~~	~~11-1~~	~~13-2~~	~~4-9~~	~~7-1~~	~~9-0~~	~~10-6~~	~~12-5~~
	~~Southern pine #2~~	~~4-4~~	~~6-5~~	~~8-3~~	~~9-9~~	~~11-5~~	~~4-1~~	~~6-1~~	~~7-9~~	~~9-2~~	~~10-9~~
	~~Southern pine #3~~	~~3-4~~	~~4-11~~	~~6-2~~	~~7-6~~	~~8-10~~	~~3-1~~	~~4-7~~	~~5-10~~	~~7-1~~	~~8-4~~
	~~Spruce-pine-fir SS~~	~~5-0~~	~~7-11~~	~~10-5~~	~~12-9~~	~~14-9~~	~~5-0~~	~~7-9~~	~~9-10~~	~~12-0~~	~~12-11~~
	~~Spruce-pine-fir #1~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-8~~	~~12-4~~	~~4-5~~	~~6-6~~	~~8-3~~	~~10-0~~	~~11-8~~
	~~Spruce-pine-fir #2~~	~~4-8~~	~~6-11~~	~~8-9~~	~~10-8~~	~~12-4~~	~~4-5~~	~~6-6~~	~~8-3~~	~~10-0~~	~~11-8~~
	~~Spruce-pine-fir #3~~	~~3-7~~	~~5-3~~	~~6-7~~	~~8-1~~	~~9-4~~	~~3-4~~	~~4-11~~	~~6-3~~	~~7-7~~	~~8-10~~
~~24~~	~~Douglas fir-larch SS~~	~~4-4~~	~~6-11~~	~~9-1~~	~~11-6~~	~~13-6~~	~~4-4~~	~~6-11~~	~~9-1~~	~~11-6~~	~~13-6~~
	~~Douglas fir-larch #1~~	~~4-0~~	~~6-0~~	~~7-8~~	~~9-6~~	~~11-0~~	~~3-10~~	~~5-8~~	~~7-4~~	~~9-2~~	~~10-8~~
	~~Douglas fir-larch #2~~	~~3-10~~	~~5-8~~	~~7-3~~	~~9-0~~	~~10-5~~	~~3-8~~	~~5-5~~	~~7-0~~	~~8-8~~	~~10-1~~
	~~Douglas fir-larch #3~~	~~3-0~~	~~4-3~~	~~5-5~~	~~6-8~~	~~7-8~~	~~2-10~~	~~4-0~~	~~5-2~~	~~6-5~~	~~7-5~~
	~~Hem-fir SS~~	~~4-2~~	~~6-7~~	~~8-7~~	~~11-0~~	~~11-4~~	~~4-2~~	~~6-7~~	~~8-7~~	~~10-7~~	~~10-10~~
	~~Hem-fir #1~~	~~4-0~~	~~6-0~~	~~7-7~~	~~9-2~~	~~10-8~~	~~3-10~~	~~5-8~~	~~7-4~~	~~8-11~~	~~10-1~~
	~~Hem-fir #2~~	~~3-10~~	~~5-8~~	~~7-3~~	~~8-7~~	~~9-11~~	~~3-8~~	~~5-4~~	~~6-11~~	~~8-5~~	~~9-8~~
	~~Hem-fir #3~~	~~3-0~~	~~4-3~~	~~5-5~~	~~6-5~~	~~7-6~~	~~2-10~~	~~4-0~~	~~5-2~~	~~6-3~~	~~7-3~~
	~~Southern pine SS~~	~~4-4~~	~~6-11~~	~~9-1~~	~~11-6~~	~~13-6~~	~~4-4~~	~~6-11~~	~~9-1~~	~~11-6~~	~~13-6~~
	~~Southern pine #1~~	~~4-0~~	~~6-0~~	~~7-8~~	~~9-6~~	~~11-0~~	~~3-10~~	~~5-8~~	~~7-4~~	~~9-2~~	~~10-8~~
	~~Southern pine #2~~	~~3-10~~	~~5-8~~	~~7-3~~	~~9-0~~	~~10-5~~	~~3-8~~	~~5-5~~	~~7-0~~	~~8-8~~	~~10-1~~
	~~Southern pine #3~~	~~3-0~~	~~4-3~~	~~5-5~~	~~6-8~~	~~7-8~~	~~2-10~~	~~4-0~~	~~5-2~~	~~6-5~~	~~7-5~~
	~~Spruce-pine-fir SS~~	~~4-2~~	~~6-7~~	~~8-7~~	~~11-0~~	~~11-4~~	~~4-2~~	~~6-7~~	~~8-7~~	~~10-7~~	~~10-10~~
	~~Spruce-pine-fir #1~~	~~4-0~~	~~6-0~~	~~7-7~~	~~9-2~~	~~10-8~~	~~3-10~~	~~5-8~~	~~7-4~~	~~8-11~~	~~10-1~~
	~~Spruce-pine-fir #2~~	~~3-10~~	~~5-8~~	~~7-3~~	~~8-7~~	~~9-11~~	~~3-8~~	~~5-4~~	~~6-11~~	~~8-5~~	~~9-8~~
	~~Spruce-pine-fir #3~~	~~3-0~~	~~4-3~~	~~5-5~~	~~6-5~~	~~7-6~~	~~2-10~~	~~4-0~~	~~5-2~~	~~6-3~~	~~7-3~~

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

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

~~a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:~~

~~H_C/H_R~~	~~Rafter Span Adjustment Factor~~
~~1/3~~	~~0.67~~
~~1/4~~	~~0.76~~
~~1/5~~	~~0.83~~
~~1/6~~	~~0.90~~
~~1/7.5 or less~~	~~1.00~~

~~where:~~

~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~

~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021

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~~TABLE R802.5.1(9)~~
~~RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS[a, b, c, d, e, f, h]~~

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20[g]				30				50				70			
		Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
		Required number of 16d common nails[a, b] per heel joint splices[c, d, e, f]															
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	16	5	8	10	13	5	8	11	14	6	11	15	20	8	14	20	26
	24	7	11	15	19	7	11	16	21	9	16	23	30	12	21	30	39
4:12	12	3	5	6	8	3	5	6	8	4	6	9	11	5	8	12	15
	16	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	24	5	8	12	15	5	9	12	16	7	12	17	22	9	16	23	29
5:12	12	3	4	5	6	3	4	5	7	3	5	7	9	4	7	9	12
	16	3	5	6	8	3	5	7	9	4	7	9	12	5	9	12	16
	24	4	7	9	12	4	7	10	13	6	10	14	18	7	13	18	23
7:12	12	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	16	3	4	5	6	3	4	5	6	3	5	7	9	4	6	9	11
	24	3	5	7	9	3	5	7	9	4	7	10	13	5	9	13	17
9:12	12	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	16	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	24	3	4	6	7	3	4	6	7	3	6	8	10	4	7	10	13
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4	3	3	4	5
	16	3	3	4	4	3	3	3	4	3	3	4	5	3	4	6	7
	24	3	4	4	5	3	3	4	6	3	4	6	8	3	6	8	10

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

~~a. 40d box nails shall be permitted to be substituted for 16d common nails.~~

~~b. Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.~~

~~c. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.~~

~~d. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.~~

~~e. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.~~

~~f. Where rafter ties are substituted for ceiling joists, the heel joint connection requirement shall be taken as the tabulated heel joint connection requirement for two-thirds of the actual rafter slope.~~

~~g. Applies to roof live load of 20 psf or less.~~

~~h. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:~~

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

~~where:~~

~~H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.~~

~~H_R = Height of roof ridge measured vertically above the top of the rafter support walls.~~

Base code rafter table relocated to R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.5.1(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	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	13-2	20-8	Note a	Note a
	Douglas fir-larch	#1	12-8	19-11	Note a	Note a
	Douglas fir-larch	#2	12-5	19-6	25-8	Note a
	Douglas fir-larch	#3	11-1	16-3	20-7	25-2
	Hem-fir	SS	12-5	19-6	25-8	Note a
	Hem-fir	#1	12-2	19-1	25-2	Note a
	Hem-fir	#2	11-7	18-2	24-0	Note a
	Hem-fir	#3	10-10	15-10	20-1	24-6
	Southern pine	SS	12-11	20-3	Note a	Note a
	Southern pine	#1	12-5	19-6	25-8	Note a
	Southern pine	#2	11-10	18-8	24-7	Note a
	Southern pine	#3	10-1	14-11	18-9	22-9
	Spruce-pine-fir	SS	12-2	19-1	25-2	Note a
	Spruce-pine-fir	#1	11-10	18-8	24-7	Note a
	Spruce-pine-fir	#2	11-10	18-8	24-7	Note a
	Spruce-pine-fir	#3	10-10	15-10	20-1	24-6
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

Table for ceiling joist spans relocated from R802.4.

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CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
19.2	Douglas fir-larch	SS	11-3	17-8	23-3	Note a
	Douglas fir-larch	#1	10-10	17-0	22-5	Note a
	Douglas fir-larch	#2	10-7	16-8	21-4	26-0
	Douglas fir-larch	#3	8-9	12-10	16-3	19-10
	Hem-fir	SS	10-7	16-8	21-11	Note a
	Hem-fir	#1	10-4	16-4	21-6	Note a
	Hem-fir	#2	9-11	15-7	20-6	25-3
	Hem-fir	#3	8-7	12-6	15-10	19-5
	Southern -pine	SS	11-0	17-4	22-10	Note a
	Southern pine	#1	10-7	16-8	22-0	Note a
	Southern pine	#2	10-2	15-7	19-8	23-5
	Southern pine	#3	8-0	11-9	14-10	18-0
	Spruce-pine-fir	SS	10-4	16-4	21-6	Note a
	Spruce-pine-fir	#1	10-2	15-11	21-0	25-8
	Spruce-pine-fir	#2	10-2	15-11	21-0	25-8
	Spruce-pine-fir	#3	8-7	12-6	15-10	19-5
24	Douglas fir-larch	SS	10-5	16-4	21-7	Note a
	Douglas fir-larch	#1	10-0	15-9	20-1	24-6
	Douglas fir-larch	#2	9-10	15-0	19-1	23-3
	Douglas fir-larch	#3	7-10	11-6	14-7	17-9
	Hem-fir	SS	9-10	15-6	20-5	Note a
	Hem-fir	#1	9-8	15-2	19-10	24-3
	Hem-fir	#2	9-2	14-5	18-6	22-7
	Hem-fir	#3	7-8	11-2	14-2	17-4
	Southern pine	SS	10-3	16-1	21-2	Note a
	Southern pine	#1	9-10	15-6	20-5	24-9
	Southern pine	#2	9-3	13-11	17-7	20-11
	Southern pine	#3	7-2	10-6	13-3	16-1
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir	#1	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#2	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#3	7-8	11-2	14-2	17-4

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
a. Span exceeds 26 feet in length.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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TABLE R802.5.1(2)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics with limited storage, live load = 20 psf, L/Δ = 240)

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	10-5	16-4	21-7	Note a
	Douglas fir-larch	#1	10-0	15-9	20-1	24-6
	Douglas fir-larch	#2	9-10	15-0	19-1	23-3
	Douglas fir-larch	#3	7-10	11-6	14-7	17-9
	Hem-fir	SS	9-10	15-6	20-5	Note a
	Hem-fir	#1	9-8	15-2	19-10	24-3
	Hem-fir	#2	9-2	14-5	18-6	22-7
	Hem-fir	#3	7-8	11-2	14-2	17-4
	Southern pine	SS	10-3	16-1	21-2	Note a
	Southern pine	#1	9-10	15-6	20-5	24-0
	Southern pine	#2	9-3	13-11	17-7	20-11
	Southern pine	#3	7-2	10-6	13-3	16-1
	Spruce-pine-fir	SS	9-8	15-2	19-11	25-5
	Spruce-pine-fir	#1	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#2	9-5	14-9	18-9	22-11
	Spruce-pine-fir	#3	7-8	11-2	14-2	17-4
16	Douglas fir-larch	SS	9-6	14-11	19-7	25-0
	Douglas fir-larch	#1	9-1	13-9	17-5	21-3
	Douglas fir-larch	#2	8-11	13-0	16-6	20-2
	Douglas fir-larch	#3	6-10	9-11	12-7	15-5
	Hem-fir	SS	8-11	14-1	18-6	23-8
	Hem-fir	#1	8-9	13-7	17-2	21-0
	Hem-fir	#2	8-4	12-8	16-0	19-7
	Hem-fir	#3	6-8	9-8	12-4	15-0
	Southern pine	SS	9-4	14-7	19-3	24-7
	Southern pine	#1	8-11	14-0	17-9	20-9
	Southern pine	#2	8-0	12-0	15-3	18-1
	Southern pine	#3	6-2	9-2	11-6	14-0
	Spruce-pine-fir	SS	8-9	13-9	18-1	23-1
	Spruce-pine-fir	#1	8-7	12-10	16-3	19-10
	Spruce-pine-fir	#2	8-7	12-10	16-3	19-10
	Spruce-pine-fir	#3	6-8	9-8	12-4	15-0

Table for ceiling joist spans relocated from R802.4.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf 2 × 4 Maximum ceiling joist spans (feet - inches)	2 × 6 (feet - inches)	2 × 8 (feet - inches)	2 × 10 (feet - inches)
19.2	Douglas fir-larch	SS	8-11	14-0	18-5	23-7
	Douglas fir-larch	#1	8-7	12-6	15-10	19-5
	Douglas fir-larch	#2	8-2	11-11	15-1	18-5
	Douglas fir-larch	#3	6-2	9-1	11-6	14-1
	Hem-fir	SS	8-5	13-3	17-5	22-3
	Hem-fir	#1	8-3	12-4	15-8	19-2
	Hem-fir	#2	7-10	11-7	14-8	17-10
	Hem-fir	#3	6-1	8-10	11-3	13-8
	Southern pine	SS	8-9	13-9	18-2	23-1
	Southern pine	#1	8-5	12-9	16-2	18-11
	Southern pine	#2	7-4	11-0	13-11	16-6
	Southern pine	#3	5-8	8-4	10-6	12-9
	Spruce-pine-fir	SS	8-3	12-11	17-1	21-8
	Spruce-pine-fir	#1	8-0	11-9	14-10	18-2
	Spruce-pine-fir	#2	8-0	11-9	14-10	18-2
	Spruce-pine-fir	#3	6-1	8-10	11-3	13-8
24	Douglas fir-larch	SS	8-3	13-0	17-2	21-3
	Douglas fir-larch	#1	7-8	11-2	14-2	17-4
	Douglas fir-larch	#2	7-3	10-8	13-6	16-5
	Douglas fir-larch	#3	5-7	8-1	10-3	12-7
	Hem-fir	SS	7-10	12-3	16-2	20-6
	Hem-fir	#1	7-7	11-1	14-0	17-1
	Hem-fir	#2	7-1	10-4	13-1	16-0
	Hem-fir	#3	5-5	7-11	10-0	12-3
	Southern pine	SS	8-1	12-9	16-10	21-6
	Southern pine	#1	7-8	11-5	14-6	16-11
	Southern pine	#2	6-7	9-10	12-6	14-9
	Southern pine	#3	5-1	7-5	9-5	11-5
	Spruce-pine-fir	SS	7-8	12-0	15-10	19-5
	Spruce-pine-fir	#1	7-2	10-6	13-3	16-3
	Spruce-pine-fir	#2	7-2	10-6	13-3	16-3
	Spruce-pine-fir	#3	5-5	7-11	10-0	12-3

Check sources for availability of lumber in lengths greater than 20 feet.
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.
a. Span exceeds 26 feet in length.

R802.5.2 Ceiling joist and rafter connections. Where ceiling joists run parallel to rafters, they shall be connected to rafters at the top wall plate in accordance with Table R802.5.2. Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed in the bottom third of the rafter height in accordance with Figure R802.4.5 and Table R802.5.2. Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be designed as a beam. Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to Table R802.5.2.

New base code requirements for ceiling joist/rafter connections.

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TABLE R802.5.2
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS[a, b, c, d, e, g]

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20[f]				30				50				70			
		Roof span (feet)															
		12	20	28	36	12	20	28	36	12	20	28	36	12	20	28	36
		Required number of 16d common nails[a, b] per heel joint splices[c, d, e]															
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	16	5	8	10	13	5	8	11	14	6	11	15	20	8	14	20	26
	24	7	11	15	19	7	11	16	21	9	16	23	30	12	21	30	39
4:12	12	3	5	6	8	3	5	6	8	4	6	9	11	5	8	12	15
	16	4	6	8	10	4	6	8	11	5	8	12	15	6	11	15	20
	24	5	8	12	15	5	9	12	16	7	12	17	22	9	16	23	29
5:12	12	3	4	5	6	3	4	5	7	3	5	7	9	4	7	9	12
	16	3	5	6	8	3	5	7	9	4	7	9	12	5	9	12	16
	24	4	7	9	12	4	7	10	13	6	10	14	18	7	13	18	23
7:12	12	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	16	3	4	5	6	3	3	5	7	3	5	7	9	4	6	9	11
	24	3	5	7	9	3	5	7	9	4	7	10	13	5	9	13	17
9:12	12	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	16	3	4	4	5	3	3	4	5	3	4	5	7	3	5	7	9
	24	3	4	6	7	3	4	6	7	3	6	8	10	4	7	10	13
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4	3	3	4	5
	16	3	3	4	4	3	3	3	4	3	3	4	5	3	4	5	7
	24	3	4	4	5	3	3	4	6	3	4	6	8	3	6	8	10

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

a. 40d box nails shall be permitted to be substituted for 16d common nails.
b. Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.
c. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
d. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.
e. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
f. Applies to roof live load of 20 psf or less.
g. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the following factors:

H_C/H_R	Heel Joint Connection Adjustment Factor
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/7.5 or less	1.11

where:

H_C = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.
H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

Table for rafter/ceiling joist connection relocated from R802.4 and updated.

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~~TABLE R802.5.2~~TABLE R802.5.2(1)
RAFTER/CEILING JOIST HEEL JOINT CONNECTIONS[~~a, b, c, d, e,~~ g]

RAFTER SLOPE	RAFTER SPACING (inches)	GROUND SNOW LOAD (psf)															
		20[~~k~~]				30				50				70			
		Roof span (feet)															
		12	~~20~~	~~28~~ 24	36	12	~~20~~	~~28~~ 24	36	12	~~20~~	~~28~~ 24	36	12	~~20~~	~~28~~ 24	36
		Required number of 16d common nails[~~a, b~~] per heel joint splices [~~a, b, c, d, e,~~ f]															
3:12	12	~~4~~ 3	~~6~~	~~8~~-5	~~10~~ 8	~~4~~ 3	~~6~~	~~8~~-6	~~11~~ 9	5	~~8~~	~~12~~ 9	~~15~~ 13	6	~~11~~	~~15~~ 12	~~20~~ 17
	16	~~5~~ 4	~~8~~	~~10~~ 7	~~13~~ 10	~~5~~ 4	~~8~~	~~11~~ 8	~~14~~ 12	6	~~11~~	~~15~~ 12	~~20~~ 17	8	~~14~~	~~20~~ 15	~~26~~ 23
	19.2	4		8	12	5		10	14	7		14	21	9		18	27
	24	~~7~~ 5	~~11~~	~~15~~ 10	~~19~~ 15	~~7~~ 6	~~11~~	~~16~~ 12	~~21~~ 18	9	~~16~~	~~23~~ 17	~~30~~ 26	12	~~21~~	~~30~~ 23	~~39~~ 34
4:12	12	3	~~5~~	~~6~~-4	~~8~~-6	3	~~5~~	~~6~~5	~~8~~-7	4	~~6~~	~~9~~ 7	~~11~~ 10	5	~~8~~	~~12~~ 9	~~15~~ 13
	16	~~4~~ 3	~~6~~	~~8~~-5	~~10~~ 8	~~4~~ 3	~~6~~	~~8~~-6	~~11~~ 9	5	~~8~~	~~12~~ 9	~~15~~ 13	6	~~11~~	~~15~~ 12	~~20~~ 17
	19.2	3		6	9	4		7	11	6		11	16	7		14	21
	24	~~5~~ 4	~~8~~	~~12~~ 8	~~15~~ 11	5	~~9~~	~~12~~ 9	~~16~~ 13	7	~~12~~	~~17~~ 13	~~22~~ 19	9	~~16~~	~~23~~ 17	~~29~~ 26
5:12	12	3	~~4~~	~~5~~-3	~~6~~-5	3	~~4~~	~~5~~-4	~~7~~-6	3	~~5~~	~~7~~ 6	~~9~~ 8	4	~~7~~	~~9~~ 7	~~12~~ 11
	16	3	~~5~~	~~6~~-4	~~8~~-6	3	~~5~~	~~7~~-5	~~9~~-7	4	~~7~~	~~9~~ 7	~~12~~ 11	5	~~9~~	~~12~~ 9	~~16~~ 14
	19.2	3		5	7	3		6	9	5		9	13	6		11	17
	24	~~4~~ 3	~~7~~	~~9~~-6	~~12~~ 9	4	~~7~~	~~10~~ 7	~~13~~ 11	6	~~10~~	~~14~~ 11	~~18~~ 16	7	~~13~~	~~18~~ 14	~~23~~ 21
7:12	12	3	~~4~~	~~4~~-3	~~5~~-4	3	~~3~~	~~4~~-3	~~5~~-4	3	~~4~~	~~5~~ 4	~~7~~ 6	3	~~5~~	~~7~~ 5	~~9~~ 8
	16	3	~~4~~	~~5~~-3	~~6~~-5	3	~~4~~	~~5~~-4	~~6~~-5	3	~~5~~	~~7~~ 5	~~9~~ 8	4	~~6~~	~~9~~ 7	~~11~~ 10
	19.2	3		4	5	3		4	6	3		6	9	4		8	12
	24	3	~~5~~	~~7~~-5	~~9~~-7	3	~~5~~	~~7~~-5	~~9~~-8	4	~~7~~	~~10~~ 8	~~13~~ 11	5	~~9~~	~~13~~ 10	~~17~~ 15
	12	3	~~3~~	~~4~~-3	~~4~~-3	3	~~3~~	3	~~4~~-3	3	~~3~~	~~4~~ 3	5	3	~~4~~	~~5~~ 4	~~7~~ 6

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9:12	16	3	~~4~~	~~4~~-3	~~5~~-4	3	~~3~~	~~4~~-3	~~5~~-4	3	~~4~~	~~5~~ 4	~~7~~ 6	3	~~5~~	~~7~~ 5	~~9~~ 8
	19.2	3		3	4	3		4	5	3		5	7	3		6	9
	24	3	~~4~~	~~6~~-4	~~7~~-5	3	~~4~~	~~6~~-4	~~7~~-6	3	~~6~~	~~8~~ 6	~~10~~ 9	4	~~7~~	~~10~~ 8	~~13~~ 12
12:12	12	3	~~3~~	3	3	3	~~3~~	3	3	3	~~3~~	3	4	3	~~3~~	~~4~~ 3	5
	16	3	~~3~~	~~4~~-3	~~4~~-3	3	~~3~~	3	~~4~~-3	3	~~3~~	~~4~~ 3	5	3	~~4~~	~~5~~ 4	~~7~~ 6
	19.2	3		3	3	3		3	4	3		4	6	3		5	7
	24	3	~~4~~	~~4~~-3	~~5~~-4	3	~~3~~	~~4~~-3	~~6~~ 5	3	~~4~~	~~6~~ 5	~~8~~ 7	3	~~6~~	~~8~~6	~~10~~ 9

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

a. ~~40d box nails shall be permitted to be substituted for 16d common nails.~~10d common (3" × 0.148") nails shall be permitted to be substituted for 16d common ($3^1/_2$" × 0.162") nails where the required number of nails is taken as 1.2 times the required number of 16d common nails, rounded up to the next full nail.
~~b. Nailing requirements shall be permitted to be reduced 25 percent if nails are clinched.~~
~~c.~~ b. Heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.
~~d.~~ c. Where intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements shall be permitted to be reduced proportionally to the reduction in span.
~~e.~~ d. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.
~~f.~~ e. Applies to roof live load of 20 psf or less.
~~g.~~ f. Tabulated heel joint connection requirements assume that ceiling joists or rafter ties are located at the bottom of the attic space. Where ceiling joists or rafter ties are located higher in the attic, heel joint connection requirements shall be increased by the adjustment factors in **Table 802.5.2(2)**.
g. Tabulated requirements are based on 10 psf roof dead load in combination with the specified roof snow load and roof live load.

TABLE R802.5.2(2)
HEEL JOINT CONNECTION ADJUSTMENT FACTORS

H_C/H_R[a, b]	HEEL JOINT CONNECTION ADJUSTMENT FACTOR
1/3	1.5
1/4	1.33
1/5	1.25
1/6	1.2
1/10 or less	1.11

a. H_C = Height of ceiling joists or rafter ties measured vertically from the top of the rafter support walls to the bottom of the ceiling joists or rafter ties; H_R = Height of roof ridge measured vertically from the top of the rafter support walls to the bottom of the roof ridge.
b. Where H_C/H_R exceeds 1/3, connections shall be designed in accordance with accepted engineering practice.

New table for heel joint connection requirements.

R802.5.2.1 Ceiling joists lapped. Ends of ceiling joists shall be lapped not less than 3 inches (76 mm) or butted overbearing partitions or beams and toenailed to the bearing member. Where ceiling joists are used to provide the continuous tie across the building ~~resistance to rafter thrust~~, lapped joists shall be nailed together in accordance with Table R802.5.2 and butted joists shall be tied together with a connection of equivalent capacity ~~in a manner to resist such thrust~~. Laps in joists ~~Joists~~ that do not ~~resist thrust~~ provide the continuous tie across the building shall be permitted to be nailed in accordance with Table R602.3(1). ~~Wood structural panel roof sheathing, in accordance with TABLE R503.2.1.1(1), shall not cantilever~~

New and updated ceiling joist lapping requirements.

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	~~more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.~~		
	R802.5.2.2 Rafter ties. Wood rafter ties shall be not less than 2 inches by 4 inches (51 mm × 102 mm) installed in accordance with Table R802.5.2 at each rafter. Other approved rafter tie methods shall be permitted.		Rafter tie requirements have been relocated, no change to requirements.
	R802.5.2.3 Blocking. Blocking shall be not less than utility grade lumber.		Blocking requirements relocated, no change to requirements.
	R802.6 Bearing. The ends of each rafter or ceiling joist shall have not less than $1^1/_2$ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch (51 mm) minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing area of 48 square inches (30 968 mm^2). Where the roof pitch is greater than or equal to 3 units vertical in 12 units horizontal (25-percent slope), and ceiling joists or rafter ties are connected to rafters to provide a continuous tension tie in accordance with **Section R802.5.2**, vertical bearing of the top of the rafter against the ridge board shall satisfy this bearing requirement.		Updated bearing requirements for certain roof pitches.
	R802.10.2 Design. Wood trusses shall be designed in accordance with accepted engineering practice. The design and manufacture of metal-plate-connected wood trusses shall comply with **ANSI/TPI 1**. The *truss design drawings* shall be prepared by a *registered design professional* where required by the statutes of the *jurisdiction* in which the project is to be constructed in accordance with **Section R106.1**.		Minor wordsmithing changes.
	R802.10.2.1 Applicability limits. The provisions of this section shall control the design of truss roof framing wh~~n~~ere snow controls for buildings, that are not greater than 60 feet (18 288 mm) in length perpendicular to the joist, rafter or truss span, not greater than 36 feet (10 973 mm) in width parallel to the joist, rafter or truss span, not more than three stories above grade plane in height, and have roof slopes not smaller than 3:12 (25 percent slope) or greater than 12:12 (100-percent slope). Truss roof framing constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 140 miles per hour (63 m/s), Exposure B or C, and a maximum ground snow load of 70 psf (3352 Pa). For consistent loading of all truss types, roof snow load is to be computed as: 0.7 p_g		Minor wordsmithing changes.

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	~~R802.11.1~~**R802.11 Roof tie uplift ~~Uplift~~ resistance.** *Roof assemblies* shall have uplift resistance in accordance with **Sections R802.11.1** and **R802.11.2**. ~~Where the uplift force does not exceed 200 pounds (90.8 kg), rafters and trusses spaced not more than 24 inches (610 mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).Where the basic wind speed does not exceed 115 mph, the wind exposure category is B, the roof pitch is 5:12 (42-percent slope) or greater, and the roof span is 32 feet (9754 mm) or less, rafters and trusses spaced not more than 24 inches (610 mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).~~ **Exceptions:** Rafters or trusses shall be permitted to be attached to their supporting wall assemblies in accordance with **Table R602.3(1)** where either of the following occur: 1. Where the uplift force per rafter or truss does not exceed 200 pounds (90.8 kg) asdetermined by **Table R802.11**. 2. Where the basic wind speed does not exceed 115 miles per hour (51.4 m/s), thewind exposure category is B, the roof pitch is 5 units vertical in 12 units horizontal (42-percent slope) or greater, the roof span is 32 feet (9754 mm) or less, and rafters and trusses are spaced not more than 24 inches (610 mm) on center.		New and updated requirements for roof tie uplift resistances.
	~~R802.11.1.1~~**R802.11.1 Truss uplift resistance.**		Base code renumbering.
	~~R802.11.1.2~~**R802.11.2 Rafter uplift resistance.**		Base code renumbering.
	R803.2.3 Installation. Wood structural panel used as roof sheathing shall be installed with joints staggered or not staggered in accordance with Table R602.3(1), APA E30 for wood roof framing or with Table R804.3 for cold-formed steel roof framing. Wood structural panel roof sheathing in accordance with Table R503.2.1.1(1) shall not cantilever more than 9 inches (229 mm) beyond the gable endwall unless supported by gable overhang framing.		Updated requirements for panel roof sheathing installations.
	R804.1.1 Applicability limits. The provisions of this section shall control the construction of cold-formed steel roof framing for buildings not greater than 60 feet (18 288 mm) perpendicular to the joist, rafter or truss span, not greater than 40 feet (12 192 mm) in width parallel to the joist span or truss, less than or equal to three stories above *grade* plane and with roof slopes not less than 3:12 (25-percent slope) or greater than 12:12 (100-percent slope). Cold-formed steel roof framing constructed in accordance with the provisions of this section shall be limited to sites where the ultimate design wind speed is less than ~~139~~140 miles per hour (62~~3~~ m/s), Exposure Category B or C, and the		Updates to windspeed requirement.

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	ground snow load is less than or equal to 70 pounds per square foot (3350 Pa).		
	R804.1.1.1 Alternate applications. Cold-formed steel roof and ceiling framing for buildings exceeding the applicability limits of **Section R804.1.1** is permitted to be designed and constructed in accordance with **AISI S230**, subject to the limits therein.		New section for alternate roof applications.
	R804.1.2 In-line framing. Cold-formed steel roof framing constructed in accordance with **Section R804** shall be located in line with ~~load-bearing studs in accordance with Figure R804.1.2 and the tolerances specified as follows:~~ the tolerances specified in **AISI S240**, Section B1.2.3. ~~1. The maximum tolerance shall be 3/4 inch (19.1 mm) between the centerline of the horizontal framing member and the centerline of the vertical framing member.~~ ~~2. Where the centerline of the horizontal framing member and bearing stiffener are located to one side of the centerline of the vertical framing member, the maximum tolerance shall be 1/8 inch (3.2 mm) between the web of the horizontal framing member and the edge of the vertical framing member.~~		Section has been updated to reference AISI standard for requirements.
	~~**FIGURE R804.1.2** **IN-LINE FRAMING**~~		Base code figure removed.
	R804.2.1 Material. Load-bearing, cold-formed steel framing members shall be cold formed to shape from structural quality sheet steel complying with the requirements of ~~ASTM A1003, Structural Grades 33 Type H and 50 Type H~~ **AISI S240**, Section A3.		Section has been updated to reference AISI standard for requirements.
	R804.2.2 Corrosion protection. Load-bearing, cold-formed steel framing shall have a ~~metallic~~protective coating complying with **AISI S240**, Section A4. ~~–ASTM A1003 and one of the following:~~ 1. ~~Not less than G 60 in accordance with ASTM A653.~~ 2. ~~Not less than AZ 50 in accordance with ASTM A792.~~		Section has been updated to reference AISI standard for requirements.
	R804.2.3 Dimension, thickness and material grade. Load-bearing, cold-formed steel roof framing members shall comply with ~~Figure R804.2.3(1) and with the dimensional and thickness requirements specified in Table R804.2.3. Additionally, C-shaped sections shall have a minimum flange width of 1.625 inches (41 mm) and a maximum flange width of 2 inches (51 mm). The minimum lip size for C-shaped sections shall be 1/2 inch (12.7 mm). Tracks shall comply with Figure R804.2.3(2) and shall have a minimum flange width of 1 1/4 inches (32 mm).~~		Section has been updated to reference AISI standard for requirements.

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	~~Minimum Grade 33 ksi steel shall be used wherever 33 mil and 43 mil thicknesses are specified. Minimum Grade 50 ksi steel shall be used wherever 54 and 68 mil thicknesses are specified~~**AISI S230**, Section A4.3 and material grade requirements as specified in **AISI S230**, Section A4.4.		
	~~**TABLE R804.2.3**~~ ~~**LOAD-BEARING COLD-FORMED STEEL ROOF FRAMING MEMBER SIZES AND THICKNESSES**~~		Base code table removed.
	~~**FIGURE R804.2.3(1)**~~ ~~**C-SHAPED SECTION**~~		Base code figure removed.
	~~**FIGURE R804.2.3(2)**~~ ~~**TRACK SECTION**~~		Base code figure removed.
	R804.2.4 Identification. Load-bearing, cold-formed steel framing members shall ~~have a legible *label*, stencil, stamp or embossment with the following information as a minimum:~~ meet the product identification requirements of **AISI S240**, Section A5.5. ~~1. Manufacturer's identification.~~ ~~2. Minimum base steel thickness in inches (mm).~~ ~~3. Minimum coating designation.~~ ~~4. Minimum yield strength, in kips per square inch (ksi) (MPa).~~		Section has been updated to reference AISI standard for requirements.
	R804.2.5 Fastening requirements. Screws for steel-to-steel connections shall be installed with a minimum edge distance and center-to-center spacing of 1/2 inch (12.7 mm), shall be self-drilling tapping and shall conform to ASTM C 1513.Structural sheathing shall be attached to cold-formed steel roof rafters with minimum No. 8 self-drilling tapping screws that conform to ASTM C 1513.Screws for attaching structural sheathing to cold-formed steel roof framing shall have a minimum head diameter of 0.292 inch (7.4 mm) with countersunk heads and shall be installed with a minimum edge distance of 3/8 inch (9.5 mm). Gypsum board ceilings shall be attached to cold-formed steel joists with minimum No. 6 screws conforming to ASTM C 954 or ASTM C 1513 with a bugle-head style and shall be installed in accordance with Section R805. For all connections, screws shall extend through the steel ~~a minimum of~~ not fewer than three exposed threads. Fasteners shall have rust-inhibitive coating suitable for the installation in which they are being used, or be manufactured from material not susceptible to corrosion.		Minor wordsmithing change.

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	R804.2.6 Web holes, web hole reinforcing and web hole patching. Web holes~~, web hole reinforcing and web hole patching shall be in accordance with this section.~~ in roof or ceiling joists shall comply with the conditions as prescribed in **AISI S230**, Section A4.5. Web holes not in conformance to the conditions of **AISI S230**, Section A4.5 shall be reinforced in accordance with the provisions of **AISI S230**, Section A4.6 or patched in accordance with the provisions of **AISI S230**, Section A4.7.		Section has been updated to reference AISI standard for requirements.
	~~**R804.2.6.1 Web holes.** Web holes in roof framing members shall comply with all of the following conditions:~~ ~~1. Holes shall conform to **Figure R804.2.6.1**.~~ ~~2. Holes shall be permitted only along the centerline of the web of the framing member.~~ ~~3. Center-to-center spacing of holes shall be not less than 24 inches (610 mm).~~ ~~4. The web hole width shall be not greater than one-half the member depth, or $2^{1}/_{2}$ inches (64 mm).~~ ~~5. Holes shall have a web hole length not exceeding $4^{1}/_{2}$ inches (114 mm).~~ ~~6. The minimum distance between the edge of the bearing surface and the edge of the web hole shall be not less than 10 inches (254 mm).~~ ~~Framing members with web holes not conforming to Items 1 though 6 shall be reinforced in accordance with **Section R804.2.6.2**, patched in accordance with **Section R804.2.6.3** or designed in accordance with accepted engineering practices.~~		Base code section removed.
	~~**FIGURE R804.2.6.1**~~ ~~**ROOF FRAMING MEMBER WEB HOLES**~~		Base code figure removed.
	~~**R804.2.6.2 Web hole reinforcing.** Reinforcement of web holes in ceiling joists not conforming to the requirements of **Section R804.2.6.1** shall be permitted if the hole is located fully within the center 40 percent of the span and the depth and length of the hole do not exceed 65 percent of the flat width of the web. The reinforcing shall be a steel plate or C-shaped section with a hole that does not exceed the web hole size limitations of **Section R804.2.6.1** for the member being reinforced. The steel reinforcing shall be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel reinforcing shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center to center along the edges of the patch with minimum edge distance of $^{1}/_{2}$ inch (12.7 mm).~~		Base code section removed.

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	~~**R804.2.6.3 Hole patching.** Patching of web holes in roof framing members not conforming to the requirements in **Section R804.2.6.1** shall be permitted in accordance with either of the following methods:~~ ~~1. Framing members shall be replaced or designed in accordance with accepted engineering practices where web holes exceed either of the following size limits:~~ ~~1.1. The depth of the hole, measured across the web, exceeds 70 percent of the flat width of the web.~~ ~~1.2. The length of the hole measured along the web, exceeds 10 inches (254 mm) or the depth of the web, whichever is greater.~~ ~~2. Web holes not exceeding the dimensional requirements in **Section R804.2.6.3**, Item 1, shall be patched with a solid steel plate, stud section or track section in accordance with **Figure R804.2.6.3**. The steel patch shall, as a minimum, be the same thickness as the receiving member and shall extend not less than 1 inch (25 mm) beyond all edges of the hole. The steel patch shall be fastened to the web of the receiving member with No. 8 screws spaced not greater than 1 inch (25 mm) center-to-center along the edges of the patch with minimum edge distance of $\frac{1}{2}$ inch (12.7 mm).~~		Base code section removed.
	~~**FIGURE R804.2.6.3** **ROOF FRAMING MEMBER WEB HOLE PATCH**~~		Base code figure removed.

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TABLE R804.3
ROOF FRAMING FASTENING SCHEDULE[a, b]

DESCRIPTION OF BUILDING ELEMENTS			NUMBER AND SIZE OF FASTENERS[a]				SPACING OF FASTENERS
Roof sheathing (oriented strand board or plywood) to rafter			No. 8 screws				6″ o.c. on edges and 12″ o.c. at interior supports. 6″ o.c. at gable end truss.
Gypsum board to ceiling joists			No. 6 screws				12″ o.c.
Gable end truss to endwall top track			No. 10 screws				12″ o.c.
Rafter to ceiling joist and to ridge member			Minimum No. 10 screws, in accordance with **Table R804.3.1.1(3)**				Evenly spaced, not less than $^1/_2$″ from all edges.
Ceiling joist or roof truss to top track of bearing wall[b]	Ceiling joist or truss spacing (in.)	Roof Span (ft)	Ultimate Design Wind Speed (mph) and Exposure Category				Each ceiling joist or roof truss.
			~~126~~130 B ~~110~~115 C	< 139 B ~~115~~ 120 C	~~126~~ 130 C	< 139 C	
	16	24	~~2~~-3	~~2~~-3	~~2~~ 4	~~3~~-5	
		28	~~2~~-3	~~2~~-3	~~3~~4	~~3~~-5	
		32	~~2~~-3	~~2~~-4	~~3~~-5	~~4~~-6	
		36	~~2~~-4	~~2~~-4	~~3~~-5	~~4~~-6	
		40	~~2~~-4	~~2~~-4	~~3~~-6	~~4~~-7	
	24	24	~~2~~-4	~~2~~-5	~~3~~-6	~~4~~-7	
		28	~~2~~-4	~~2~~-5	~~4~~-6	~~5~~-8	
		32	~~2~~-4	~~3~~-6	~~4~~-7	~~5~~-8	
		36	~~2~~-4	~~3~~-6	~~4~~-8	~~6~~-9	
		40	~~2~~-6	~~3~~-6	~~5~~-8	~~6~~ 10	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mil = 0.0254 mm.

a. Screws are a minimum No. 10 unless noted otherwise.
b. Indicated number of screws shall be applied through the flanges of the truss or ceiling joist or through each leg of a 54 mil clip angle. See **Section R804.3.8** for additional requirements to resist uplift forces.

Roof framing schedule has been updated for windspeed and gypsum requirements.

R804.3.1.1 Minimum ceiling joist size. Ceiling joist size and thickness shall be determined in accordance with the limits set forth in Tables R804.3.1.1(1) and R804.3.1.1(2). When determining the size of ceiling joists, the lateral support of the top flange shall be classified as unbraced, braced at midspan or braced at third points in accordance with Section R804.3.1.**43**. Where sheathing material is attached to the top flange of ceiling joists or where the bracing is spaced closer than at third points of the joists, the "third point" values from Tables R804.3.1.1(1) and R804.3.1.1(2) shall be used.

Base code renumbering and minor wordsmithing.

R804.3.1.2 Ceiling joist bottom flange bracing. The bottom flanges of ceiling joists shall be laterally braced by the application of gypsum board or continuous steel straps installed perpendicular to the joist run in accordance with one of the following:

1. Gypsum board shall be fastened with No. 6 screws in accordance with Section R702.
2. Steel straps with a minimum size of 1 1/2 inches by 33 mils (38 mm by 0.84 mm) shall be installed at a maximum spacing of 4 feet (1219 mm). Straps shall

Minor wordsmithing changes.

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	be fastened to the bottom flange at each joist with one No. 8 screw and shall be fastened to blocking with two No. 8 screws. Blocking shall be installed between joists at a maximum spacing of 12 feet (3658 mm) measured along a line of continuous strapping (perpendicular to the joist run)~~. Blocking shall also be located~~, and at the termination of all straps.		
	R804.3.2.1.2 Rake overhangs. Rake overhangs shall not exceed ~~12 inches (305 mm) measured horizontally~~the limitations provided for Option 1 or 2 in **Figure R804.3.2.1.2**. Outlookers at gable endwalls shall be installed in accordance with **Figure R804.3.2.1.2**. The required strength for uplift connectors required for Option 1 shall be determined in accordance with **AISI S230**, Table F3-4.		Minor updates to rake overhang requirements, new reference standard included.
	FIGURE R804.3.2.1.2 **GABLE ENDWALL OVERHANG DETAILS**		New title for figure.
	R804.3.2.2 Roof rafter support brace. ~~When~~ Where used to reduce roof rafter spans in determining roof rafter sizes, a roof rafter support brace shall meet all of the following conditions: 1. Minimum 350S162-33 C-shaped brace member with maximum length of 8 feet (2438 mm). 2. Minimum brace member slope of 45 degrees (0.785 rad) to the horizontal. 3. Minimum connection of brace to a roof rafter and ceiling joist with four No.10 screws at each end. 4. Maximum 6 inches (152 mm) between brace/ceiling joist connection and load-bearing wall below. 5. Each roof rafter support brace greater than 4 feet (1219 mm) in length, shall be braced with a supplemental brace having a minimum size of 350S162-33 or 350T162-33 such that the maximum unsupported length of the roof rafter support brace is 4 feet (1219 mm). The supplemental brace shall be continuous and shall be connected to each roof rafter support brace using two No. 8 screws.		Minor wordsmithing change.
	R804.3.2.5 Roof rafter bottom flange bracing. The bottom flanges of roof rafters shall be continuously braced, at a maximum spacing of ~~8~~4 feet (~~2440~~1219 mm) as measured parallel to the roof rafters, with one of the following members: 1. Minimum 33-mil (0.84 mm) C-shaped member. 2. Minimum 33-mil (0.84 mm) track section. 3. Minimum 1 1/2-inch by 33-mil (38 mm by 0.84 mm) steel strap.		Updated roof rafter spacing requirements.

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	The bracing element shall be fastened to the bottom flange of each roof rafter with one No. 8 screw and shall be fastened to blocking with two No. 8 screws. Blocking shall be installed between roof rafters in-line with the continuous bracing at a maximum spacing of 12 feet (3658 mm) measured perpendicular to the roof rafters. The ends of continuous bracing shall be fastened to blocking or anchored to a stable building component with two No. 8 screws.		
	R804.3.6 Roof trusses. Cold-formed steel trusses shall be designed and installed in accordance with ~~S100, Section D4~~ **AISI S230**, Section F6 ~~AISI S240~~. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practices, such as the SBCA *Cold-Formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses*. Trusses shall be connected to the top track of the load-bearing wall in accordance with Table R804.3, either with ~~two~~ the required number of No. 10 screws applied through the flange of the truss or by using a 54-mil (1.37 mm) clip angle with ~~two~~ the required number of No. 10 screws in each leg.		Updated reference standard for roof trusses and minor update to requirements.
	TABLE R804.3.7.1 **REQUIRED LENGTHS FOR CEILING DIAPHRAGMS AT GABLE ENDWALLS** **GYPSUM BOARD SHEATHED, CEILING HEIGHT = 8 FEET[a, b, c, d, e, f, g]**		Updated requirements in table for gable endwall design.

EXPOSURE CATEGORY		ULTIMATE DESIGN WIND SPEED (mph)									
B		~~126~~	~~< 139~~	—	—	115	120	130	≤ 140	=	=
C		~~110~~	—	~~126~~	~~< 139~~	=	=	115	120	130	≤ 140
Roof pitch	Building endwall width (feet)	Minimum diaphragm length (feet)									
3:12 to 6:12	24 - 28	~~20~~	~~22~~	~~28~~	~~32~~	16	18	24	26	30	34
	> 28 - 32	~~22~~	~~28~~	~~32~~	~~38~~	20	20	26	32	34	40
	> 32 - 36	~~26~~	~~32~~	~~38~~	~~44~~	24	26	30	36	42	46
	> 36 - 40	~~30~~	~~36~~	~~44~~	~~50~~	26	28	36	40	48	52
6:12 to 9:12	> 24 - 28	~~22~~	~~26~~	~~32~~	~~36~~	20	20	26	30	34	38
	> 28 - 32	~~26~~	~~32~~	~~38~~	~~44~~	24	26	30	36	42	46
	> 32 - 36	~~32~~	~~38~~	~~44~~	~~52~~	26	30	38	42	48	54
	> 36 - 40	~~36~~	~~44~~	~~52~~	~~60~~	30	34	40	50	56	62
9:12 to 12:12	> 24 - 28	~~26~~	~~30~~	~~36~~	~~42~~	22	24	30	34	38	44
	> 28 - 32	~~30~~	~~36~~	~~42~~	~~50~~	26	28	36	40	46	52
	> 32 - 36	~~36~~	~~42~~	~~50~~	~~60~~	30	32	40	48	54	62
	> 36 - 40	~~42~~	~~50~~	~~60~~	~~70~~	36	38	48	56	64	72

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s, 1 foot = 304.8 mm, 1 mil = 0.0254 mm.

a. Ceiling diaphragm is composed of 1/2-inch gypsum board (min. thickness) secured with screws spaced at 6 inches o.c. at panel edges and 12 inches o.c. infield. Use No. 8 screws (min.) where framing members have a designation thickness of 54 mils or less and No. 10 screws (min.) where framing members have a designation thickness greater than 54 mils.
b. Maximum aspect ratio (length/width) of diaphragms is 2:1.
c. Building width is in the direction of horizontal framing members supported by the wall studs.
d. Required diaphragm lengths are to be provided at each end of the structure.
e. Multiplying required diaphragm lengths by 0.35 is permitted if all panel edges are blocked.
f. Multiplying required diaphragm lengths by 0.9 is permitted if all panel edges are secured with screws spaced at 4 inches o.c.
g. To determine the minimum diaphragm length for buildings with ceiling heights of 9 feet or 10 feet values in ~~the~~ this table ~~above~~ shall be multiplied by 1.15.

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	R804.3.7.2 Roof diaphragm. A roof *diaphragm* shall be provided by attaching ~~a minimum of~~ not less than 3/8 -inch (9.5 mm) wood structural panel ~~which~~ that complies with Section R803 to roof rafters or truss top chords in accordance with Table R804.3. Buildings with 3:1 or larger plan *aspect ratio* and with roof rafter slope (pitch) of 9:12 or larger shall have the roof rafters and ceiling joists blocked in accordance with Figure R804.3.7(2).		Minor wordsmithing changes.
	SECTION R805 **CEILING FINISHES** **R805.1 Ceiling installation.** Ceilings shall be installed in accordance with the requirements for interior wall finishes as provided in ~~Section R702~~ **Sections R702.1** through **R702.6**.		Base code renumbering.
	SECTION R806 **ROOF VENTILATION** **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 1/4 inch (1.6 mm) minimum and 1/16 inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than 1/4 inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth perforated vinyl or similar material with openings having a least dimension of 1/16 inch (1.6 mm) minimum and 1/4 inch (6.4 mm) maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air and shall be protected to prevent the entry of birds, rodents, snakes and other similar creatures.		Minor updates to requirements for protection of ventilation openings.
	R806.2 Minimum vent area. The minimum net free ventilating area shall be 1/15 of the area of the vented space. **Exception:** The minimum net free ventilation area shall be 1/300 of the vented space provided ~~one or more~~both of the following conditions are met: 1. In Climate Zones 6, 7 and 8, a Class I or II vapor retarder is installed on the warm-in-winter side of the ceiling. 2. Not less than 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located not more than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically~~, with t~~. The balance of the required ventilation provided ~~by eave or cornice vents.~~ shall be located in the bottom one-third of the attic space. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.		Minor wordsmithing changes.

	R806.3 Vent and insulation clearance. Where eave or cornice vents are installed, blocking, bridging and insulation shall not block the free flow of air. Not less than a 1-inch (25 mm) space shall be provided between the insulation and the roof sheathing and at the location of the vent.		Minor wordsmithing changes.
	R806.5 Unvented attic and unvented enclosed rafter assemblies. Unvented *attics* and unvented enclosed roof framing assemblies created by ceilings that are applied directly to the underside of the roof framing members and structural roof sheathing applied directly to the top of the roof framing members/rafters, shall be permitted where all the following conditions are met: 1. The unvented *attic* space is completely within the *building thermal envelope*. 2. ~~No i~~Interior Class I vapor retarders are not installed on the ceiling side (*attic* floor) of the unvented *attic* assembly or on the ceiling side of the unvented enclosed roof framing assembly. 3. Where wood shingles or shakes are used, a minimum 1/4 -inch (6.4 mm) vented airspace separates the shingles or shakes and the roofing underlayment above the structural sheathing. 4. In Climate Zones 5, 6, 7 and 8, any *air-impermeable insulation* shall be a Class II vapor retarder, or shall have a Class II vapor retarder coating or covering in direct contact with the underside of the insulation. 5. Insulation shall ~~be located in accordance~~comply with ~~the following~~Item 5.3 and either Item 5.1 or 5.2: 5.1. Item 5.1.1, 5.1.2, 5.1.3 or 5.1.4 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing. 5.1.1. Where only *air-impermeable insulation* is provided, it shall be applied in direct contact with the underside of the structural roof sheathing. 5.1.2. Where *air-permeable insulation* is ~~provided inside the building thermal envelope, it shall be installed in accordance with Section 5.1. In addition to the air-permeable insulation~~ installed directly below the structural sheathing, rigid board or sheet insulation shall be installed directly above the structural roof sheathing in accordance with the *R*-values in Table R806.5 for condensation control. 5.1.3. Where both *air-impermeable* and *air-permeable insulation* are provided, the *air-impermeable insulation* shall be applied in direct contact with the underside of the structural roof sheathing in accordance with Item 5.1.1 and shall be in accordance with the *R*-values in Table R806.5 for condensation control. The *air-permeable*		Updates to base code insulation requirements in unvented attics.

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insulation shall be installed directly under the *air-impermeable insulation*.

5.1.4. Alternatively, sufficient rigid board or sheet 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.

5.2. In Climate Zones 1, 2 and 3, air-permeable insulation installed in unvented attics shall meet the following requirements:

5.2.1. An approved *vapor diffusion port* shall be installed not more than 12 inches (305 mm) from the highest point of the roof, measured vertically from the highest point of the roof to the lower edge of the port.

5.2.2. The port area shall be greater than or equal to 1:600 of the ceiling area. Where there are multiple ports in the attic, the sum of the port areas shall be greater than or equal to the area requirement.

5.2.3. The vapor-permeable membrane in the *vapor diffusion port* shall have a vapor permeance rating of greater than or equal to 20 perms when tested in accordance with Procedure A of ASTM E96.

5.2.4. The *vapor diffusion port* shall serve as an air barrier between the *attic* and the exterior of the building.

5.2.5. The *vapor diffusion port* shall protect the *attic* against the entrance of rain and snow.

5.2.6. Framing members and blocking shall not block the free flow of water vapor to the port. Not less than a 2-inch (51 mm) space shall be provided between any blocking and the roof sheathing. Air-permeable insulation shall be permitted within that space.

5.2.7. The roof slope shall be greater than or equal to 3:12 (vertical/horizontal).

5.2.8. Where only air-permeable insulation is used, it shall be installed directly below the structural roof sheathing, on top of the attic floor, or on top of the ceiling.

5.2.9. *Air-impermeable insulation*, ~~if any~~where used in conjunction with airpermeable insulation, shall be directly above or below

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	the structural roof sheathing and is not required to meet the *R*-value in Table 806.5. Where directly below the structural roof sheathing, there shall be no space between the *air-impermeable insulation* and air-permeable insulation. 5.2.10. ~~The~~ Where air-permeable insulation is used and is installed directly below the roof structural sheathing, air shall be supplied at a flow rate greater than or equal to 50 CFM (23.6 L/s) per 1,000 square feet (93 m) of ceiling. The air shall be supplied from ductwork providing supply air to the occupiable space when the conditioning system is operating. Alternatively, the air shall be supplied by a supply fan when the conditioning system is operating. Exceptions: 1. Where both air-impermeable and air-permeable insulation are used, and the *R*-value in Table 806.5 is met, air supply to the attic is not required. 2. Where only air-permeable insulation is used and is installed on top of the attic floor, or on top of the ceiling, air supply to the attic is not required. 5.2~~2~~3 Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.		
	SECTION R807 **ATTIC ACCESS** **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 m2). 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 with *ready access*. 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. See Section M1305.1.3 for access requirements where mechanical *equipment* is located in *attics*.		Minor wordsmithing change.

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2015 Houston IRC Amendments	2021 IRC – Chapter 9 – Roof Assemblies	2021 Houston IRC Amendments	Code Change Summary
	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.~~ E108. **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.		Minor wordsmithing changes.
	R902.3 Building-integrated photovoltaic product. *Building-integrated photovoltaic* (BIPV) *products* installed as the roof covering shall be tested, *listed* and *labeled* for fire classification in accordance with ~~Section R902.1~~**UL 7103**. Class A, B or C BIPV products shall be installed where the edge of the roof is less than 3 feet (914 mm) from a *lot line*.		Updated photovoltaic requirements per new UL referenced standard.
	R902.4 Rooftop-mounted photovoltaic ~~panels and modules.~~ panel systems. Rooftop-mounted photovoltaic ~~panels and modules~~ panel systems installed on or above the roof covering shall be tested, listed and identified with a fire classification in accordance with UL ~~1703.~~ 1703 and UL 2703. Class A, B or C photovoltaic ~~panels~~ panel systems and modules 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.		Minor wordsmithing changes and new UL reference standard added.
	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 and *photovoltaic shingles* shall conform to the applicable standards listed in this chapter. Underlayment materials required to comply with ASTM ~~D 226, D 1970, D 4869~~ D226, D1970, D4869 and ~~D 6757~~ 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:**		Underlayment requirements and exceptions have been updated to coincide with ASTM standards.

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1. As an alternative, self-adhering polymer-modifiedbitumen underlayment bearing a label indicating compliance ~~complying~~ with **ASTM D1970**~~, and installed in accordance with both the underlayment manufacturer's and roof covering manufacturer's 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-wide (102 mm) strip of self-adheringpolymer-modified bitumen membrane bearing a *label* indicating compliance ~~complying~~ with **ASTM D1970**, 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* complying with **Table R905.1.1(1)** for the applicable roof covering ~~for maximum ultimate design wind speeds, V_{ult}, less than 140 miles per hour~~ areas where wind design is not required in accordance with **Figure R301.2.1.1** ~~shall be applied over the entire roof over the 4-inch-wide (102 mm) membrane strips.~~ Underlayment shall be applied in accordance with **Table R905.1.1(2)** using the application requirements for areas where wind design is not required in accordance with **Figure R301.2.1.1**. Underlayment shall be attached in accordance with **Table R905.1.1(3)**.

3. ~~As an alternative, two layers of *underlayment* complying with ASTM D226 Type II or ASTM D4869 Type III or Type IV shall be permitted to be installed as follows in 3.1–3.4:~~

3.1. ~~Apply a 19-inch-wide (483 mm) strip of *underlayment* parallel with the eave. Starting at the eave, apply 36-inch-wide (914 mm) strips of *underlayment* felt, overlapping successive sheets 19 inches (483 mm). End laps shall be 4 inches (102 mm) and shall be offset by 6 feet (1829 mm).~~

3.2. ~~The *underlayment* shall be attached with corrosion-resistant fasteners in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at side and end laps.~~

3.3. ~~*Underlayment shall be attached using metal or plastic cap nails with a nominal cap diameter of not less than 1 inch (25 mm). Metal caps shall have a thickness of not less than 32-gage sheet metal. Powerdriven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Minimum thickness of the outside edge of plastic caps shall be 0.035 inch (0.89 mm).*~~

3.4. ~~The cap nail shank shall be not less than 0.083 inch (2.11 mm) for ring shank cap nails and 0.091 inch (2.31 mm) for smooth shank cap nails. Cap nail shank shall have a length sufficient to~~

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	~~penetrate through the roof sheathing or not less than 3/4 inch (19 mm) into the roof sheathing.~~		
	TABLE R905.1.1(1) **UNDERLAYMENT TYPES**		New photovoltaic shingle requirements, minor wordsmithing changes.

ROOF COVERING	SECTION	MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} < 140 MPH	MAXIMUM ULTIMATE DESIGN WIND SPEED, $V_{ult} \geq$ 140 MPH
Asphalt shingles	R905.2	ASTM ~~D 226~~ D226 Type I ASTM ~~D 4869~~ D4869 Type I, II, III or IV ASTM ~~D 6757~~	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ Type III or Type IV ASTM ~~D 6757~~ D6757
Clay and concrete tile	R905.3	ASTM ~~D 226~~ D226 Type II ASTM ~~D 2626~~ D2626 Type I ASTM ~~D 6380~~ D6380 Class M mineral-surfaced roll roofing	ASTM ~~D 226~~ D226 Type II ASTM ~~D 2626~~ D2626 Type I ASTM ~~D 6380~~ D6380 Class M mineral- surfaced roll roofing
Metal roof shingles	R905.4	ASTM ~~D 226~~ D226 Type I or II ASTM ~~D 4869~~ D4869 Type I, II, III or IV	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Mineral-surfaced roll roofing	R905.5	ASTM ~~D 226~~ D226 Type I or II ASTM ~~D 4869~~ D4869 Type I, II, III or IV	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Slate and slate-type shingles	R905.6	ASTM ~~D 226~~ D226 Type I ASTM ~~D 4869~~ D4869 Type I, II, III or IV	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Wood shingles	R905.7	ASTM ~~D 226~~ D226 Type I or II ASTM ~~D 4869~~ D4869 Type I, II, III or IV	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Wood shakes	R905.8	ASTM ~~D 226~~ D226 Type I or II ASTM ~~D 4869~~ D4869 Type I, II, III or IV	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Metal panels	R905.10	Manufacturer's instructions	ASTM ~~D 226~~ D226 Type II ASTM ~~D 4869~~ D4869 Type III or Type IV
Photovoltaic shingles	R905.16	ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D4869 Type III or Type IV ASTM D6757

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

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TABLE R905.1.1(1)
UNDERLAYMENT TYPES

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1 ~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} < 140 MPH~~	AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1 ~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} ≥ 140 MP~~
Asphalt shingles	R905.2	**ASTM D226** Type I or II **ASTM D48696** Type I, II, III or IV **ASTM D6757**	**ASTM D226** Type II **ASTM D4869** Type III or Type IV ~~ASTM D6757~~
Clay and concrete tile	R905.3	**ASTM D226** Type II **ASTM D2626** Type I **ASTM D6380** Class M mineral-surfaced roll roofing	**ASTM D226** Type II ~~ASTM D2626 Type I~~ ~~ASTM D6380 Class M mineral-surfaced roll roofing~~
Metal roof shingles	R905.4	**ASTM D226** Type I or II **ASTM D4869** Type I, II, III or IV	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Mineral-surfaced roll roofing	R905.5	**ASTM D226** Type I or II **ASTM D4869** Type I, II, III or IV	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Slate and slate-type shingles	R905.6	**ASTM D226** Type I **ASTM D4869** Type I, II, III or IV	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Wood shingles	R905.7	**ASTM D226** Type I or II **ASTM D4869** Type I, II, III or IV	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Wood shakes	R905.8	**ASTM D226** Type I or II **ASTM D4869** Type I, II, III or IV	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Metal panels	R905.10	Manufacturer's instructions	**ASTM D226** Type II **ASTM D4869** Type III or Type IV
Photovoltaic shingles	R905.16	**ASTM D4869** Type I, II, III or IV **ASTM D6757**	**ASTM D4869** Type III or Type IV ~~ASTM D6757~~

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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. **End laps shall be 4 inches and shall be offset by 6 feet.** 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 Speed, V_{ult} < 140 mph except all laps shall be not less than 4 inches.
Clay and concrete tile	R905.3	For roof slopes from two and one-half units vertical in 12 units horizontal ($2^1/_2$:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be ~~a minimum of~~**not fewer than** 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~~**not fewer than** one	Same as Maximum Ultimate Design Wind Speed, V_{ult} < 140 mph except all laps shall be not less than 4 inches.

Minor updates to underlayment table.

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		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.	
Metal roof shingles	R905.4	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.~~ **End laps shall be 4 inches and shall be offset by 6 feet.** 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.
Mineral-surfaced roll roofing	R905.5	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, ~~fastened sufficiently to hold in place.~~ **End laps shall be 4 inches and shall be offset by 6 feet.** For roof slopes of four
Slate and slate-type shingles	R905.6		
Wood shingles	R905.7		
Wood shakes	R905.8		
Metal panels	**R905.10**		

			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.
Photovoltaic shingles	R905.16	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. End laps shall be 4 inches and shall be offset by 6 feet. 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 Speed, *V*_{*ult*} < 140 mph, except all laps shall be not less than 4 inches.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

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TABLE R905.1.1(2)
UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} < 140 MPH~~ AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1	~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} ≥ 140 MPH~~AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1
Asphalt shingles	R905.2	For roof slopes from 2 units vertical in 12 units horizontal (2:12), up to 4 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. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of 4 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 Speed, V_{ult} < 140 mph except all laps shall be not less than 4 inches.~~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. End laps shall be 4 inches and shall be offset by 6 feet.

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Clay and concrete tile	**R905.3**	For roof slopes from $2^1/_2$ units vertical in 12 units horizontal ($2^1/_2$:12), up to 4 units vertical in 12 units horizontal (4:12), underlayment shall be not fewer than 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. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be not fewer than 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 Speed, V_{ult} < 140 mph, except all laps shall be not less than 4 inches.~~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. End laps shall be 4 inches and shall be offset by 6 feet.
Metal roof shingles	**R905.4**	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~~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. End laps shall be 4 inches and shall be offset by 6 feet. ~~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.~~
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**		

Photovoltaic shingles	**R905.16**	For roof slopes from 2 units vertical in 12 units horizontal (2:12), up to 4 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. End laps shall be 4 inches and shall be offset by 6 feet. For roof slopes of 4 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 Speed, V_{ult} < 140 mph, except all laps shall be not less than 4 inches.~~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. End laps shall be 4 inches and shall be offset by 6 feet.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

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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 and end laps. Underlayment shall be attached using metal or plastic cap nails or cap staples with a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of not less than 32-gage 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. Staples 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 3/4 inch into the roof sheathing.
Clay and concrete tile	R905.3		
photovoltaic	R905.16		
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 a nominal cap diameter of not less than 1 inch. Metal caps shall have a thickness of at least 32-gage 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. Staples 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 3/4 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		

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

Minor updates to underlayment table.

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TABLE R905.1.1(3)
UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} < 140 MPH~~AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1	~~MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} ≥ 140 MPH~~AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1
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 side and end laps. Underlayment shall be attached using annular ring or deformed shank nails with 1-inch-diameter metal or plastic caps~~cap nails or cap staples with a nominal cap diameter of not less than 1 inch~~. Metal caps shall have a thickness of not less than 32-gage 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 nailsand 0.091 inch for smooth shank cap nails. Staples shall benot less than 21 gage~~. The cap nail shank~~ and cap staple legs~~ shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing.
Clay and concrete tile	**R905.3**		
Photovoltaic	**R905.16**		
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 side and end laps. Underlayment shall be attached using annular ring or deformed shank nails with 1-inch-diameter metal or plastic caps~~cap nails or cap staples with a nominal cap diameter of not lessthan 1 inch~~. Metal caps shall have a thickness of not less than 32-gage 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 nailsand 0.091 inch for smooth shank cap nails. Staples shall benot less than 21 gage~~. The cap nail shank~~ and cap staple legs~~ shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ 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**		

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

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	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 not less than 24 inches (610 mm) inside the exterior wall line of the building. On roofs with slope equal to or greater than ~~8~~ eight units vertical in 12 units horizontal (67-percent slope), the ice barrier shall also be applied not less than 36 inches (914 mm) measured along the roof slope from the eave edge of the building. **Exception:** Detached accessory structures not containing conditioned floor area.		Minor wordsmithing changes.
	R905.2.2 Slope. Asphalt shingles shall be used only on roof slopes of two units vertical in 12 units horizontal ~~(2:12)~~ (17-percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal ~~(2:12)~~ (17-percent slope) up to four units vertical in 12 units horizontal ~~(4:12),~~ (33-percent slope), double *underlayment* application is required in accordance with Section R905.1.1.		Minor wordsmithing changes.
	R905.2.4 Asphalt shingles. Asphalt shingles shall comply with ASTM ~~D 3462.~~ D3462.		Minor wordsmithing changes.
	R905.2.4.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM ~~D 7158.~~ D7158. Asphalt shingles shall meet the classification requirements of Table R905.2.4.1 for the appropriate ultimate design wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM ~~D 7158~~ D7158 and the required classification in Table R905.2.4.1. **Exception:** Asphalt shingles not included in the scope of ASTM ~~D 7158~~ D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM ~~D 3161~~ D3161 and the required classification in Table R905.2.4.1.		Minor wordsmithing changes.

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	TABLE R905.2.4.1 **CLASSIFICATION OF ASPHALT ROOF SHINGLES** (table below) For SI: 1 foot = 304.8 mm; 1 ~~mph~~ mile per hour = 0.447 m/s. a. The standard calculations contained in ASTM ~~D 7158~~ D7158 assume Exposure Category B or C and a building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.		Minor wordsmithing changes.
	R905.2.5 Fasteners. Fasteners for asphalt shingles shall be galvanized steel, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (3 mm)] shank with a minimum 3/8 -inch-diameter (9.5 mm) head, complying with ASTM ~~F 1667,~~ F1667, of a length to 3 penetrate through the roofing materials and not less than 3/4 inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than 3/4 inch (19.1 mm) thick, the fasteners shall penetrate through the sheathing.		Minor wordsmithing changes.
	R905.2.6 Attachment. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer's *approved* installation instructions, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12, 175-percent slope), shingles shall be installed ~~as required by~~ in accordance with the manufacturer's *approved* installation instructions.		Updated to include manufacturer's instructions.
	R905.2.8 Flashing. Flashing for asphalt shingles shall comply with this section and the asphalt shingle manufacturer's *approved* installation instructions.		Updated to include manufacturer's instructions.
	R905.2.8.2 Valleys. Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted: 1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be not less than 24 inches (610 mm) wide and of any of the corrosion-resistant metals in Table R905.2.8.2. 2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing, complying with ASTM ~~D 3909~~ D3909 or ASTM ~~D 6380~~ D6380 Class M, shall be permitted. The bottom layer shall be 18 inches (457 mm) and the top layer not less than 36 inches (914 mm) wide. 3. For closed valleys (valley covered with shingles), valley lining of one ply of smooth roll roofing complying with ASTM ~~D 6380~~ D6380 and not less than 36 inches		Minor wordsmithing changes.

TABLE R905.2.4.1
CLASSIFICATION OF ASPHALT ROOF SHINGLES

MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult} FROM FIGURE R301.2(~~4~~5)A (mph)	MAXIMUM BASIC WIND SPEED, V_{ASD} FROM TABLE R301.2.1.3 (mph)	ASTM ~~D 7158[a]~~ D7158[a] SHINGLE CLASSIFICATION	ASTM ~~D 3161~~ D3161 SHINGLE CLASSIFICATION
110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	F
155	120	G or H	F
168	130	H	F
181	140	H	F
194	150	H	F

	wide (914 mm) or valley lining as described in Item 1 or 2 shall be permitted. Self-adhering polymer-modified bitumen underlayment complying with ASTM ~~D 1970~~ D1970 shall be permitted in lieu of the lining material.		
	TABLE R905.2.8.2 **VALLEY LINING MATERIAL** **MATERIAL** / **MINIMUM THICKNESS (inches)** / **GAGE** / **WEIGHT (pounds)** Cold-rolled copper / 0.0216 nominal / — / ASTM ~~B 370~~B370, 16 oz. per square foot Lead-coated copper / 0.0216 nominal / — / ASTM ~~B 101~~B101, 16 oz. per square foot High-yield copper / 0.0162 nominal / — / ASTM ~~B 370~~B370, 12 oz. per square foot Lead-coated high-yield copper / 0.0162 nominal / — / ASTM ~~B 101~~B101, 12 oz. per square foot Aluminum / 0.024 / — / — Stainless steel / — / 28 / — Galvanized steel / 0.0179 / 26 (zinc coated G90) / — Zinc alloy / 0.027 / — / — Lead / — / — / $2^{1}/_{2}$ Painted terne / — / — / 20 For SI: 1 inch = 25.4 mm, 1 pound = 0.454 kg.		Minor wordsmithing changes.
	R905.3.1 Deck requirements. Concrete and clay tile shall be installed only over solid sheathing~~ or spaced structural sheathing boards~~. **Exception:** Spaced lumber sheathing in accordance with **Section R803.1** shall be permitted in *Seismic Design Categories* A, B and C.		New exception provided for deck requirements in seismic zones.
	R905.3.2 Deck slope. Clay and concrete roof tile shall be installed on roof slopes of two and one-half units vertical in 12 units horizontal ~~(2 1/2 :12)~~ (25-percent slope) or greater. For roof slopes ~~–~~from two and one-half units vertical in 12 units horizontal ~~(2 1/2 :12)~~ (25-percent slope) to four units vertical in 12 units horizontal ~~(4:12),~~ (33-percent slope), double underlayment application is required in accordance with Section R905.3.3.		Minor wordsmithing changes.
	R905.3.6 Fasteners. Nails shall be corrosion resistant and not less than 11-gage [0.120 inch (3 mm)], $^{5}/_{16}$-inch (11 mm) head, and of sufficient length to penetrate the deck not less than $^{3}/_{4}$ inch (19 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.		Updated to include metric measurement.
	R905.4.4.1 Wind resistance of metal roof shingles. *Metal roof shingles* applied to a solid or closely fitted deck shall be tested in accordance with **ASTM D3161**, **FM 4474**, **UL 580** or **UL 1897**. *Metal roof shingles* tested in accordance with **ASTM D3161** shall meet the classification		New wind resistance requirements for metal roof shingles.

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<table>
<tr>
<td></td>
<td>requirements of Table R905.4.4.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TABLE R905.4.4.1
CLASSIFICATION OF STEEP SLOPE METAL ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161
<table>
<tr><th>MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult}, FROM FIGURE R301.2(2) (mph)</th><th>MAXIMUM BASIC WIND SPEED, V_{ASD}, FROM TABLE R301.2.1.3 (mph)</th><th>ASTM D3161 SHINGLE CLASSIFICATION</th></tr>
<tr><td>110</td><td>85</td><td>A, D or F</td></tr>
<tr><td>116</td><td>90</td><td>A, D or F</td></tr>
<tr><td>129</td><td>100</td><td>A, D or F</td></tr>
<tr><td>142</td><td>110</td><td>F</td></tr>
<tr><td>155</td><td>120</td><td>F</td></tr>
<tr><td>168</td><td>130</td><td>F</td></tr>
<tr><td>181</td><td>140</td><td>F</td></tr>
<tr><td>194</td><td>150</td><td>F</td></tr>
</table>
For SI: 1 mile per hour = 1.609 kph.</td>
<td></td>
<td>New table for metal roof shingle requirements.</td>
</tr>
<tr>
<td></td>
<td>R905.6.6 Flashing. Flashing and counterflashing shall be made with sheet metal. Valley flashing shall be not less than 15 inches (381 mm) wide. Valley and flashing metal shall be a minimum uncoated thickness of 0.0179-inch (0.5 mm) zinc coated G90. Chimneys, stucco or brick walls shall have not less than two plies of felt for a cap flashing consisting of a 4-inch-wide (102 mm) strip of felt set in plastic cement and extending 1 inch (25 mm) above the first felt and a top coating of plastic cement. The felt shall extend ~~over the base flashing~~ 2 inches (51 mm) over the base flashing.</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td>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.</td>
<td></td>
<td>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.</td>
<td>No change to Houston amendment.</td>
</tr>
<tr>
<td></td>
<td>TABLE R905.7.4
WOOD SHINGLE MATERIAL REQUIREMENTS
<table>
<tr><th>MATERIAL</th><th>MINIMUM GRADES</th><th>APPLICABLE GRADING RULES</th></tr>
<tr><td>Wood shingles of natu- rally naturally durable wood</td><td>1, 2 or 3</td><td>~~Cedar Shake and Shingle Bureau~~ CSSB</td></tr>
</table></td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td></td>
<td>R905.7.5 Application. Wood shingles shall be installed in accordance with this chapter and the manufacturer's instructions. Wood shingles shall be laid with a side lap not less than 1/2 inches (38 mm) between joints in courses, and two joints shall not be in direct alignment in any three adjacent courses. Spacing between shingles shall be not less than 1/4 inch to 3/8 inch (6.4 mm to 9.5 mm). Weather exposure for wood shingles shall not exceed those set in Table R905.7.5(1).</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
</table>

Fasteners for untreated (naturally durable) wood shingles shall be box nails in accordance with Table R905.7.5(2). Nails shall be stainless steel Type 304 or 316 or hot-dipped galvanized with a coating weight of ASTM ~~A 153~~ A153 Class D (1.0 oz/ft2). Alternatively, two 16-gage stainless steel Type 304 or 316 staples with crown widths 7/16 inch (11.1 mm) minimum, 3/4 inch (19.1 mm) maximum, shall be used. Fasteners installed within 15 miles (24 km) of ~~salt~~ ~~water~~ saltwater coastal areas shall be stainless steel Type 316. Fasteners for fire-retardant-treated shingles in accordance with Section R902 or pressure-impregnated-preservative-treated shingles of naturally durable wood in accordance with AWPA U1 shall be stainless steel Type 316. ~~All~~ Fasteners shall have a minimum penetration into the sheathing of 1/2 inch (19.1 mm). For sheathing less than 3/4 inch in (19.1 mm) thickness, each fastener shall penetrate through the sheathing. Wood shingles shall be attached to the roof with two fasteners per shingle, positioned in accordance with the manufacturer's installation instructions. Fastener packaging shall bear a label indicating the appropriate grade material or coating weight.

TABLE R905.7.5(2)

NAIL REQUIREMENTS FOR WOOD SHAKES AND WOOD SHINGLES

SHAKES	NAIL TYPE AND MINIMUM LENGTH	MINIMUM HEAD SIZE	MINIMUM SHANK DIAMETER
18″ straight-split	5d box 1 3/4″	0.19″	.080″
18″ and 24″ handsplit and resawn	6d box 2″	0.19″	.0915″
24″ taper-split	5d box 1 3/4″	0.19″	.080″
18″ and 24″ tapersawn	6d box 2″	0.19″	.0915″
Shingles	**Nail Type and Minimum Length**	**Minimum Head Size**	**Minimum Shank Diameter**
16″ and 18″	3d box 1 1/4″	0.19″	.080″
24″	4d box 1 1/2″	0.19″	.080″

For SI: 1 inch = 25.4 mm.

Minor updates to table.

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TABLE R905.7.5(2)
NAIL REQUIREMENTS FOR WOOD SHAKES AND WOOD SHINGLES

~~SHAKES~~PRODUCT TYPE	NAIL TYPE, ~~AND~~ MINIMUM LENGTH AND SHANK DIAMETER (inches)	~~MINIMUM HEAD SIZE~~	~~MINIMUM SHANK DIAMETER~~
Shakes			
18" straight-split	5d box $1^3/_4$" × 0.080	~~0.19"~~	~~.080"~~
18" and 24" handsplit and resawn	6d box 2" × 0.099	~~0.19"~~	~~.0915"~~
24" taper-split	5d box $1^3/_4$" × 0.080	~~0.19"~~	~~.080"~~
18" and 24" tapersawn	6d box 2" × 0.099	~~0.19"~~	~~.0915"~~
Shingles	~~Nail Type and Minimum Length~~	~~Minimum Head Size~~	~~Minimum Shank Diameter~~
16" and 18"	3d box $1^1/_4$" × 0.076	~~0.19"~~	~~.080"~~
24"	4d box $1^1/_2$" × 0.076	~~0.19"~~	~~.080"~~

For SI: 1 inch = 25.4 mm.

R905.7.6 Valley flashing. Roof flashing shall be not less than No. 26 gage [0.019 inches (0.5 mm)] corrosion-resistant sheet metal and shall extend 10 inches (254 mm) from the centerline each way for roofs having slopes less than 12 units vertical in 12 units horizontal (100-percent slope), and 7 inches (178 mm) from the centerline each way for slopes of 12 units vertical in 12 units horizontal (100-percent slope) and greater. Sections of flashing shall have an end lap of not less than 4 inches (102 mm).

Minor wordsmithing to include slope percentage.

TABLE R905.8.5
WOOD SHAKE MATERIAL REQUIREMENTS

MATERIAL	MINIMUM GRADES	APPLICABLE GRADING RULES
Wood shakes of naturally durable wood	1	Cedar Shake and Shingle Bureau
Tapersawn shakes of naturally durable wood	1 or 2	Cedar Shake and Shingle Bureau
Preservative-treated shakes and shingles of naturally durable wood	1	Cedar Shake and Shingle Bureau
Fire-retardant-treated shakes and shingles of naturally durable wood	1	Cedar Shake and Shingle Bureau
Preservative-treated tapersawn shakes of Southern pine treated in accordance with AWPA Standard U1 (Commodity Specification A, ~~Use Category 3B and Section 5.6~~Special Requirement 4.6)	1 or 2	Forest Products Laboratory of the Texas Forest Services

Minor wordsmithing changes.

R905.8.6 Application. Wood shakes shall be installed in accordance with this chapter and the manufacturer's installation instructions. Wood shakes shall be laid with a side lap not less than 1 1/2 inches (38 mm) between joints in adjacent courses. Spacing between shakes in the same course shall be 3/8 inch to 5/8 inch (9.5 mm to 15.9 mm) including tapersawn shakes. Weather exposures for wood shakes shall not exceed those set in Table R905.8.6. Fasteners for untreated (naturally durable) wood shakes shall be box nails in accordance with Table R905.7.5(2). Nails shall be stainless steel Type 304, or Type 316 or hot-dipped with a coating weight of ASTM ~~A 153~~ A153 Class D (1.0 oz/ft2). Alternatively, two 16-gage Type 304 or

Minor wordsmithing changes.

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	Type 316 stainless steel staples, with crown widths 7/16 inch (11.1 mm) minimum, 3/4 inch (19.1 mm) maximum, shall be used. Fasteners installed within 15 miles (24 km) of ~~salt water~~ salt-water coastal areas shall be stainless steel Type 316. Wood shakes shall be attached to the roof with two fasteners per shake positioned in accordance with the manufacturer's installation instructions Fasteners for fire-retardant-treated (as defined in Section R902) shakes or pressure-impregnated-preservative-treated shakes of naturally durable wood in accordance with AWPA U1 shall be stainless steel Type 316. ~~All f~~Fasteners shall have a minimum penetration into the sheathing of 3/4 inch (19.1 mm). Where the sheathing is less than 3/4 inch (19.1 mm) thick, each fastener shall penetrate through the sheathing. Fastener packaging shall bear a label indicating the appropriate grade material or coating weight.		
	R905.8.7 Shake placement. The starter course at the eaves shall be doubled and the bottom layer shall be either 15-inch (381 mm), 18-inch (457 mm) or 24-inch (610 mm) wood shakes or wood shingles. Fifteen-inch (381 mm) or 18-inch (457 mm) wood shakes shall be permitted to be used for the final course at the ridge. Shakes shall be interlaid with 18-inch-wide (457 mm) strips of not less than No. 30 felt shingled between each course in such a manner that ~~no~~ felt is not exposed to the weather by positioning the lower edge of each felt strip above the butt end of the shake it covers a distance equal to twice the weather exposure.		Minor wordsmithing changes.
	R905.9 Built-up roofs. The installation of built-up roofs shall comply with the provisions of this section and the manufacturer's *approved* installation instructions.		Updated to include manufacturer's instructions.
	TABLE R905.9.2 **BUILT-UP ROOFING MATERIAL STANDARDS** **MATERIAL STANDARD** / **STANDARD** Acrylic coatings used in roofing — ASTM ~~D 6083~~D6083 Aggregate surfacing — ASTM ~~D 1863~~ D1863 Asphalt adhesive used in roofing — ASTM ~~D 3747~~ D3747 Asphalt cements used in roofing — ASTM ~~D 2822; D 3019; D 4586~~D2822; D3019; D4586 Asphalt-coated glass fiber base sheet — ASTM ~~D 4601~~ D4601 Asphalt coatings used in roofing — ASTM ~~D 1227; D 2823; D 2824; D 4479~~D1227; D2823; D2824; D4479 Asphalt glass felt — ASTM ~~D 2178~~ D2178 Asphalt primer used in roofing — ASTM ~~D 41~~ D41 Asphalt-saturated and asphalt-coated organic felt base sheet — ASTM ~~D 2626~~ D2626 Asphalt-saturated organic felt (perforated) — ASTM ~~D 226~~ D226 Asphalt used in roofing — ASTM ~~D 312~~ D312 Coal-tar cements used in roofing — ASTM ~~D 4022; D 5643~~ D4022; D5643 Coal-tar primer used in roofing, dampproofing and waterproofing — ASTM ~~D 43~~ D43 Coal-tar saturated organic felt — ASTM ~~D 227~~ D227 Coal-tar used in roofing — ASTM ~~D 450~~D450, Type I or II Glass mat, coal tar — ASTM ~~D 4990~~ D4990 Glass mat, venting type — ASTM ~~D 4897~~ D4897 Mineral-surfaced inorganic cap sheet — ASTM ~~D 3909~~ D3909 Thermoplastic fabrics used in roofing — ASTM ~~D 5665; D 5726~~ D5665; D5726		Minor wordsmithing changes.

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TABLE R905.10.3(1)
METAL ROOF COVERING STANDARDS

ROOF COVERING TYPE	STANDARD APPLICATION RATE/THICKNESS
Galvanized steel	ASTM ~~A 653~~ A653 G90 Zinc coated
Stainless steel	ASTM ~~A 240~~ A240, 300 Series alloys
Steel	ASTM ~~A 924~~A924
Lead-coated copper	ASTM ~~B 101~~B101
Cold-rolled copper	ASTM ~~B 370~~B370 minimum 16 oz/sq ft and 12 oz/sq ft high-yield copper for metal-sheet roof-covering systems; 12 oz/sq ft for preformed metal shingle systems.
Hard lead	2 lb/sq ft
Soft lead	3 lb/sq ft
Aluminum	ASTM ~~B 209~~B209, 0.024 minimum thickness for roll-formed panels and 0.019-inch minimum thickness for pressformed shingles.
Terne (tin) and terne-coated stainless	Terne coating of 40 lb per double base box, field painted where applicable in accordance with manufacturer's installation instructions.
Zinc	0.027 inch minimum thickness: 99.995% electrolytic high-grade zinc with alloy additives of copper (0.08 - 0.20%), titanium (0.07% - 0.12%) and aluminum (0.015%).

For SI: 1 ounce per square foot = 0.305 kg/m^2, 1 pound per square foot = 4.214 kg/m^2, 1 inch = 25.4 mm, 1 pound = 0.454 kg.

TABLE R905.10.3(2)
MINIMUM CORROSION RESISTANCE

55% aluminum-zinc-alloy-coated steel	ASTM ~~A 792~~A792 AZ 50
5% aluminum alloy-coated steel	ASTM ~~A 875~~A875 GF60
Aluminum-coated steel	ASTM ~~A 463~~A463 T2 65
Galvanized steel	ASTM ~~A 653~~A653 G-90
Prepainted steel	ASTM ~~A 755~~A755[a]

a. Paint systems in accordance with ASTM ~~A 755~~ A755 shall be applied over steel products with corrosion-resistant coatings complying with ASTM ~~A 792,~~ A792, ASTM ~~A 875,~~ A875, ASTM ~~A 463,~~ A463, or ASTM ~~A 653,~~ A653.

R905.11 Modified bitumen roofing. The installation of modified bitumen roofing shall comply with the provisions of this section and the manufacturer's *approved* installation instructions.

R905.11.1 Slope. Modified bitumen ~~membrane~~ roofsing shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) for drainage.

R905.11.2 Material standards. Modified bitumen ~~roof coverings~~ roofing shall comply with the standards in Table R905.11.2.

TABLE R905.11.2
MODIFIED BITUMEN ROOFING MATERIAL STANDARDS

MATERIAL	STANDARD
Acrylic coating	ASTM ~~D 6083~~D6083
Asphalt adhesive	ASTM ~~D 3747~~D3747
Asphalt cement	ASTM ~~D 3019~~D3019
Asphalt coating	ASTM ~~D 1227; D 2824~~D1227; D2824
Asphalt primer	ASTM ~~D 41~~D41
Modified bitumen roof membrane	ASTM ~~D 6162; D 6163; D 6164; D 6222; D 6223; D 6298; CGSB 37-GP-56M~~D6162; D6163; D6164; D6222; D6223; D6298

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No Houston amendment.

Minor wordsmithing changes.

Updated to include manufacturer's instructions.

Minor wordsmithing changes.

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	R905.11.2.1 Base sheet. A base sheet that complies with the requirements of Section 1507.11.2 of the *International Building Code*, ASTM D1970, or ASTM D4601 shall be permitted to be used with a modified bitumen cap sheet.		New section for base sheet requirements.
	R905.12.2 Material standards. Thermoset single-ply roof coverings shall comply with ASTM ~~D 4637~~**, ~~ASTM D 5019~~ D4637** or ~~**CGSB 37-GP-52M.**~~ **ASTM D5019.**		Minor wordsmithing changes, referenced standard CGSB removed.
	R905.13.2 Material standards. Thermoplastic single-ply roof coverings shall comply with ASTM ~~D 4434,~~**D4434,** ASTM ~~D 6754~~, ~~ASTM D 6878~~ **D6754,** or ~~**CGSB CAN/CGSB 37.54.**~~ **ASTM D6878.**		Minor wordsmithing changes, referenced standard CGSB removed.
	R905.15.3 Application. Liquid-applied roofing shall be installed in accordance with this chapter and the manufacturer's installation instructions.		Minor wordsmithing changes.
	R905.16.3 Underlayment. ~~Unless otherwise noted, required underlayment shall conform to ASTM D 4869 or ASTM D6757~~*Underlayment* shall comply with **Section R905.1.1.**		Updates to section to reference code for underlayment requirements.
	R905.16.3.1 Ice barrier. Where required, ice barriers shall comply with Section R905.1.2.		New requirements for ice barriers.
	~~**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.~~		Underlayment requirements have been relocated to R905.1.
	~~**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.~~		Underlayment requirements have been relocated to R905.1.
	~~**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~~		Underlayment requirements have been relocated to R905.1.

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	~~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 D 4869 Type IV, or ASTM D 6757. 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 mm) with a thickness of not less than 32-gage sheet metal. The capnail 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 D 1970 shall be permitted.~~		
	R905.16.~~5~~6 Material standards. *Photovoltaic shingles* shall be *listed* and *labeled* in accordance with ~~UL 1703~~**UL 7103** or with both **UL 61730-1** and **UL 61730-2**.		Base code renumbering and new referenced standards included.
	R905.16.~~6~~5 Attachment.		Base code renumbering.
	R905.16.~~7~~6 Wind resistance. *Photovoltaic shingles* shall ~~be tested in accordance with procedures and acceptance criteria in ASTM D3161. Photovoltaic shingles shall~~ comply with the classification requirements of ~~Table R905.2.4.1~~**Table R905.16.6** for the appropriate maximum basic wind speed. ~~Photovoltaic shingle packaging shall bear a label to indicate compliance with the procedures in ASTM D3161 and the required classification from Table R905.2.4.1.~~		Base code renumbering and updates to section for wind resistance requirements.
	TABLE R905.16.6 **Classification of Photovoltaic Shingles** MAXIMUM ULTIMATE DESIGN WIND SPEED, V_{ult}, FROM **FIGURE R301.2(2)** (mph) / MAXIMUM BASIC WIND SPEED, V_{ASD}, FROM **TABLE R301.2.1.3** (mph) / **UL 7103** SHINGLE CLASSIFICATION 110 / 85 / A, D or F 116 / 90 / A, D or F 129 / 100 / A, D or F 142 / 110 / F 155 / 120 / F 168 / 130 / F 181 / 140 / F 194 / 150 / F For SI: 1 mile per hour = 1.609 kph.		New photovoltaic shingle table for windspeed requirements.

	R905.17.5 Material standards. *BIPV roof panels* shall be *listed* and *labeled* in accordance with ~~UL 1703~~ **UL 7103** or with both **UL 61730-1** and **UL 61730-2**.		Minor wordsmithing and new UL standards referenced.
	SECTION R906 **ROOF INSULATION** **R906.1 General.** ~~The use of~~Where above-deck thermal insulation is installed, such insulation shall be ~~permitted provided that such insulation is~~ covered with an *approved* roof covering and ~~complies with FM 4450~~shall comply with **NFPA 276** or **UL 1256**.		Minor wordsmithing and new NFPA standard referenced.
	TABLE R906.2 **MATERIAL STANDARDS FOR ROOF INSULATION** Cellular glass board — ASTM ~~C 552~~C552 Composite boards — ASTM ~~C 1289~~C1289, Type III, IV, V or VI Expanded polystyrene — ASTM ~~C 578~~ Extruded polystyrene board — ASTM ~~C 578~~ ~~Perlite board~~ Fiber-reinforced gypsum board — ASTM ~~C 728~~C1278 ~~Polyisocyanurate board~~ Glass-faced gypsum board — ASTM ~~C 1289, Type I or II~~C1177 ~~Wood fiberboard~~ Mineral wool board — ASTM ~~C 208~~C726 ~~Fiber-reinforced gypsum board~~Perlite board — ASTM ~~C 1278~~C728 ~~Glass-faced gypsum board~~Polyisocyanurate board — ASTM ~~C 1177~~ C1289, Type I or II Wood fiberboard — ASTM C208		Minor updates to roof insulation standards table.
	SECTION R907 **ROOFTOP-MOUNTED** **PHOTOVOLTAIC PANEL SYSTEMS** **R907.1 Rooftop-mounted photovoltaic panel systems.** Rooftop-mounted *photovoltaic panels* ~~or modules~~*systems* shall be designed and installed in accordance with ~~this section,~~ Section R324		Minor updates to section.
	~~**R907.2 Wind resistance.** Rooftop-mounted photovoltaic panel or modules systems shall be installed 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).~~		PV requirements relocated to Section R324.
	~~**R907.3 Fire classification.** Rooftop-mounted photovoltaic panels or modules shall have the same fire classification as the roof assembly required in Section R902.~~		PV requirements relocated to Section R324.
	~~**R907.4 Installation.** Rooftop-mounted photovoltaic panels or modules shall be installed in accordance with the manufacturer's instructions.~~		PV requirements relocated to Section R324.
	~~**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.~~		PV requirements relocated to Section R324.

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	R908.3.1 Roof ~~re-cover.~~ recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur: 1. Where the new roof covering is installed in accordance with the roof covering manufacturer's approved instructions 2. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings. 3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs where applied in accordance with Section R908.4. 4. The application of a new protective *roof coating* over an existing protective *roof coating*, metal roof panel, metal roof shingle, mineral surfaced roll roofing, built-up roof, modified bitumen roofing, thermoset and thermoplastic single-ply roofing and spray polyurethane foam roofing system shall be permitted without tear-off of existing roof coverings.		Minor updates to roof recover requirements.

2015 Houston IRC Amendments	2021 IRC – Chapter 10 – Chimneys and Fireplaces	2021 Houston IRC Amendments	Code Change Summary
	R1001.2.1 Ash dump cleanout. Cleanout openings located within foundation walls below fireboxes, ~~when~~ where provided, shall be equipped with ferrous metal or masonry doors and frames constructed to remain tightly closed except when in use. Cleanouts shall be ~~accessible and~~ located to allow access so that ash removal will not create a hazard to combustible materials.		Minor wordsmithing changes.
	R1001.5 Firebox walls. Masonry fireboxes shall be constructed of *solid masonry* units, hollow masonry units grouted solid, stone or concrete. Where a lining of firebrick not less than 2 inches (51 mm) thick or other *approved* lining is provided, the minimum thickness of back and sidewalls shall each be 8 inches (203 mm) of *solid masonry*, including the lining. The width of joints between firebricks shall not be greater than 1/4 inch (6.4 mm). Where a lining is not provided, the total minimum thickness of back and side walls shall be 10 inches (254 mm) of *solid masonry*. Firebrick shall conform to ASTM ~~C 27~~ C27 or ~~C 1261~~ C1261 and shall be laid with ~~medium duty~~ medium-duty refractory mortar conforming to ASTM ~~C 199~~ C199.		Minor wordsmithing changes.
	R1001.5.1 Steel fireplace units. Installation of steel fireplace units with *solid masonry* to form a masonry fireplace is permitted ~~when~~ where installed either in accordance with the requirements of their listing or the requirements of this section. Steel fireplace units incorporating a steel firebox lining shall be constructed with steel not less than 1/4 inch (6.4 mm) thick, and an air-circulating chamber that is ducted to the interior of the building. The firebox lining shall be encased with *solid masonry*		Minor wordsmithing changes.

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	to provide a total thickness at the back and sides of not less than 8 inches (203 mm), of which not less than 4 inches (102 mm) shall be of *solid masonry* or concrete. Circulating air ducts used with steel fireplace units shall be constructed of metal or masonry.		
	R1001.6 Firebox dimensions. The firebox of a concrete or masonry fireplace shall have a ~~**minimum**~~ depth of not less than 20 inches (508 mm). The throat shall ~~not~~ be not less than 8 inches (203 mm) above the fireplace opening. The throat opening shall ~~not~~ be not less than 4 inches (102 mm) deep. The cross-sectional area of the passageway above the firebox, including the throat, damper and smoke chamber, shall ~~not~~ be not less than the cross-sectional area of the flue. **Exception**: Rumford fireplaces shall be permitted provided that the depth of the fireplace is not less than 12 inches (305 mm) and not less than one-third of the width of the fireplace opening, that the throat is not less than 12 inches (305 mm) above the lintel and is not less than ~~1/20~~ one-twentieth the cross-sectional area of the fireplace opening.		Minor wordsmithing changes.
	R1001.8 Smoke chamber. Smoke chamber walls shall be constructed of *solid masonry* units, hollow masonry units grouted solid, stone or concrete. The total minimum thickness of front, back and side walls shall be 8 inches (203 mm) of *solid masonry*. The inside surface shall be parged smooth with refractory mortar conforming to ASTM ~~C 199~~ C199. Where a lining of firebrick not less than 2 inches (51 mm) thick, or a lining of vitrified clay not less than 5/8 inch (16 mm) thick, is provided, the total minimum thickness of front, back and side walls shall be 6 inches (152 mm) of *solid masonry*, including the lining. Firebrick shall conform to ASTM ~~C 1261~~ C1261 and shall be laid with ~~medium duty~~ medium-duty refractory mortar onforming to ASTM ~~C 199~~ C199. Vitrified clay linings shall conform to ASTM ~~C 315~~ C315.		Minor wordsmithing changes.
	R1001.11 Fireplace clearance. Wood beams, joists, studs and other combustible material shall have a clearance of not less than 2 inches (51 mm) from the front faces and sides of masonry fireplaces and not less than 4 inches (102 mm) from the back faces of masonry fireplaces. The airspace shall not be filled, except to provide fireblocking in accordance with Section R1001.12. **Exceptions:** 1. Masonry fireplaces *listed* and *labeled* for use in contact with combustibles in accordance with UL 127 and installed in accordance with the manufacturer's instructions are permitted to have combustible material in contact with their exterior surfaces. 2. Where masonry fireplaces are part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete walls less than 12 inches (306 mm) from the inside surface of the nearest firebox lining. 3. Exposed combustible trim and the edges of sheathing materials such as wood siding, flooring and gypsum board shall be permitted to abut the masonry fireplace sidewalls and hearth extension in accordance		Minor wordsmithing changes.

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	with Figure R1001.11, provided such combustible trim or sheathing is not less than 12 inches (305 mm) from the inside surface of the nearest firebox lining. 4. Exposed combustible mantels or trim ~~may~~ **is permitted to** be placed directly on the masonry fireplace front surrounding the fireplace opening providing such combustible materials are not placed within 6 inches (152 mm) of a fireplace opening. Combustible material within 12 inches (306 mm) of the fireplace opening shall not project more than 1/8 inch (3 mm) for each 1-inch (25 mm) distance from such an opening.		
	R1001.13 Fireplace accessories. *Listed* and *labeled* fireplace accessories shall be installed in accordance with the conditions of the listing and the manufacturer's instructions. Fireplace accessories shall comply with **UL 907**.		New section for fireplace accessory requirements.
	R1003.5 Corbeling. Masonry chimneys shall not be corbeled more than one-half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) thick unless it projects equally on each side of the wall, except that on the second *story* of a two-story *dwelling*, corbeling of chimneys on the exterior of the enclosing walls ~~may~~ shall be permitted to be equal to the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.		Minor wordsmithing changes.
	R1003.9.2 Spark arrestors. Where a spark arrestor is installed on a masonry chimney, the spark arrestor shall meet all of the following requirements: 1. The net free area of the arrestor shall be not less than four times the net free area of the outlet of the chimney flue it serves. 2. The arrestor screen shall have heat and corrosion resistance equivalent to 19-gage galvanized steel or 24-gage stainless steel. 3. Openings shall not permit the passage of spheres having a diameter greater than 1/2 inch (12.7 mm) nor block the passage of spheres having a diameter less than 3/8 inch (9.5 mm). 4. The spark arrestor shall be ~~accessible~~ **located with access** for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.		Minor wordsmithing changes.
	R1003.11.6 Notice of usage. ~~When~~ Where a flue is relined with a material not complying with Section R1003.11.1, the chimney shall be plainly and permanently identified by a *label* attached to a wall, ceiling or other conspicuous location adjacent to where the connector enters the chimney. The *label* shall include the following message or equivalent language: THIS CHIMNEY FLUE IS FOR USE ONLY WITH [TYPE OR CATEGORY OF *APPLIANCE*] *APPLIANCES* THAT BURN [TYPE OF FUEL]. DO NOT CONNECT OTHER TYPES OF *APPLIANCES*.		Minor wordsmithing changes.

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	R1003.12 Clay flue lining (installation). Clay flue liners shall be installed in accordance with ASTM ~~C 1283~~ C1283 and extend from a point not less than 8 inches (203 mm) below the lowest inlet or, in the case of fireplaces, from the top of the smoke chamber to a point above the enclosing walls. The lining shall be carried up vertically, with a ~~maximum~~ slope not greater than 30 degrees (0.52 rad) from the vertical. Clay flue liners shall be laid in medium-duty water insoluble refractory mortar conforming to ASTM ~~C 199~~ C199 with tight mortar joints left smooth on the inside and installed to maintain an airspace or insulation not to exceed the thickness of the flue liner separating the flue liners from the interior face of the chimney masonry walls. Flue liners shall be supported on all sides. Only enough mortar shall be placed to make the joint and hold the liners in position.		Minor wordsmithing changes.
	R1003.15.1 Option 1. Round chimney flues shall have a minimum net cross-sectional area of not less than ~~1/12~~ one-twelfth of the fireplace opening. Square chimney flues shall have a minimum net cross-sectional area of ~~1/10~~ one-tenth of the fireplace opening. Rectangular chimney flues with an *aspect ratio* less than 2 to 1 shall have a minimum net cross-sectional area of ~~1/10~~ one-tenth of the fireplace opening. Rectangular chimney flues with an *aspect ratio* of 2 to 1 or more shall have a minimum net cross-sectional area of ~~1/8~~ one-eighth of the fireplace opening. Cross-sectional areas of clay flue linings are shown in Tables R1003.14(1) and R1003.14(2) or as provided by the manufacturer or as measured in the field.		Minor wordsmithing changes.
	SECTION R1005 **FACTORY-BUILT CHIMNEYS** **R1005.1 Listing.** Factory-built chimneys shall be *listed* and *labeled* and shall be installed and terminated in accordance with the manufacturer's installation instructions.		Minor wordsmithing changes.
	R1005.2 Decorative shrouds. Decorative shrouds shall not be installed at the termination of factory-built chimneys except where the shrouds are *listed* and *labeled* for use with the specific factory-built chimney system and installed in accordance with the manufacturer's installation instructions.		Minor wordsmithing changes.
	R1005.8 Insulation shield. Where factory-built chimneys pass through insulated assemblies, an insulation shield constructed of steel having a thickness of not less than 0.0187 inch (0.4712 mm) (No. 26 gage) shall be installed to provide clearance between the chimney and the insulation material. The clearance shall be not less than the clearance to combustibles specified by the chimney manufacturer's installation instructions. Where chimneys pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the insulation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a listed chimney system shall be installed in accordance with the manufacturer's installation instructions.		New requirements for insulation shields on factory-built chimneys.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments	2021 IRC – Chapter 11 – [RE] Energy Efficiency	2021 Houston IRC Amendments	Code Change Summary
N1101.1 Scope. ~~This chapter~~ The *Energy Conservation Code* regulates the energy efficiency for the design and construction of buildings regulated by this code.	**SECTION N1101** **GENERAL** **N1101.1 Scope.** This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code. ***Note:*** *The text of the following Sections N1101.2 through* ~~N1105 is extracted from~~N1111 parallels the text of *the* 2012~~8~~ *edition of the* International Energy Conservation Code-Residential Provisions ~~and has been editorially revised to conform to the scope and application of this code~~(IECC-R). *The section numbers appearing in parenthesis after each section number are the section numbers of the corresponding text in the* ~~International Energy Conservation Code-Residential Provisions.~~IECC-R. If a section does not have a section number in parenthesis after it, then there is no corresponding text in the IECC-R.	**SECTION N1101** **GENERAL** **N1101.1 Scope.** ~~This chapter~~ The *Energy Conservation Code* regulates the energy efficiency for the design and construction of buildings regulated by this code. ~~***Note:*** *The text of the following Sections N1101.2 through* N1105 is extracted fromN1111 parallels the text of *the* 20128 *edition of the* International Energy Conservation Code-Residential Provisions and has been editorially revised to conform to the scope and application of this code(IECC-R). *The section numbers appearing in parenthesis after each section number are the section numbers of the corresponding text in the* International Energy Conservation Code-Residential Provisions.IECC-R. If a section does not have a section number in parenthesis after it, then there is no corresponding text in the IECC-R.~~	No change to Houston amendment.
{**EDITORIAL NOTE:** DELETE THE REMAINDER OF THIS CHAPTER IN ITS ENTIRETY.}		[**EDITORIAL NOTE:** DELETE THE REMAINDER OF THIS CHAPTER IN ITS ENTIRETY.]	No change to Houston amendment.

2015 Houston IRC Amendments	2021 IRC – Chapter 12 – Mechanical Administration	2021 Houston IRC Amendments	Code Change Summary
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.	**M1201.2 Application.** In addition to the general administration requirements of Chapter 1, the administrative provisions of this chapter shall ~~**also**~~ apply to the mechanical requirements of Chapters 13 through 24.	**M1201.2 Application.** In addition to the general administration requirements of Chapter 1, the administrative provisions of ~~this chapter~~ the *Mechanical Code* shall apply to ~~the mechanical requirements of Chapters 13 through 24~~ 12 through 23, as well as to the mechanical provisions of Chapter 24.	No change to Houston amendment.
	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 such devices and safeguards were 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.		Minor wordsmithing change.

2015 Houston IRC Amendments	2021 IRC – Chapter 13 – General Mechanical System Requirements	2021 Houston IRC Amendments	Code Change Summary
	SECTION M1305 **APPLIANCE ACCESS** **M1305.1 Appliance access for inspection service, repair and replacement.** *Appliances* shall be ~~accessible~~ be located to for access for inspection, service, repair and replacement without removing permanent construction, other ~~-~~*appliances*, or any other piping or ducts not connected to the *appliance* being inspected, serviced, repaired or replaced. A level working space not less than		Minor wordsmithing change.

	30 inches deep and 30 inches wide (762 mm by 762 mm) shall be provided in front of the control side to service an *appliance*.		
	~~**M1305.1.1 Furnaces and air handlers.** Furnaces and air handlers within compartments or alcoves shall have a minimum working space clearance of 3 inches (76 mm) along the sides, back and top with a total width of the enclosing space being not less than 12 inches (305 mm) wider than the furnace or air handler. Furnaces having a firebox open to the atmosphere shall have not less than a 6-inch (152 mm) working space along the front combustion chamber side. Combustion air openings at the rear or side of the compartment shall comply with the requirements of Chapter 17.~~ ~~**Exception**: This section shall not apply to replacement appliances installed in existing compartments and alcoves where the working space clearances are in accordance with the equipment or appliance manufacturer's installation instructions.~~		Base code section removed
	M1305.1.21 Appliances in rooms.		Base code renumbering.
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.	**M1305.1.32 Appliances in attics.**	**APPLIANCE ACCESS** **M1305.1.2 Appliances in attics.** *Attics* containing *appliances* shall be provided with pull down stairs with a load capacity of not less than 350 pounds, large enough to allow removal of the largest appliance, and a stair width not less than 22 inches at its narrowest point. ~~an opening~~ Attics containing appliances shall have 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 (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 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 22 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. If the opening to the attic is through a vertical door on the same level as the appliances, it shall have a	Base code renumbering. No change to Houston amendment.

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		minimum clear access opening of 30 inches (762 mm) high and 22 inches (559 mm) wide and be large enough to allow removal of the largest appliance.	
	M1305.1.32.1 Electrical requirements.	**M1305.1.2.1 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.	Base code renumbering. New Houston amendment to match similar amendment in M1305.1.3.3 referencing the NEC for electrical requirements.
	M1305.1.43Appliances under floors.		Base code renumbering.
	M1305.1.43.1 Ground clearance.		Base code renumbering.
	M1305.1.43.2 ~~Excavations~~Pit locations. ~~Excavations for *appliance* installations shall extend to a depth of 6 inches (152 mm) below the *appliance* and 12 inches (305 mm) on all sides, except that the control side shall have a clearance of 30 inches (762 mm)~~ Appliances installed in pits or excavations shall not come in direct contact with the surrounding soil and shall be installed not less than 3 inches (76 mm) above the pit floor. The sides of the pit or excavation shall be held back not less than 12 inches (305 mm) from the appliance. Where the depth exceeds 12 inches (305 mm) below adjoining grade, the walls of the pit or excavation shall be lined with concrete or masonry. Such concrete or masonry shall extend not less than 4 inches (102 mm) above adjoining grade and shall have sufficient lateral load-bearing capacity to resist collapse. Excavation on the control side of the appliance shall extend horizontally not less than 30 inches (762 mm). The appliance shall be protected from flooding in an approved manner.		New base code requirements for appliance pits and their location.
	M1305.1.43.3 Electrical requirements.	**M1305.1.3.3 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.	Base code renumbering. No change to Houston amendment, relocated from Section M1305.1.4.3.
		M1305.1.4 Appliances on roofs. Appliances located on roofs shall meet the access requirements of Chapter 3 of the *Mechanical Code*.	New Houston amendment requiring appliances on roofs to comply with Chapter 3 of the Houston UMC.
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.			Previous Houston amendment relocated to Section M1305.1.3.3, no changes.

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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).		**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*~~ 2311 of the *Fire 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).	No change to Houston amendment.
	M1307.5 Electrical appliances. Electrical *appliances* shall be installed in accordance with Chapters 14, 15, 19, 20 and 34 through 43 ~~**of this code**~~.		No Houston amendment.
M1308.2 Protection against physical damage. Where piping will be concealed within lightframe 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.		**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 and ~~galvanized~~ steel piping shall not be required to be protected.	No change to Houston amendment.
2015 Houston IRC Amendments	**2021 IRC – Chapter 14 – Heating and Cooling Equipment and Appliances**	**2021 Houston IRC Amendments**	**Code Change Summary**
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.		**GENERAL** **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.	No change to Houston amendment.
	M1401.4 ~~Outdoor~~ Exterior installations. *Equipment* and *appliances* installed outdoors shall be *listed* and *labeled* for outdoor installation. Supports and foundations shall prevent excessive vibration, settlement or movement of the *equipment*. Supports and foundations shall be in accordance with Section M1305.1.43.1.		Minor wordsmithing and base code renumbering.
	SECTION M1402 **CENTRAL FURNACES** **M1402.1 General.** Oil-fired central furnaces shall conform to **ANSI /UL 727**. Electric furnaces shall conform to **UL 1995** or **UL/CSA/ANCE 60335-2-40**.	**SECTION M1402** **CENTRAL FURNACES** **M1402.1 General.** Oil-fired central furnaces shall conform to ANSI/UL 727. Electric furnaces shall conform to UL 1995 or UL/CSA~~/ANCE~~ 60335-2-40.	New Houston amendment accepted during Public Comment to remove “ANCE” from portion of reference standard as they no longer sponsor this standard.
		SECTION M1403 **HEAT PUMP EQUIPMENT** **M1403.1 Heat pumps.** Electric heat pumps shall be listed and labeled in accordance with UL 1995 or UL/CSA~~/ANCE~~ 60335-2-40.	New Houston amendment accepted during Public Comment to remove “ANCE” from portion of reference standard as they no longer sponsor this standard.

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	SECTION M1405 **BASEBOARD CONVECTORS** **M1405.1 General.** Electric baseboard convectors shall be installed in accordance with the manufacturer's instructions and Chapters 34 through 43 ~~of this code~~. Electric baseboard heaters shall be listed and labeled in accordance with UL 1042.		Minor wordsmithing changes.
	SECTION M1406 **RADIANT HEATING SYSTEMS** **M1406.1 General.** Electric radiant heating systems shall be installed in accordance with the manufacturer's instructions and Chapters 34 through 43 ~~of this code~~ and shall be listed for the application.		Minor wordsmithing changes.
	M1406.2 Clearances. Clearances for radiant heating panels or elements to any wiring, outlet boxes and junction boxes used for installing electrical devices or mounting luminaires shall comply with Chapters 34 through 43 ~~of this code~~.		Minor wordsmithing changes.
	SECTION M1407 **DUCT HEATERS** **M1407.1 General.** Electric duct heaters shall be installed in accordance with the manufacturer's instructions and Chapters 34 through 43 ~~of this code~~. Electric duct heaters shall comply with UL 1996.		Minor wordsmithing changes.
	M1407.4 Access. Duct heaters shall be located to allow access~~ible~~ for servicing, and clearance shall be maintained to permit adjustment, servicing and replacement of controls and heating elements.		Minor wordsmithing changes.
	M1411.2 Refrigeration coils in warm-air furnaces. Where a cooling coil is located in the supply plenum of a warm-air furnace, the furnace blower shall be rated at not less than 0.5- inch water column (124 Pa) static pressure unless the furnace is *listed* and *labeled* for use with a cooling coil. Cooling coils shall not be located upstream from heat exchangers unless *listed* and *labeled* for such use. Conversion of existing furnaces for use with cooling coils shall be permitted provided that the furnace will operate within the temperature rise specified for the furnace.		Minor wordsmithing changes.
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.		**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.	No change to Houston amendment.
	M1411.3.1.2 Appliance, equipment and insulation in pans. Where *appliances*, *equipment* or insulation are subject to water damage when auxiliary drain pans fill, that portion of the *appliance*, *equipment* and insulation shall be installed above the rim of the pan. Supports located inside		New base code requirements for insulation requirements for appliances/equipment.

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	of the pan to support the *appliance* or *equipment* shall be water resistant and *approved*.		
		M1411.6 Insulation of refrigerant piping. Piping and fittings for refrigerant vapor (suction) lines shall be insulated with insulation having a thermal resistivity of not less than R-3 and having an external surface permeance not exceeding 0.05 perm [2.87 ng/(s x m^2 x Pa)] when tested in accordance with ASTM E96.	New Houston amendment for insulation of refrigerant piping to coincide with IECC requirements.
	M1411.8 Support of refrigerant piping. Refrigerant piping and tubing shall be securely fastened to a permanent support within 6 feet (1829 mm) of the condensing unit.		New section providing requirements for refrigerant piping support.
	~~M1411.8~~**M1411.9 Locking access port caps.**		Base code renumbering.
		SECTION M1412 **ABSORPTION COOLING EQUIPMENT** **M1412.1 Approval of equipment.** Absorption systems shall be installed in accordance with the manufacturer's instructions. Absorption equipment shall comply with UL 1995 or UL/CSA~~/ANCE~~ 60335-2-40.	New Houston amendment accepted during Public Comment to remove "ANCE" from portion of reference standard as they no longer sponsor this standard.
		SECTION M1413 **EVAPORATIVE COOLING EQUIPMENT** **M1413.1 General.** Evaporative cooling equipment and appliances shall comply with UL 1995 or UL/CSA~~/ANCE~~ 60335-2-40 and shall be installed:	New Houston amendment accepted during Public Comment to remove "ANCE" from portion of reference standard as they no longer sponsor this standard.

2015 Houston IRC Amendments	2021 IRC – Chapter 15 – Exhaust Systems	2021 Houston IRC Amendments	Code Change Summary
	M1502.3 Duct termination. Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be in accordance with the dryer manufacturer's installation instructions. If the manufacturer's instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet (914 mm) in any direction from openings into buildings, including openings in ventilated soffits. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.		Minor updates to duct termination requirements.
	M1502.3.1 Exhaust termination outlet and passageway size. The passageway of dryer exhaust duct terminals shall be undiminished in size and shall provide an open area of not less than 12.5 square inches (8065 mm2).		New requirements for exhaust termination.

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	M1502.4.1 Material and size. Exhaust ducts shall have a smooth interior finish and shall be constructed of metal ~~having a minimum thickness of~~ not less than 0.0157 inch~~es~~ (0.3950 mm) in thickness (No. 28 gage). The duct shall be 4 inches (102 mm) nominal in diameter.		Minor wordsmithing changes.
	M1502.4.2 Duct installation. Exhaust ducts shall be supported at intervals not to exceed 12 feet (3658 mm) and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed in accordance with Section M1601.4.1 and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude more than 1/8 inch (3.2 mm) into the inside of the duct. Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.		New requirements for dryer ducts enclosed in wall or ceiling cavities.
	M1502.4.5 Booster fans prohibited. Domestic booster fans shall not be installed in dryer exhaust systems.		New requirements prohibited booster fans in dryer exhaust systems.
	~~M1502.4.5~~**M1502.4.6 Duct length.**		Base code renumbering.
	~~M1502.4.5.1~~**M1502.4.6.1 Specified length.**		Base code renumbering.
	~~TABLE M1502.4.5.1~~ **TABLE M1502.4.6.1** **DRYER EXHAUST DUCT FITTING EQUIVALENT LENGTH**		Base code renumbering.
	~~M1502.4.5.2~~**M1502.4.6.2 Manufacturer's instructions.**		Base code renumbering.
	~~M1502.4.5.3~~**M1502.4.6.3 Dryer exhaust duct power ventilator.**		Base code renumbering.
	~~M1502.4.6~~**M1502.4.7 Length identification.**		Base code renumbering.
	~~M1502.4.7~~**M1502.4.8 Exhaust duct required.**		Base code renumbering.

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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 m²) for makeup air shall be provided in the door or by other approved means.		**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 m²) for makeup air shall be provided in the door or by other approved means.	No change to Houston amendment.
	SECTION M1503 ~~RANGE~~ **~~HOODS~~ DOMESTIC COOKING EXHAUST EQUIPMENT** **M1503.1 General.** ~~Range hoods shall discharge to the outdoors through a duct. The duct serving the hood shall have a smooth interior surface, shall be air tight, shall be equipped with a back draft damper and shall be independent of all other exhaust systems. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building.~~Domestic cooking exhaust equipment shall comply with the requirements of this section. **~~Exception:~~** ~~Where installed in accordance with the manufacturer's instructions, and where mechanical or natural *ventilation* is otherwise provided, *listed* and *labeled* ductless range hoods shall not be required to discharge to the outdoors.~~		Requirements for range hoods has been expanded to include all domestic cooking exhaust equipment.
	M1503.2 Domestic cooking exhaust. Where domestic cooking exhaust equipment is provided, it shall comply with one of the following: 1. The fan for overhead range hoods and downdraft exhaust equipment not integral with the cooking appliance shall be listed and labeled in accordance with UL 507. 2. Overhead range hoods and downdraft exhaust equipment with integral fans shall comply with UL 507. 3. Domestic cooking appliances with integral downdraft exhaust equipment shall be listed and labeled in accordance with ANSI Z21.1 or UL 858. 4. Microwave ovens with integral exhaust for installation over the cooking surface shall be listed and labeled in accordance with UL 923.		New requirements for domestic cooking exhaust.
	M1503.2.1 Open-top broiler exhaust. Domestic open-top broiler units shall be provided with a metal exhaust hood having a thickness of not less than 0.0157 inch (0.3950 mm) (No. 28 gage). Such hoods shall be installed with a clearance of not less than 1/4 inch (6.4 mm) between the hood and the underside of combustible material and cabinets. A clearance of not less than 24 inches (610 mm) shall be maintained between the cooking surface and combustible material and cabinets. The hood width shall be not less than the width of the broiler unit and shall extend over the entire unit. **Exception:** Broiler units that incorporate an integral exhaust system, and that are listed and labeled for use without an exhaust hood, shall not be required to have an exhaust hood.		New requirements for domestic cooking exhaust.
	M1503.3 Exhaust discharge. Domestic cooking exhaust equipment shall discharge to the outdoors through a duct. The duct shall have a smooth interior surface, shall be air tight, shall be equipped with a backdraft damper and shall be independent of all other exhaust systems. Ducts serving domestic cooking exhaust equipment shall not terminate in an attic or crawl space or areas inside the building.		New requirements for domestic cooking exhaust.

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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.	**M1503.2~~4~~ Duct material.** Ducts serving ~~range hoods~~ domestic cooking exhaust equipment 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 1 inch (25 mm) above the indoor concrete floor surface. 4. The PVC duct extends not more than 1 inch (25 mm) above grade *outside of the building.* 5. The PVC ducts are solvent cemented.	**M1503.4 Duct material.** Ducts serving domestic cooking exhaust equipment 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.	Minor wordsmithing changes. No change to Houston amendment.
	M1503.3~~5~~5 Kitchen exhaust rates. Where domestic kitchen cooking *appliances* are equipped with ducted range hoods or down-draft exhaust systems, the fans shall be sized in accordance with Section M1507~~5~~**5.4.4**.		Base code renumbering.
	M1503.4~~6~~6 Makeup air required. ~~Exhaust hood.~~ Where one or more gas, liquid or solid fuel-burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system~~s~~ capable of exhausting in excess of 400 cubic feet per minute (0.19 m3/s) shall be mechanically or ~~naturally~~ passively 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~~ fewer one damper. ~~Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers 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.~~ complying with Section M1503.6.2. **Exception**: Makeup air is not required for exhaust systems installed for the exclusive purpose of space cooling and intended to be operated only when windows or other air inlets are open.		Updated requirements for makeup air, new exception provided.
	M1503.4~~6~~6.1 Location.		Base code renumbering.
	M1503.6.2 Makeup air dampers. Where makeup air is required by Section M1503.6, makeup air dampers shall comply with this section. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be located to allow access for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or		New requirements for makeup air dampers.

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	replaced. Gravity or barometric dampers shall not be used in passive makeup air systems except where the dampers are rated to provide the design makeup airflow at a pressure differential of 0.01 in. w.c. (3 Pa) or less.		
	~~**SECTION M1504**~~ ~~**INSTALLATION OF MICROWAVE OVENS**~~ ~~**M1504.1 Installation of a microwave oven over a cooking appliance.** The installation of a *listed* and *labeled* cooking *appliance* or microwave oven over a *listed* and *labeled* cooking *appliance* shall conform to the terms of the upper *appliance's listing* and *label* and the manufacturer's installation instructions. The microwave oven shall conform to UL 923.~~		Base code requirements have been relocated to Section M1901.2.
	~~**SECTION M1505**~~ ~~**OVERHEAD EXHAUST HOODS**~~ ~~**M1505.1 General.** Domestic open-top broiler units shall have a metal exhaust hood, having a minimum thickness of 0.0157 inch (0.3950 mm) (No. 28 gage) with 1/4 inch (6.4 mm) clearance between the hood and the underside of combustible material or cabinets. A clearance of not less than 24 inches (610 mm) shall be maintained between the cooking surface and the combustible material or cabinet. The hood shall be not less than the width of the broiler unit, extend over the entire unit, discharge to the outdoors and be equipped with a backdraft damper or other means to control infiltration/exfiltration when not in operation. Broiler units incorporating an integral exhaust system, and *listed* and *labeled* for use without an exhaust hood, need not have an exhaust hood.~~		Base code section removed.
	SECTION M150~~6~~4 **EXHAUST DUCTS AND EXHAUST OPENINGS** **M150~~6~~4.1 Duct construction.**		Base code renumbering.
	M150~~6~~4.2 Duct length.		Base code renumbering.
	M150~~6~~4.3 Exhaust openings. Air exhaust openings shall terminate as follows: ~~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 (3048 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~~ 1. Not less than 3 feet (914 mm) from property lines. 2. Not less than 3 feet (914 mm) from gravity air intake openings, operable windows and doors. 3. Not less than 10 feet (3048 mm) from mechanical air intake openings except where the exhaust opening is located not less than 3 feet (914 mm) above the air intake opening. Openings shall comply with Sections R303.5.2 and R303.6.		Updates to exhaust opening termination requirements.

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	SECTION M1507~~5~~ **MECHANICAL VENTILATION** **M1507~~5~~.1 General.** Where local exhaust or whole-house mechanical *ventilation* is provided, the ventilation system ~~equipment~~ shall be designed in accordance with this section.		Base code renumbering and minor wordsmithing.
	M1507~~5~~.2 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or circulated to another *dwelling unit* and shall be exhausted directly to the outdoors. Exhaust air from bathrooms ~~and~~, toilet rooms and kitchens shall not discharge into an *attic*, crawl space or other areas inside the building. This section shall not prohibit the installation of ductless range hoods in accordance with the exception to Section M1503.3.		Base code renumbering and minor updates to air recirculation requirements.
	M1505.3 Exhaust equipment. Exhaust fans and whole-house mechanical ventilation fans ~~equipment serving single *dwelling units*~~ shall be *listed* and *labeled* as providing the minimum required airflow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.		New exhaust equipment listing requirements.
	M1507~~5~~.3~~4~~ Whole-house mechanical ventilation system. Whole-house mechanical ventilation systems shall be designed in accordance with Sections M1507.~~3~~4.1 through M1507.~~3~~4.~~3~~4.		Base code renumbering.
	M1507~~5~~.3~~4~~.1 System design.		Base code renumbering.
	M1507~~5~~.3~~4~~.2 System controls. The whole-house mechanical ventilation system shall be provided with controls that enable manual override. Controls shall include text or a symbol indicating their function.		Base code renumbering and new requirements for control signage.
	M1507~~5~~.3~~4~~.3 Mechanical ventilation rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate not less than that ~~as~~ determined in accordance with Table M1507~~5~~.3~~4~~.3(1) M1505.4.3(1) or not less than that determined by Equation 15-1. Ventilation rate in cubic feet per minute = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)] Equation 15-1 **Exceptions:** 1. Ventilation rate credit. The minimum mechanical ventilation rate determined in accordance with **Table M1505.4.3(1)** or **Equation 15-1** shall be reduced by 30 percent, provided that both of the following conditions apply: 1.1. A ducted system supplies ventilation air directly to each bedroom and to one or more of the following rooms: 1.1.1. Living room. 1.1.2. Dining room. 1.1.3. Kitchen.		Base code renumbering and updates to mechanical ventilation requirements.

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	1.2. The whole-house ventilation system is a balanced ventilation system. 2. Programmed intermittent operation. The whole-house mechanical ventilation system is permitted to operate intermittently where the system has controls that enable operation for not less than 25 percent of each 4-hour segment and the ventilation rate prescribed in **Table M1505.4.3(1)**, by **Equation 15-1** or by Exception 1 is multiplied by the factor determined in accordance with **Table M1505.4.3(2)**.		
	TABLE M1507~~5~~.3~~4~~.3(1) **CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS**		Base code renumbering.
	TABLE M1507.3~~4~~.3(2) **INTERMITTENT WHOLE-HOUSE MECHANICAL VENTILATION RATE FACTORS[a, b]**		Base code renumbering.
	M1507~~5~~.4.4 Local exhaust rates. *Local exhaust* systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with Table M1507~~5~~.4.4.		Base code renumbering.
	TABLE M1507~~5~~.4.4 **MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS** TABLE M1505.4.4 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS AREA TO BE EXHAUSTED | EXHAUST RATES[a] Kitchens | 100 cfm intermittent or 25 cfm continuous Bathrooms-Toilet Rooms | Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous For SI: 1 cubic foot per minute = 0.0004719 m^3/s, 1 inch water column = 0.2488 kPa. a. The listed exhaust rate for bathrooms-toilet rooms shall equal or exceed the exhaust rate at a minimum static pressure of 0.25 inch water column in accordance with **Section M1505.3**.		Base code renumbering and new footnote for minimum exhaust table.

2015 Houston IRC Amendments	2021 IRC – Chapter 16 – Duct Systems	2021 Houston IRC Amendments	Code Change Summary
	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.		New requirements for above-ground duct systems.

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	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 fireblocking in accordance with ~~Section R602.8~~**Section R302.11**. Fireblocking materials used for isolation shall comply with **Section R302.11.1**. 7.5. Stud wall cavities in the outside walls of building envelope assemblies shall not be utilized as air plenums. 8. Volume dampers, equipment and other means of supply, return and exhaust air adjustment used in system balancing shall be provided with access.		
	M1601.1.2 Underground duct systems. Underground *duct systems* shall be constructed of *approved* concrete, clay, metal or plastic. The maximum ~~duct~~ design temperature for systems utilizing plastic duct and fittings shall ~~not~~ be ~~greater than~~ 150°F (66°C). Metal ducts shall be protected from corrosion in an *approved* manner or shall be completely encased in concrete not less than 2 inches (51 mm) thick. Nonmetallic ducts shall be installed in accordance with the manufacturer's instructions. Plastic pipe and fitting materials shall conform to cell classification 12454-B of ASTM ~~D 1248~~ D1248 or ASTM ~~D 1784~~ D1784 and external loading properties of ASTM ~~D 2412~~ D2412. Ducts shall slope to ~~an accessible point for drainage.Where encased in concrete, ducts shall be sealed andsecured prior to any concrete being poured~~ a drainage point that has access. Ducts shall be sealed, secured and tested prior to encasing the ducts in concrete or direct burial. Duct tightness shall be verified as required by Section N1103.3. Metallic ducts having an		Minor wordsmithing changes and new duct sealing and tightness requirements.

	approved protective coating and nonmetallic ducts shall be installed in accordance with the manufacturer's instructions.		
	M1601.3 Duct insulation materials. Duct insulation materials shall conform to the following requirements: 1. Duct coverings and linings, including adhesives where used, shall have a flame spread index not higher than 25, and a smoke-developed index not over 50 when tested in accordance with ASTM E 84 or UL 723, using the specimen preparation and mounting procedures of ASTM E 2231. **Exception:** Spray application of polyurethane foam to the exterior of ducts in *attics* and crawl spaces shall be permitted subject to all of the following: 1. The flame spread index is not greater than 25 and the smoke-developed index is not greater than 450 at the specified installed thickness. 2. The foam plastic is protected in accordance with the ignition barrier requirements of Sections R316.5.3 and R316.5.4. 3. The foam plastic complies with the requirements of Section R316. 2. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C 411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C). Coverings and linings shall be listed and labeled. 3. External reflective duct insulation shall be legibly printed or identified at intervals not greater than 36 inches (914 mm) with the name of the manufacturer, the product *R*-value at the specified installed thickness and the flame spread and smoke-developed indices. The installed thickness of the external duct insulation shall include the enclosed air space(s). The product *R*-value for external reflective duct insulation shall be determined in accordance with ASTM C1668. 4. External duct insulation and factory-insulated flexible ducts shall be legibly printed or identified at intervals not longer than 36 inches (914 mm) with the name of the manufacturer, the thermal resistance *R*-value at the specified installed thickness and the flame spread and smoke-developed ~~indexes~~ indices of the composite materials. Spray polyurethane foam manufacturers shall provide the same product information and properties, at the nominal installed thickness, to the customer in writing at the time of foam application. Nonreflective duct insulation product *R*-values shall be based on insulation only, excluding air films, vapor retarders or other duct components, and shall be based on tested C-values at 75°F (24°C) mean temperature at the installed thickness, in accordance with recognized industry procedures. The installed thickness of duct insulation used to determine its *R*-value shall be determined as follows:		Minor wordsmithing change.

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	4.1. For duct board, duct liner and factory-made rigid ducts not normally subjected to compression, the nominal insulation thickness shall be used. 4.2. For ductwrap, the installed thickness shall be assumed to be 75 percent (25-percent compression) of nominal thickness. 4.3. For factory-made flexible air ducts, The installed thickness shall be determined by dividing the difference between the actual outside diameter and nominal inside diameter by two. 4.4. For spray polyurethane foam, the aged *R*-value per inch measured in accordance with recognized industry standards shall be provided to the customer in writing at the time of foam application. In addition, the total *R*-value for the nominal application thickness shall be provided.		
	M1601.4.1 Joints, seams and connections. 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*. 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 181A and shall be marked "181A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape. Tapes and mastics used to seal metallic and 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 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 all ductwork shall be installed in accordance with the manufacturers' instructions. **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~~ without access, 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 joints and seams. ~~of other than the snap-lock and button-lock~~		Minor wordsmithing changes.

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	~~types~~.This exception shall not apply to snap-lock and button-lock type joints and seams that are located outside of conditioned spaces.		
	M1601.4.6 Duct insulation. Duct insulation shall be installed in accordance with the following requirements: 1. A vapor retarder having a ~~maximum~~ permeance of not greater than 0.05 perm [2.87 ng/(s · m2· Pa)] in accordance with ASTM E–96, or aluminum foil with a ~~minimum~~ thickness of not less than 2 mils-(0.05 mm), shall be installed on the exterior of insulation on cooling supply ducts that pass through unconditioned spaces conducive to condensation except where the insulation is spray polyurethane foam with a ~~maximum~~ water vapor permeance of ~~3~~not greater than 3perms per inch [1722 ng/(s · m2· Pa)] at the installed thickness. 2. ~~Exterior~~Outdoor *duct systems* shall be protected against the elements. 3. Duct coverings shall not penetrate a fireblocked wall or floor.		Minor wordsmithing changes.
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~~.		**M1601.4.10 Flood hazard areas.** In flood hazard areas as established by Table R301.2, *duct systems* shall be located or installed in accordance with Chapter 19 of the *City Code* ~~Section R322.1.6~~.	No change to Houston amendment.
	M1601.5.1 General. The space shall be cleaned of loose combustible materials and scrap, and shall be tightly enclosed. The ground surface of the space shall be covered with a moisture barrier having a ~~minimum~~ thickness of not less than 4 mils (0.1 mm). Plumbing waste cleanouts shall not be located within the space. **Exception:** Plumbing waste cleanouts shall be permitted to be located in unvented crawl spaces that receive *conditioned air* in accordance with Section R408.3.		Minor wordsmithing changes.
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.	**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 (3048 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 manufacturer~~s~~'s 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.	**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 (3048 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.	New return air opening requirements. No change to Houston amendment.

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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.	**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. 5. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified. 6. 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. ~~6~~7. Return air from one dwelling unit shall not be discharged into another dwelling unit.	**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. 5. For other than dedicated HVAC systems, return air shall not be taken from indoor swimming pool enclosures and associated deck areas except where the air in such spaces is dehumidified. 6. 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. 7. Return air from one dwelling unit shall not be discharged into another dwelling 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, as well as rated floorceiling and 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, as well as rated floor-ceiling and 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.	No change to Houston amendment.
2015 Houston IRC Amendments	**2021 IRC – Chapter 18 – Chimneys and Vents**	**2021 Houston IRC Amendments**	**Code Change Summary**
	M1802.4 Blocked vent switch. Oil-fired *appliances* shall be equipped with a device that will stop burner operation in the event that the venting system is obstructed. Such device shall have a manual reset and shall be installed in accordance with the manufacturer's instructions.		New requirements for oil-fired appliances to include stop burner operation.
	M1803.2 Connectors for oil and solid fuel-burning appliances. Connectors for oil and solid fuel-burning *appliances* shall be constructed of factory-built chimney material, Type L vent material or single-wall metal pipe having resistance to corrosion and heat and thickness not less than that of galvanized steel as specified in Table M1803.2.		Minor wordsmithing change.
	M1803.3.1 Floor, ceiling and wall penetrations. A chimney connector or vent connector shall not pass through any floor or ceiling. A chimney connector or vent connector shall not pass through a wall or partition unless the connector is *listed* and *labeled* for wall pass-through, or is routed through a device *listed* and *labeled* for wall pass-through and is installed in accordance with the conditions of its *listing* and *label*. Connectors for oil-fired *appliances listed* and *labeled* for Type L		Minor wordsmithing change.

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	vents, passing through walls or partitions shall be in accordance with the following: 1. Type L vent material for oil *appliances* shall be installed with not less than *listed* and *labeled* clearances to combustible material. 2. Single-wall metal pipe shall be *guarded* by a ventilated metal thimble not less than 4 inches (102 mm) larger in diameter than the vent connector. ~~A minimum~~ Not less than 6 inches (152 mm) of clearance shall be maintained between the thimble and combustibles.		
	M1803.3.5 Access. The entire length of a connector shall ~~be~~ allow access~~ible~~ for inspection, cleaning and replacement.		Minor wordsmithing change.
	M1803.4.2 Connection to factory-built fireplace flue. A different *appliance* shall not be connected to a flue serving a factory-built fireplace unless the *appliance* is specifically *listed* for such an installation. The connection shall be made in ~~conformance~~ compliance with the *appliance* manufacturer's instructions.		Minor wordsmithing change.
	M1803.4.3 Connection to masonry fireplace flue. A connector shall extend from the *appliance* to the flue serving a masonry fireplace to convey the flue gases directly into the flue. The connector shall be provided with access~~ible~~ or shall be removable for inspection and cleaning of both the connector and the flue. *Listed* direct-connection devices shall be installed in accordance with their *listing*.		Minor wordsmithing change.
	M1805.2 Masonry chimney connection. A chimney connector shall enter a masonry chimney not less than 6 inches (152 mm) above the bottom of the chimney. Where it is not possible to locate the connector entry ~~at least~~ not less than 6 inches (152 mm) above the bottom of the chimney flue, a clean out shall be provided by installing a capped tee in the connector next to the chimney. A connector entering a masonry chimney shall extend through, but not beyond, the wall and shall be flush with the inner face of the liner. Connectors, or thimbles where used, shall be firmly cemented into the masonry.		Minor wordsmithing change.

2015 Houston IRC Amendments	2021 IRC – Chapter 19 – Special Appliances, Equipment and Systems	2021 Houston IRC Amendments	Code Change Summary
	SECTION M1901 **RANGES AND OVENS** **M1901.1 Clearances.** Freestanding or built-in ranges shall have a vertical clearance above the cooking top of not less than 30 inches (762 mm) to unprotected combustible material. Reduced clearances are permitted in accordance with the *listing* and *labeling* of the range hoods or ~~*appliances*. The installation of a listed and labeled cooking appliance or microwave oven over a listed and labeled cooking appliance shall be in accordance with Section M1504.1. The clearances for a domestic open-top broiler unit shall be in accordance with Section M1505.1~~ ovens with integral exhaust.		Updates to base code requirements.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	M1901.2 Cooking appliances. Cooking *appliances* shall be *listed* and *labeled* for household use and shall be installed in accordance with the manufacturer's instructions. The installation shall not interfere with *combustion air* or access for operation and servicing. Electric cooking appliances shall comply with UL 1026 or UL 858. Solid-fuel-fired fireplace stoves shall comply with UL 737. Microwave ovens shall comply with UL 923.		Microwave oven requirements relocated to M1901.2.
	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*.		Minor wordsmithing change.

2015 Houston IRC Amendments	2021 IRC – Chapter 20 – Boilers and Water Heaters	2021 Houston IRC Amendments	Code Change Summary
	M2001.1.1 Standards. Packaged oil-fired boilers shall be listed and labeled in accordance with UL 726. Packaged electric boilers shall be listed and labeled in accordance with UL 834. Solid fuel-fired boilers shall be listed and labeled in accordance with UL 2523. Boilers shall be designed, constructed and certified in accordance with the ASME *Boiler and Pressure Vessel Code*, Section I or IV. Controls and safety devices for boilers with fuel input ratings of 12,500,000 Btu/hr (3-663 ~~388 watts~~ kW) or less shall meet the requirements of ASME CSD-1. Gas-fired boilers shall conform to the requirements listed in Chapter 24.		Metric measurement updated.
	TABLE M2003.2 **EXPANSION TANK MINIMUM CAPACITY[a]** **FOR FORCED HOT-WATER SYSTEMS** **SYSTEM VOLUME[b] (gallons) / PRESSURIZED DIAPHRAGM TYPE / NONPRESSURIZED TYPE** 10 / 1.0 / 1.5 20 / 1.5 / 3.0 30 / 2.5 / 4.5 40 / 3.0 / 6.0 50 / 4.0 / 7.5 60 / 5.0 / 9.0 70 / 6.0 / 10.5 80 / 6.5 / 12.0 90 / 7.5 / 13.5 100 / 8.0 / 15.0 For SI: 1 gallon = 3.785 L, 1 pound per square inch gauge = 6.895 kPa, °C = [(°F)-32]/1.8. a. ~~Based~~ on average water temperature of 195°F ~~(91°C)~~, fill pressure of 12 psig and a ~~maximum~~ an operating pressure of not greater than 30 psig. b. System volume includes volume of water in boiler, convectors and piping, not including the expansion tank.		Minor wordsmithing changes to table footnotes.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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	SECTION M2005 **WATER HEATERS** **M2005.1 General.** Water heaters shall be installed in accordance with Chapter 28, the manufacturer's instructions and the requirements of this code. Water heaters installed in an attic shall comply with the requirements of Section M1305.1.~~3~~2. Gas-fired water heaters shall comply with the requirements in Chapter 24. Domestic electric water heaters shall comply with UL 174. Oiled-fired water heaters shall comply with UL 732. Solar ~~T~~thermal ~~solar~~ water ~~heaters~~ heating systems shall comply with Chapter 23 and ~~UL~~SRCC ~~174~~300. Solid fuel-fired water heaters shall comply with UL 2523.		Minor wordsmithing changes and update to reference standard.
	SECTION M2006 **POOL HEATERS** **M2006.1 General.** Pool and spa heaters shall be installed in accordance with the manufacturer's installation instructions. Oil-fired pool heaters shall comply with UL 726. Electric pool and spa heaters shall comply with UL 1261. Pool and spa heat pump water heaters shall comply with UL 1995, UL/CSA/ANCE 60335-2-40 or CSA C22.2 No. 236. **Exception:** Portable residential spas and portable residential exercise spas shall comply with UL 1563 or CSA C22.2 No. 218.1.	**SECTION M2006** **POOL HEATERS** **M2006.1 General.** Pool and spa heaters shall be installed in accordance with the manufacturer's installation instructions. Oil-fired pool heaters shall comply with UL726. Electric pool & spa heaters shall comply with UL 1261. Pool and spa heat pump water heaters shall comply with UL 1995, UL/CSA~~/ANCE~~ 60335-2-40 or CSA C22.2 No. 236. **Exception:** Portable residential spas and portable residential exercise spas shall comply with UL 1563 or CSA C22.2 No. 218.1.	New requirements for pool and spa heat pump water heaters. New exception for section requirements. New Houston amendment accepted during Public Comment to remove ANCE from standard name.
	~~**M2006.3 Temperature-limiting devices.** Pool heaters shall have temperature-relief valves.~~		Base code section removed.
	M2006.4~~3~~ Bypass valves.		Base code renumbering.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments	2021 IRC – Chapter 21 – Hydronic Piping	2021 Houston IRC Amendments	Code Change Summary
	TABLE M2101.9 **HANGER SPACING INTERVALS** **PIPING MATERIAL** / **MAXIMUM HORIZONTAL SPACING (feet)** / **MAXIMUM VERTICAL SPACING (feet)** ABS / 4 / 10[a] CPVC ≤ 1-inch pipe or tubing / 3 / 5[a] CPVC ≥ 1 1/4 inches / 4 / 10[a] Copper or copper-alloy pipe / 12 / 10 Copper or copper-alloy tubing / 6 / 10 PB pipe or tubing / 2.67 / 4 PE pipe or tubing / 2.67 / 4 PE-RT ≤ 1 inch / 2.67 / 10[a] PE-RT ≥ 1 1/4 inches / 4 / 10[a] PEX tubing ≤ 1 inch / 2.67 / 4 PEX tubing ≥ 1 1/4 inches / 4 / 10[a] PP < 1-inch pipe or tubing / 2.67 / 4 PP > 1 1/4 inches / 4 / 10[a] PVC / 4 / 10[a] Steel pipe / 12 / 15 Steel tubing / 8 / 10 For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm. a. 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.		No Houston amendment.
	M2101.10 Tests. Hydronic piping systems shall be tested hydrostatically at a pressure of one and one-half times the maximum system design pressure, but not less than 100 pounds per square inch (689 kPa). The duration of each test shall be not less than 15 ~~minutes and not more than 20~~ minutes. **Exception:** For PEX piping systems, testing with a compressed gas shall be an alternative to hydrostatic testing where compressed air or other gas pressure testing is specifically authorized by all of the manufacturers' instructions for the PEX pipe and fittings products installed at the time the system is being tested, and compressed air or other gas testing is not otherwise prohibited by applicable codes, laws, or regulations outside of this code.		New exception for PEX hydronic piping testing.
	M2101.11 Used materials. Used pipe, fittings, valves and other materials shall not be reused in hydronic systems.		New section prohibiting used materials in hydronic piping.
	M2101.12 Material rating. Pipe and tubing shall be rated for the operating temperature and pressure of the system. Fittings shall be suitable for the pressure applications and recommended by the manufacturer for use with the pipe and tubing material installed. Where used underground, materials shall be suitable for burial.		New requirements for pipe and tubing rating.
	M2101.13 Joints and connections. Joints and connections shall be of an *approved* type. Joints and connections shall be tight for the pressure of the system. Joints used underground shall be *approved* for such applications.		New requirements for hydronic piping joints and connections.

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	M2101.13.1 Joints between different piping materials. Joints between different piping materials shall be made with *approved* transition fittings.		New requirements for joints between different materials in hydronic piping.
	M2101.14 Preparation of pipe ends. Pipe shall be cut square and shall be free of burrs and obstructions. Pipe ends shall have full-bore openings and shall be prepared in accordance with the pipe manufacturer's instructions.		New pipe end preparation requirements for hydronic piping systems.
	M2101.15 Joint preparation and installation. Where required by **Sections M2101.16** through **M2101.18**, the preparation and installation of mechanical and thermoplastic-welded joints shall comply with **Sections M2101.15.1** and **M2101.15.2**.		New joint requirements for hydronic piping systems.
	M2101.15.1 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions.		New joint requirements for hydronic piping systems.
	M2101.15.2 Thermoplastic-welded joints. Joint surfaces for thermoplastic-welded joints shall be cleaned by an *approved* procedure. Joints shall be welded in accordance with the manufacturer's instructions.		New joint requirements for hydronic piping systems.
	M2101.16 CPVC plastic pipe. Joints between CPVC plastic pipe or fittings shall be solvent cemented in accordance with **Section P2906.9.1.2**. Threaded joints between fittings and CPVC plastic pipe shall be in accordance with **Section M2101.16.1**.		New joint requirements for hydronic piping systems.
	M2101.16.1 Threaded joints. Threads shall conform to **ASME B1.20.1** The pipe shall be Schedule 80, 40 or heavier plastic pipe and shall be threaded with dies specifically designed for plastic pipe. Thread lubricant, pipe-joint compound or tape shall be applied on the male threads only and shall be *approved* for application on the piping material.		New joint requirements for hydronic piping systems.
	M2101.17 Cross-linked polyethylene (PEX) plastic tubing. Joints between cross-linked polyethylene plastic tubing and fittings shall comply with **Sections M2101.17.1** and **M2101.17.2**. Mechanical joints shall comply with **Section M2101.15.1**.		New joint requirements for hydronic piping systems.
	M2101.17.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.		New fitting requirements for hydronic piping systems.

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	M2101.17.2 Plastic-to-metal. Solder joints in a metal pipe shall not occur within 18 inches (457 mm) of a transition from such metal pipe to plastic pipe or tubing.		New joint requirements for hydronic piping systems.
	M2101.18 Polyethylene plastic pipe and tubing. Joints between polyethylene plastic pipe and tubing or fittings for systems shall be heat-fusion joints complying with **Section M2101.18.1**, electrofusion joints complying with **Section M2101.18.2**, or stab-type insertion joints complying with **Section M2101.18.3**.		New joint requirements for hydronic piping systems.
	M2101.18.1 Heat-fusion joints. Joints shall be of the socket-fusion, saddle-fusion or butt-fusion type, and joined in accordance with **ASTM D2657**. Joint surfaces shall be clean and free from moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with **ASTM D2683** or **ASTM D3261**.		New joint requirements for hydronic piping systems.
	M2101.18.2 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free from moisture, and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for the period of time specified by the manufacturer. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with **ASTM F1055**.		New joint requirements for hydronic piping systems.
	M2101.18.3 Stab-type insert fittings. Joint surfaces shall be clean and free from moisture. Pipe ends shall be chamfered and inserted into the fittings to full depth. Fittings shall be manufactured in accordance with **ASTM F1924**.		New joint requirements for hydronic piping systems.
	M2101.19 Polypropylene (PP) plastic. Joints between PP plastic pipe and fittings shall comply with **Sections M2101.19.1** and **M2101.19.2**.		New joint requirements for hydronic piping systems.
	M2101.19.1 Heat-fusion joints. Heat-fusion joints for polypropylene (PP) pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, electrofusion polypropylene fittings or by butt fusion. Joint surfaces shall be clean and free from moisture. The joint shall remain undisturbed until cool. Joints shall be made in accordance with **ASTM F2389**.		New joint requirements for hydronic piping systems.
	M2101.19.2 Mechanical and compression sleeve joints. Mechanical and compression sleeve joints shall be installed in accordance with the manufacturer's instructions.		New joint requirements for hydronic piping systems.
	M2101.20 Raised temperature polyethylene (PE-RT) plastic tubing. Joints between raised temperature polyethylene tubing and fittings shall comply with **Sections M2101.20.1** through **M2101.20.4**. Mechanical joints shall comply with **Section M2101.15.1**.		New joint requirements for hydronic piping systems.

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	M2101.20.1 Compression-type fittings. Where compression-type fittings include inserts and ferrules or O-rings, the fittings shall be installed without omitting the inserts and ferrules or O-rings.		New fitting requirements for hydronic piping systems.
	M2101.20.2 PE-RT-to-metal connections. Solder joints in a metal pipe shall not occur within 18 inches (457 mm) of a transition from such metal pipe to PE-RT pipe or tubing.		New joint requirements for hydronic piping systems.
	M2101.20.3 Heat-fusion joints. Heat-fusion joints shall be of the socket-fusion, saddlefusion or butt-fusion type, and shall be joined in accordance with **ASTM D2657**. Joint surfaces shall be clean and free from moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with **ASTM D2683** or **ASTM D3261**.		New joint requirements for hydronic piping systems.
	M2101.20.4 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free from moisture and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for the period of time specified by the manufacturer and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with **ASTM F1055**.		New joint requirements for hydronic piping systems.
	M2101.21 PVC plastic pipe. Joints between PVC plastic pipe or fittings shall be solvent cemented in accordance with **Section P2906.9.1.4**. Threaded joints between fittings and PVC plastic pipe shall be in accordance with **Section M2101.16.1**.		New joint requirements for hydronic piping systems.
	M2101.22 Shutoff valves. Shutoff valves shall be installed in ground-source loop piping systems in the locations indicated in **Sections M2101.22.1** through **M2101.22.6**.		New shutoff valve requirements for hydronic piping systems.
	M2101.22.1 Heat exchangers. Shutoff valves shall be installed on the supply and return sides of a heat exchanger. **Exception:** Shutoff valves shall not be required where heat exchangers are integral with a boiler or are a component of a manufacturer's boiler and heat exchanger packaged unit and are capable of being isolated from the hydronic system by the supply and return valves required by **Section M2001.3**.		New shutoff valve requirements for hydronic piping systems.
	M2101.22.2 Central systems. Shutoff valves shall be installed on the building supply and return of a central utility system.		New shutoff valve requirements for hydronic piping systems.

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	M2101.22.3 Pressure vessels. Shutoff valves shall be installed on the connection to any pressure vessel.		New shutoff valve requirements for hydronic piping systems.
	M2101.22.4 Pressure-reducing valves. Shutoff valves shall be installed on both sides of a pressure-reducing valve.		New shutoff valve requirements for hydronic piping systems.
	M2101.22.5 Equipment and appliances. Shutoff valves shall be installed on connections to mechanical equipment and *appliances*. This requirement does not apply to components of ground-source loop systems such as pumps, air separators, metering devices, and similar equipment.		New shutoff valve requirements for hydronic piping systems.
	M2101.22.6 Expansion tanks. Shutoff valves shall be installed at connections to nondiaphragm-type expansion tanks.		New shutoff valve requirements for hydronic piping systems.
	M2101.23 Reduced pressure. A pressure relief valve shall be installed on the low-pressure side of a hydronic piping system that has been reduced in pressure. The relief valve shall be set at the maximum pressure of the system design. The valve shall be installed in accordance with **Section M2002**.		New pressure release valve requirements for hydronic piping systems.
	M2101.24 Installation. Piping, valves, fittings and connections shall be installed in accordance with the manufacturer's instructions.		New requirements for hydronic piping installations.
	M2101.25 Protection of potable water. Where hydronic systems have a connection to a potable water supply, the potable water system shall be protected from backflow in accordance with **Section P2902**.		New requirements for hydronic piping installations.
	M2101.26 Pipe penetrations. Openings for pipe penetrations in walls, floors and ceilings shall be larger than the penetrating pipe. Openings through concrete or masonry building elements shall be sleeved. The annular space surrounding pipe penetrations shall be protected in accordance with **Section P2606.1**.		New requirements for hydronic piping installations.
	M2101.27 Clearance from combustibles. A pipe in a piping system having an exterior surface temperature exceeding 250ºF (121ºC) shall have a clearance of not less than 1 inch (25 mm) from *combustible materials*.		New requirements for hydronic piping installations.
	M2101.28 Contact with building material. A piping system shall not be in direct contact with building materials that cause the piping or fitting material to degrade or corrode, or that interfere with the operation of the system.		New requirements for hydronic piping installations.

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	M2101.29 Strains and stresses. Piping shall be installed so as to prevent detrimental strains and stresses in the pipe. Provisions shall be made to protect piping from damage resulting from expansion, contraction and structural settlement. Piping shall be installed so as to avoid structural stresses or strains within building components.		New requirements for hydronic piping installations.
	M2101.29.1 Flood hazard. Piping located in a flood hazard area shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation.		New requirements for hydronic piping installations.
	M2101.30 Chemical compatibility. Antifreeze and other materials used in the system shall be chemically compatible with the pipe, tubing, fittings and mechanical systems.		New requirements for hydronic piping installations.
	SECTION M2103 **FLOOR HEATING SYSTEMS** **M2103.1 Piping materials.** Piping for embedment in concrete or gypsum materials shall be standard-weight steel pipe, copper and copper~~-~~alloy pipe and tubing, cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe, chlorinated polyvinyl chloride (CPVC), polybutylene, cross-linked polyethylene (PEX) tubing, polyethylene of raised temperature (PE-RT) or polypropylene (PP) with a ~~minimum~~ rating of not less than ~~100~~ 80 pounds per square inch at 180°F (~~690~~552 kPa at 82°C).		Updated requirement for piping embedded in concrete or gypsum.
	M2103.2 Thermal barrier required. Radiant floor heating systems shall have a thermal barrier in accordance with Sections M2103.2.1 ~~through~~ and M2103.2.42. Insulation R-values for slab-on-grade and suspended floor installations shall be in accordance with Chapter 11. **Exception:** Insulation shall not be required in engineered systems where it can be demonstrated that the insulation will decrease the efficiency or have a negative effect on the installation.		Updated thermal barrier requirements for suspended floor installations.
	~~**M2103.2.1 Slab-on-grade installation.** Radiant piping used in slab-on-grade applications shall have insulating materials having a minimum R-value of 5 installed beneath the piping.~~		Base code section removed.
	~~**M2103.2.2 Suspended floor installation.** In suspended floor applications, insulation shall be installed in the joist bay cavity serving the heating space above and shall consist of materials having a minimum R-value of 11.~~		Base code section removed.
	M2103.2.31—Thermal break required. A thermal break consisting of asphalt expansion joint materials or similar insulating materials shall be provided at a point where a heated slab meets a foundation wall or other conductive slab.		New requirements for thermal breaks for heated slabs.

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	M2103.2.42 Thermal barrier material marking. Insulating materials used in thermal barriers shall be installed so that the manufacturer's *R*-value mark *is readily observable upon inspection.*		New requirements for material marking.
	M2103.3 Piping joints. Copper and copper–alloy systems shall be soldered, brazed, or press connected. Soldering shall be in accordance with ASTM B–828. Fluxes for soldering shall be in accordance with ASTM B—813. Brazing fluxes shall be in accordance with AWS A5.31. Press-connect joints shall be in accordance with ASME B16.51. Piping joints that are embedded shall be installed in accordance with the following requirements: 1. Steel pipe joints shall be welded. 2. Copper tubing shall be joined by brazing complying with Section P3003.6.1. 3. Polybutylene pipe and tubing joints shall be installed with socket-type heat-fused polybutylene fittings. 4. CPVC tubing shall be joined using solvent cement joints. 5. Polypropylene pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings. 6. Cross-linked polyethylene (PEX) tubing shall be joined using cold expansion, insert or compression fittings. 7. Raised temperature polyethylene (PE-RT) tubing shall be joined using insert or compression fittings.		Minor update to pipe joint requirements.
	M2104.2 Piping joints. Piping joints that are embedded, other than those in Section M2103.3, ~~that are embedded~~ shall comply with the following requirements: 1. Cross-linked polyethylene (PEX) tubing shall be installed in accordance with the manufacturer's instructions. 2. Polyethylene tubing shall be installed with heat–fusion joints. 3. Polypropylene (PP) tubing shall be installed in accordance with the manufacturer's instructions. 4. Raised temperature polyethylene (PE-RT) shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing change.
	M2104.3 Raised temperature polyethylene (PE-RT) plastic tubing. Joints between raised temperature polyethylene tubing and fittings shall conform to Sections M2104.3.1~~, M2104.3.2 and~~ through M2104.3.3. Mechanical joints shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing change.

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	TABLE M2105.5 GROUND-SOURCE LOOP PIPE FITTINGS PIPE MATERIAL / STANDARD Chlorinated polyvinyl chloride (CPVC) — ASTM D2846; ASTM F437; ASTM F438; ASTM F439; ASTM F1970; CSA B137.6 Cross-linked polyethylene (PEX) — ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2159; ASTM F2434; CSA B137.5; ANSI/CSA/IGSHPA C448; NSF 358-3 High-density polyethylene (HDPE) — ASTM D2683; ASTM D3261; ASTM F1055; CSA B137.1; ANSI/CSA/IGSHPA C448; NSF 358-1 Polyethylene/aluminum/polyethylene (PE-AL-PE) — ASTM F1282; ASTM F2434; CSA B137.9 Polypropylene (PP-R) — ASTM F2389; CSA B137.11; NSF 358-2 Polyvinyl chloride (PVC) — ASTM D2464; ASTM D2466; ASTM D2467; ASTM F1970; CSA B137.2; CSA B137.3 Raised temperature polyethylene (PE-RT) — ASTM D2683; ASTM D3261; ASTM F1055; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; CSA B137.1; CSA B137.18; ANSI/CSA/IGSHPA C448; NSF 358-4		New standards included in pipe fitting table.
	M2105.7 Preparation of pipe ends. Pipe shall be cut square~~, reamed,~~ and shall be free of burrs and obstructions. ~~CPVC, PE and PVC pipe shall be chamfered.~~ Pipe ends shall have full-bore openings and shall be prepared in accordance with the pipe manufacturer's instructions. ~~not be undercut.~~		Preparation of pipe end requirements have been modified.
	M2105.11.1 Heat-fusion joints. Joints shall be of the socket-fusion, saddle-fusion or butt-fusion type, and joined in accordance with ASTM D-2657. Joint surfaces shall be clean and free ~~of~~ from moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall ~~be~~ remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM D-2683 or ASTM D-3261.		Minor wordsmithing change.
	M2105.11.2 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free ~~of~~ from moisture, and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for the period of time specified by the manufacturer. The joint shall ~~be~~ remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM F-1055.		Minor wordsmithing change.
	M2105.11.3 Stab-type insert fittings. Joint surfaces shall be clean and free ~~of~~ from moisture. Pipe ends shall be chamfered		Minor wordsmithing change.
	M2105.12.1 Heat-fusion joints. Heat-fusion joints for polypropylene (PP) pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings, electrofusion polypropylene fittings or by butt fusion. Joint surfaces shall be clean and free from moisture. The joint shall ~~be~~ remain undisturbed until cool. Joints shall be made in accordance with ASTM F-2389.		Minor wordsmithing change.

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	M2105.13 Raised temperature polyethylene (PE-RT) plastic tubing. Joints between raised temperature polyethylene tubing and fittings shall comply with Sections M2105.13.1 ~~and through~~ M2105.13.2~~4~~. Mechanical joints shall comply with Section M2105.8.1.		No Houston amendment.
	M2105.13.3 Heat-fusion joints. Heat-fusion joints shall be of the socket-fusion, saddle-fusion or butt-fusion type, and shall be joined in accordance with ASTM D2657. Joint surfaces shall be clean and free from moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM D2683 or ASTM D3261.		No Houston amendment.
	M2105.13.4 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free from moisture and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for the period of time specified by the manufacturer and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM F1055.		No Houston amendment.
2015 Houston IRC Amendments	**2021 IRC – Chapter 22 – Special Piping and Storage Systems**	**2021 Houston IRC Amendments**	**Code Change Summary**
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*.		**SECTION M2201** **OIL TANKS** **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*.	No change to Houston amendment.
	M2201.2.2 Out~~side~~doors above-ground tanks. Tanks installed out~~side~~doors, above ground shall be ~~a minimum of~~not less than 5 feet (1524 mm) from an adjoining property line. Such tanks shall be suitably protected from the weather and from physical damage.		Minor wordsmithing change.
	M2201.6 Flood-resistant installation. In flood hazard areas as established by Table R301.2(1), tanks shall be installed in accordance with Section R322.2.4 or R322.3.~~7~~10.		Base code renumbering.
	M2201.7 Tanks abandoned or removed. ~~Exterior~~ Outdoor above-grade fill piping shall be removed when tanks are abandoned or removed. Tank abandonment and removal shall be in accordance with the *International Fire Code*.		No Houston amendment.
	M2202.1 Materials. Piping shall consist of steel pipe, copper and copper-alloy pipe and tubing, ~~or~~ steel tubing conforming to **ASTM A539**, or stainless steel tubing conforming to **ASTM A254)** or **ASTM A269**. Aluminum tubing shall not be used between the fuel-oil tank and the burner units.		Piping materials updated to include stainless steel per ASTM standards.

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	M2202.2 Joints and fittings. Piping shall be connected with ~~standard~~ fittings compatible with the piping material. Cast-iron fittings shall not be used for oil piping. Unions requiring gaskets or packings, right or left couplings, and sweat fittings employing solder having a melting point less than 1,000°F (538°C) shall not be used for oil piping. Threaded joints and connections shall be made tight with a lubricant or pipe thread compound.		Minor wordsmithing change.
	M2203.2 Supply piping. Supply piping used in the installation of oil burners and *appliances* shall be not smaller than 3/8 -inch (9 mm) pipe or 3/8 -inch (9 mm) outside diameter tubing. Copper tubing and fittings shall be ~~a minimum of~~ Type L or heavier.		Minor wordsmithing change.
	M2203.5 Vent termination. Vent piping shall terminate outside of buildings at a point not less than 2 feet (610 mm), measured vertically or horizontally, from any building opening. Outer ends of vent piping shall terminate in a weather-proof cap or fitting having an unobstructed area ~~at least~~ equal to or greater than the cross-sectional area of the vent pipe, and shall be located sufficiently above the ground to avoid being obstructed by snow and ice.		Minor wordsmithing change.
	M2204.2 Shutoff valves. A ~~readily accessible~~ manual shutoff valve shall be installed between the oil supply tank and the burner. Such valve shall be provided with ready access. Where the shutoff valve is installed in the discharge line of an oil pump, a pressure- relief valve shall be incorporated to bypass or return surplus oil. Valves shall comply with UL 842.		Minor wordsmithing change.

2015 Houston IRC Amendments	2021 IRC – Chapter 23 – Solar Thermal Energy Systems	2021 Houston IRC Amendments	Code Change Summary
	SECTION M2301 **~~THERMAL~~ SOLAR THERMAL ENERGY SYSTEMS** **M2301.1 General.** This section provides for the design, construction, installation, *alteration* and repair of *equipment* and systems using ~~thermal~~ solar thermal energy to provide space heating or cooling, hot water heating and swimming pool heating.		Minor wordsmithing change.
	M2301.2 Design and installation. The design and installation of ~~thermal~~ solar thermal energy systems shall comply with Sections M2301.2.1 through M2301.2.13.		Minor wordsmithing change.
	M2301.2.1 Access. ~~Solar energy collectors, controls, dampers, fans, blowers and pumps shall be accessible for inspection, maintenance, repair and replacement~~ Access shall be provided to solar energy *equipment* for maintenance. Solar systems and appurtenances shall not obstruct or interfere with the operation of any doors, windows or other building components requiring operation or access.		Solar access requirements have been updated.
	M2301.2.2.2 Collector sensors. Collector sensor installation, sensor location and the protection of exposed sensor wires from ~~ultraviolet light~~ degradation shall be in accordance with ICC 900/SRCC 300.		Minor wordsmithing and new reference standard added.

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	M2301.2.3 Pressure and temperature relief valves and system components. System components containing fluids shall be protected with temperature and pressure relief valves or pressure relief valves. Relief devices shall be installed in sections of the system so that a section cannot be valved off or isolated from a relief device. Direct systems and the potable water portion of indirect systems shall be equipped with a relief valve in accordance with Section P2804. For indirect systems, pressure relief valves in solar loops shall comply with **ICC 900/**SRCC 300. System components shall have a working pressure rating of not less than the setting of the pressure relief device.		New ICC reference standard added.
	M2301.2.4 Vacuum relief. System components that might be subjected to ~~pressure drops below atmospheric pressure~~a vacuum during operation or shutdown shall be ~~protected by~~designed to withstand such a vacuum- or shall be protected with vacuum relief valves.		Minor wordsmithing to clarify vacuum relief requirements.
	M2301.2.6 Protection from freezing. System components shall be protected from damage resulting from freezing of heat-transfer liquids at the winter design temperature provided in Table R301.2(1). Freeze protection shall be provided ~~by heating, insulation, thermal mass and heat transfer fluids with freeze points lower than the winter design temperature, heat tape or other *approved* methods, or combinations thereof~~in accordance with ICC 900/SRCC 300. Drain-back systems shall be installed in compliance with Section M2301.2.6.1. Systems utilizing freeze-protection valves shall comply with Section M2301.2.6.2. **Exception:** Where the 97.5-percent winter design temperature is greater than ~~32°F (0°C)~~or equal to 48°F (9°C).		Updated requirements for protection of solar system components from freezing.
	M2301.2.6.1 Drain-back systems. Drain-back systems shall be designed and installed to allow for manual gravity draining of fluids from areas subject to freezing to locations not subject to freezing, and air filling of the components and piping. Such piping and components shall maintain a horizontal slope in the direction of flow of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope). Piping and components subject to manual gravity draining shall permit subsequent air filling upon drainage and air venting upon refilling.		New requirements for drain-back systems.
	M2301.2.6.2 Freeze-protection valves. Freeze-protection valves shall discharge in a manner that does not create a hazard or structural damage.		New requirements for freeze-protection valves.
	M2301.2.7 Storage tank sensors. Storage tank sensors shall comply with ICC 900/SRCC 300.		New ICC reference standard added.

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	M2301.2.8 Expansion tanks. Expansion tanks in solar energy systems shall be installed in accordance with Section M2003 in solar collector loops that contain pressurized heat transfer fluid. Where expansion tanks are used, the system shall be designed in accordance with ICC 900/SRCC 300 to provide an expansion tank that is sized to withstand the maximum operating pressure of the system. **Exception:** Expansion tanks shall not be required in the collector loop of *drain-back systems*.		New ICC reference standard added and exception requirement has been clarified.
	M2301.2.9 Roof and wall penetrations. Roof and wall penetrations shall be flashed and sealed in accordance with Chapter 9 ~~of this code~~ to prevent entry of water, rodents and insects.		Minor wordsmithing change.
	M2301.2.10 Description and warning labels. Solar thermal systems shall comply with description label and warning label requirements of Section M2301.2.11.2 and ICC 900/SRCC 300.		New ICC reference standard added.
	M2301.2.11.1 Solar loop isolation. Valves shall be installed to allow the solar ~~collectors~~ loop to be isolated from the remainder of the system.		Minor wordsmithing change.
	M2301.3.1 Collectors and panels. Solar thermal collectors and panels shall be listed and labeled in accordance with ~~SRCC 100 or SRCC 600. Collectors and panels shall be *listed* and *labeled* to show the manufacturer's name, model number, serial number, collector weight, collector maximum allowable temperatures and pressures, and the type of heat transfer fluids that are compatible with the collector or panel. The *label* shall clarify that these specifications apply only to the collector or panel~~ ICC 901/SRCC 100. Factory-built collectors shall bear a label indicating the manufacturer's name, model number and serial number.		Collector and panel requirements have been updated and new ICC reference added.
	M2301.3.2 Thermal storage units. Pressurized ~~thermal~~ water storage ~~units~~ tanks shall bear ~~*listed* and *labeled* to show~~ a label indicating the manufacturer's name and address, model number, serial number, storage unit maximum and minimum allowable operating temperatures and ~~pressures, and the type of heat transfer fluids that are compatible with the storage unit~~ allowable operating temperatures and storage unit maximum and minimum allowable operating pressures. The *label* shall clarify that these specifications apply only to the ~~thermal~~ water storage ~~unit~~ tanks.		Minor updates to thermal storage unit requirements.
	M2301.4 Heat transfer gasses or liquids and heat exchangers. *Essentially toxic transfer fluids*, ethylene glycol, flammable gases and flammable liquids shall not be used as heat-transfer fluids. Heat transfer gas~~s~~es and liquids shall be rated to withstand the system's maximum design temperature under operating conditions without degradation. Heat exchangers used in solar thermal systems shall comply with Section P2902.5.2 and ICC 900/SRCC 300.		New ICC reference standard added.

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	Heat transfer fluids shall be in accordance with SRCC 300. The flash point of the heat transfer fluids utilized in solar thermal systems shall be not less than 50°F (28°C) above the design maximum nonoperating or no-flow temperature attained by the fluid in the collector.		

2015 Houston IRC Amendments	2021 IRC – Chapter 24 – Fuel Gas	2021 Houston IRC Amendments	Code Change Summary
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 commonly encountered in the construction of one- and two-family *dwellings* and *structure*s regulated by this *code.* Covering of *piping systems* shall extend from the *point of delivery* to the outlet of the *appliance* shutoff *valves*. *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.*		**SECTION G2401** **GENERAL** **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 commonly encountered in the construction of one- and two-family dwellings and structures regulated by this *code.* Covering 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.*	No change to Houston amendment.

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	AIR CONDITIONER, GAS-FIRED. A gas-burning, automatically operated *appliance* for supplying cooled ~~and/or~~ air, dehumidified air, or both, or chilled liquid.		Minor updates to fuel gas definition.
	APPLIANCE. Any apparatus or device that utilizes a fuel or a raw material as a fuel to produce light, heat, power, refrigeration or air conditioning. Also, an apparatus that compresses fuel gases.		Minor updates to fuel gas definition.
	APPLIANCE, AUTOMATICALLY CONTROLLED. Appliances equipped with an automatic *burner* ignition and safety shut-off device and other automatic devices, ~~which~~ that accomplish complete turn-on and shut-off of the gas to the *main burner* or *burners*, and graduate the gas supply to the *burner* or *burners*, but do not affect complete shut-off of the gas.		Minor wordsmithing change.
	APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests ~~or~~, furnishing inspection services or furnishing certification, where such agency has been approved by the *code official*.		Minor wordsmithing change.
	DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the *building's* perimeter plus the depth number~~,~~ (in feet~~,~~) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).		Minor wordsmithing change.
	DRAFT HOOD. A nonadjustable device built into an *appliance*, or made as part of the *vent connector* from an *appliance*, that is designed to ~~(1)~~, provide for ready escape of the *flue gases* from the *appliance* in the event of no *draft,* backdraft, or stoppage beyond the *draft hood*~~, (2)~~, prevent a backdraft from entering the *appliance*~~,~~ and ~~(3)~~ neutralize the effect of stack action of the chimney or gas vent upon operation of the *appliance*.		Minor wordsmithing change.
	FURNACE PLENUM. An air compartment or chamber to which one or more ducts are connected and ~~which~~ that forms part of an air distribution system.		Minor wordsmithing change.
	INFRARED RADIANT HEATER. A heater ~~which~~ that directs ~~a~~ substantial amount of its energy output in the form of infrared radiant energy into the area to be heated. Such heaters are of either the vented or unvented type.		Minor wordsmithing change.

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	JOINT, MECHANICAL. A general form of gas-tight joints obtained by the joining of metal parts through a positive-holding mechanical construction, such as a press-connect joint, flanged joint, threaded joint, flared joint or compression joint.		Minor wordsmithing change.
	JOINT, PLASTIC ADHESIVE. A joint made in thermoset plastic *piping* by the use of an adhesive substance ~~which~~ that forms a continuous bond between the mating surfaces without dissolving either one of them.		Minor wordsmithing change.
	NONCOMBUSTIBLE MATERIALS. Materials that, when~~n~~re tested in accordance with ASTM E-136, have ~~at least~~ not fewer than three of four specimens tested meeting all of the following criteria: 1. The recorded temperature of the surface and interior thermocouples shall not at any time during the test rise more than 54ºF (30ºC) above the furnace temperature at the beginning of the test. 2. There shall not be flaming from the specimen after the first 30 seconds. 3. If the weight loss of the specimen during testing exceeds 50 percent, the recorded temperature of the surface and interior thermocouples shall not at any time during the test rise above the furnace air temperature at the beginning of thetest, and there shall not be flaming of the specimen.		Minor wordsmithing change.
	PIPING. Where used in this code, *"piping"* refers to either *pipe* or *tubing*, or both. **Pipe.** A rigid conduit of iron, steel, copper, ~~brass~~ copper-alloy or plastic. Tubing. Semirigid conduit of copper, copper-alloy, aluminum, plastic or steel.		Piping now includes copper-alloy.
	PIPING SYSTEM. ~~All~~ The fuel *piping,* valves and fittings from the outlet of the *point of delivery* to the outlets of the *appliance* shutoff valves.		Minor wordsmithing change.
	POINT OF DELIVERY. For natural gas systems, the *point of delivery* is the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where a meter is not provided. Where a system shutoff valve is provided after ~~a t~~ the outlet of the service meter assembly, such valve shall be considered to be downstream of the *point of delivery*. For undiluted liquefied petroleum gas systems, the *point of delivery* shall be considered to be the outlet of the service pressure regulator, exclusive of line gas regulators, in the system.		Minor update to base code definition.

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	PRESS-CONNECT JOINT. A permanent mechanical joint incorporating an elastomeric seal or an elastomeric seal and corrosion-resistant grip or bite ring. The joint is made with a pressing tool and jaw or ring approved by the fitting manufacturer.		New base code definition.
	REGULATOR, MONITORING. A pressure regulator set in series with another pressure regulator for the purpose of preventing an overpressure in the downstream piping system.		New base code definition.
	ROOM HEATER, VENTED. A free-standing heating unit used for direct heating of the space in and adjacent to that in which the unit is located. (See ~~**also**~~ "Vented room heater.")		Minor wordsmithing changes.
	SERVICE METER ASSEMBLY. The meter, valve, regulator, piping, fittings and equipment installed by the service gas supplier before the *point of delivery*.		New base code definition.
	SYSTEM SHUTOFF. A valve installed after the *point of delivery* to shut off the entire piping system.		New base code definition.
	TOILET, GAS-FIRED. A packaged and completely assembled appliance containing a toilet that incinerates refuse instead of flushing it away with water.		New base code definition.
	UNIT HEATER. A self-contained, automatically controlled, vented, fuel-gas-burning, space-heating appliance, intended for installation in the space to be heated without the use of ducts, and having integral means for circulation of air ~~High-static pressure type. A self-contained, automatically controlled, vented *appliance* having integral means for circulation of air against 0.2 inch w.c. (50 Pa) or greater static pressure. Such *appliance* is equipped with provisions for attaching an outlet air duct and, where the *appliance* is for indoor installation remote from the space to be heated, is also equipped with provisions for attaching an inlet air duct.~~ ~~Low-static pressure type. A self-contained, automatically controlled, vented *appliance*, intended for installation in the space to be heated without the use of ducts, having integral means for circulation of air. Such units are allowed to be equipped with louvers or face extensions made in accordance with the manufacturer's specifications.~~		Updates to unit heater definition.

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	VALVE. A device used in *piping* to control the gas supply to any section of a system of *piping* or to an *appliance*. **Appliance shutoff.** A *valve* located in the *piping system*, used to isolate individual *appliances* for purposes such as service or replacement. **Automatic.** An automatic or semiautomatic device consisting essentially of a *valve* and an operator that control the gas supply to the *burner(s)* during operation of an *appliance*. The operator shall be actuated by application of gas pressure on a flexible diaphragm, by electrical means, by mechanical means or by other *approved* means. **Automatic gas shutoff.** A *valve* used in conjunction with an automatic gas shutoff device to shut off the gas supply to a water-heating system. It shall be constructed integrally with the gas shutoff device or shall be a separate assembly. **Individual main burner.** A *valve* that controls the gas supply to an individual *main burner*. **Main burner control.** A *valve* that controls the gas supply to the *main burner* manifold. **Manual main gas-control.** A manually operated *valve* in the gas line for the purpose of completely turning on or shutting off the gas supply to the *appliance*, except to *pilot* or pilots that are provided with independent shutoff. **Manual reset.** An automatic shutoff valve installed in the gas supply *piping* and set to shut off when unsafe conditions occur. The device remains closed until manually reopened. **Service shutoff.** A valve, installed by the serving gas supplier between the ~~service meter or~~ source of supply and the *point of delivery*~~customer *piping system*~~, to shut off the entire *piping system*.		Minor wordsmithing change.
	G2404.3 (301.3) Listed and labeled. *Appliances* regulated by this *code* shall be *listed* and *labeled* for the application in which they are used unless otherwise *approved* in accordance with Section R104.11. The approval of unlisted *appliances* in accordance with Section R104.11 shall be based ~~**up**~~on *approved* engineering evaluation.		Minor wordsmithing change.
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.~~	No change to Houston amendment.

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	G2404.8 (301.12) Seismic resistance. When~~re~~ earthquake loads are applicable in accordance with this code, the supports shall be designed and installed for the seismic forces in accordance with this code.		Minor wordsmithing change.
	SECTION G2405 (302) **STRUCTURAL SAFETY** **G2405.1 (302.1) Structural safety.** The building shall not be weakened by the installation of any gas *piping*. In the process of installing or repairing~~,~~ any gas *piping*, the finished floors, walls, ceilings, tile work or any other part of the building or premises ~~which~~ that is required to be changed or replaced shall be left in a safe structural condition in accordance with the requirements of this code.		Minor wordsmithing change.
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 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.	**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 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 c~~*Combustion air* shall be taken directly from the outdoors in accordance with Section G2407.6. 6. ~~A clothes dryer is installed in a residential bathroom or toilet room having a permanent opening with an area of not less than 100 square inches (0.06 M²)~~ that communicates with a space outside of a sleeping room, bathroom, toilet room or storage closet.		Minor update to base code requirements. Previous Houston amendment removed to go with base code requirements.

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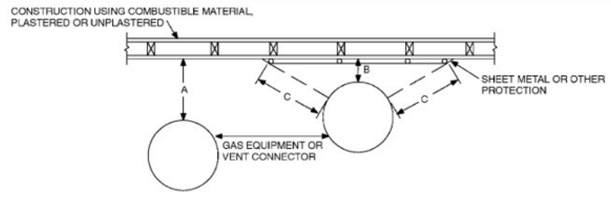
	G2407.5.3.1 (304.5.3.1) Combining spaces on the same story. ~~E~~Where combining spaces on the same story, each opening shall have a minimum free area of 1 square inch per 1,000 *Btu*/h (2,200 mm^2/kW) of the total input rating of all *appliances* in the space, but not less than 100 square inches (0.06 m^2). One permanent opening shall commence within 12 inches (305 mm) of the top and one permanent opening shall commence within 12 inches (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 inches (76 mm).		Minor wordsmithing changes.
	G2407.5.3.2 (304.5.3.2) Combining spaces in different stories. The volumes of spaces in different stories shall be considered ~~as~~ to be communicating spaces where such spaces are connected by one or more permanent openings in doors or floors having a total minimum free area of 2 square inches per 1,000 *Btu*/h (4402 mm^2/kW) of total input rating of all *appliances*.		Minor wordsmithing changes.
	G2407.6.2 (304.6.2) One-permanent-opening method. One permanent opening, commencing within 12 inches (305 mm) of the top of the enclosure, shall be provided. The *appliance* shall have *clearances* of ~~at least~~ not less than 1 inch (25 mm) from the sides and back and 6 inches (152 mm) from the front of the *appliance*. The opening shall directly communicate with the outdoors or through a vertical or horizontal duct to the outdoors, or spaces that freely communicate with the outdoors (see Figure G2407.6.2) and shall have a minimum free area of 1 square inch per 3,000 *Btu*/h (734 mm^2/kW) of the total input rating of all *appliances* located in the enclosure and not less than the sum of the areas of all *vent connectors* in the space.		Minor wordsmithing changes.
	G2407.8 (304.8) Engineered installations. Engineered *combustion air* installations shall provide an adequate supply of *combustion*, *ventilation* and *dilution air* ~~and shall be *approve*~~ determined using *approved* engineering methods.		Minor wordsmithing changes.
	 NOTES: "A" ~~equals~~ = the *clearance* without protection. "B" ~~equals~~ = the reduced *clearance* permitted in accordance with Table G2409.2. The protection applied to the construction using *combustible material* shall extend far enough in each direction to make "C" equal to "A." **FIGURE G2409.2(1) [308.2(1)]** **EXTENT OF PROTECTION NECESSARY TO REDUCE CLEARANCES FROM GAS EQUIPMENT OR VENT CONNECTORS**		Minor wordsmithing changes.

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TABLE G2409.2 (308.2)[a through k]
REDUCTION OF CLEARANCES WITH SPECIFIED FORMS OF PROTECTION

	WHERE THE REQUIRED CLEARANCE WITH NO PROTECTION FROM APPLIANCE, VENT CONNECTOR, OR SINGLE-WALL METAL PIPE IS: (inches)									
	36		18		12		9		6	
	Allowable clearances with specified protection (inches)									
	Use Column 1 for clearances above appliance or horizontal connector. Use Column 2 for clearances from appliance, vertical connector and single-wall metal pipe.									
	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2	Above Col. 1	Sides and rear Col. 2
1. 3 1/2-inch-thick masonry wall without ventilated airspace	—	24	—	12	—	9	—	6	—	5
2. 1/2-inch insulation board over 1-inch glass fiber or mineral wool batts	24	18	12	9	9	6	6	5	4	3
3. 0.024-inch (nominal 24 gage) sheet metal over 1-inch glass fiber or mineral wool batts reinforced with wire on rear face with ventilated airspace	18	12	9	6	6	4	5	3	3	3
4. 3 1/2-inch-thick masonry wall with ventilated airspace	—	12	—	6	—	6	—	6	—	6
5. 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	2
6. 1/2-inch-thick insulation board with ventilated airspace	18	12	9	6	6	4	5	3	3	3
7. 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace over 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	3
8. 1-inch glass fiber or mineral wool batts sandwiched between two sheets 0.024-inch (nominal 24 gage) sheet metal with ventilated airspace	18	12	9	6	6	4	5	3	3	3

For SI: 1 inch = 25.4 mm, °C = [(°F - 32)/1.8], 1 pound per cubic foot = 16.02 kg/m^3, 1 Btu per inch per square foot per hour per °F = 0.144 W/m^2 ~~x~~ K.

a. Reduction of *clearances* from *combustible materials* shall not interfere with combustion air, draft hood *clearance* and relief, and accessibility of servicing.
b. ~~All c~~*C*learances shall be measured from the outer surface of the *combustible material* to the nearest point on the surface of the *appliance*, disregarding any intervening protection applied to the *combustible material*.
c. Spacers and ties shall be of *noncombustible material*. A spacer or tie shall not be used directly opposite an *appliance* or *connector*.
d. For all clearance reduction systems using a ventilated airspace, adequate provision for air circulation shall be provided as described [see Figures G2409.2(2) and G2409.2(3)].
e. There shall be ~~at least~~**not less than** 1 inch between *clearance* reduction systems and combustible walls and ceilings for reduction systems using ventilated airspace.
f. Where a wall protector is mounted on a single flat wall away from corners, it shall have ~~an~~ **a minimum 1-inch** air gap ~~of not less than 1 inch~~. To provide air circulation, the bottom and top edges, or only the side and top edges, or all edges shall be left open.
g. Mineral wool batts (blanket or board) shall have a density of ~~not less than~~ 8 pounds per cubic foot and a **minimum** melting point of ~~not less than~~ 1500°F.
h. Insulation material used as part of a *clearance* reduction system shall have a thermal conductivity of 1.0 Btu per inch per square foot per hour per °F or less.
i. There shall be not less than 1 inch between the *appliance* and the protector. **In no case shall T**~~t~~he *clearance* between the *appliance* and the combustible surface ~~shall not~~ be reduced below that allowed in this table.
j. ~~All c~~*C*learances and thicknesses are minimum; larger *clearances* and thicknesses are acceptable.
k. *Listed* single-wall connectors shall be installed in accordance with the manufacturer's instructions.

Minor wordsmithing changes to table.

SECTION G2411 (310)
ELECTRICAL BONDING

G2411.1 (310.1) Pipe and tubing other than CSST. Each above-ground portion of a *gas piping system* other than corrugated stainless steel tubing (CSST) that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. *Gas piping* other than CSST shall be considered to be bonded where it is connected to an *appliance*~~s~~ that ~~are~~ is connected to the *equipment* grounding conductor of the circuit that ~~supplying~~ supplies that *appliance*.

Minor wordsmithing changes.

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	G2411.~~1.1~~2 (310.~~1.1~~2) CSST. This section applies to ~~C~~corrugated stainless steel tubing (CSST) that is not listed with an arc-resistant jacket or coating system in accordance with ANSI LC1/CSA 6.26. CSST gas *piping* systems and piping systems containing one or more segments of CSST shall be electrically continuous and bonded to the electrical service grounding electrode system or, where provided, the lightning protection **grounding** electrode system.		Base code renumbering. Minor updates to table and new referenced standard included.
	G2411.~~1.1~~2.1 (310.~~1.1~~2.1) Point of connection.		Base code renumbering.
	G2411.~~1.1~~2.2 (310.~~1.1~~2.2) Size and material of jumper. The bonding jumper shall be not smaller than 6 AWG copper wire ~~of~~ or equivalent.		Base code renumbering.
	G2411.~~1.1~~2.3 (310.~~1.1~~2.3) 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~~installed to meet this requirement shall be bonded to the electrical service grounding electrode system or, where provided, the lightning protection grounding electrode system.		Base code renumbering and minor wordsmithing.
	G2411.~~1.1~~2.4 (310.~~1.1~~2.4) Bonding connections.		Base code renumbering.
	2411.~~1.1~~2.5 (310.~~1.1~~2.5) Connection devices.		Base code renumbering.
	G2411.3 (310.3) Arc-resistant CSST. This section applies to corrugated stainless steel tubing (CSST) that is listed with an arc-resistant jacket or coating system in accordance with ANSI LC1/CSA 6.26. The CSST shall be electrically continuous and bonded to an effective ground fault current path. Where any CSST component of a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of Section G2411.2 shall apply. Arc-resistant-jacketed CSST shall be considered to be bonded where it is connected to an appliance that is connected to the appliance grounding conductor of the circuit that supplies that appliance.		New section provided for arc-resistant CSST requirements.
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.	No change to Houston amendment.

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	G2412.8 (401.8) Minimum sizes. ~~All *p*~~*Pipe* utilized for the installation, extension and *alteration* of any *piping system* shall be sized to supply the full number of outlets for the intended purpose and shall be sized in accordance with Section G2413.		Minor wordsmithing changes.
	G2412.9 (401.9) Identification. Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer. **Exceptions:** 1. Steel pipe sections that are 2 feet (610 mm) and less in length and are cut from longer sections of pipe. 2. Steel pipe fittings 2 inches and less in size. 3. Where identification is provided on the product packaging or crating. 4. Where other approved documentation is provided.		New exceptions provided for pipe identification.
	G2412.10 (401.10) ~~Third-party testing and certification~~ Piping materials standards. Piping, tubing and fittings shall ~~comply with~~ be manufactured to the applicable referenced standards, specifications and performance criteria ~~of this code~~ listed in Section G2414 and shall be identified in accordance with Section G2412.9.~~Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved *third-party certification agency*.~~		Minor updates to piping requirements.
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.~~	**G2413.3 (402.3) Sizing.** *Gas piping* shall be sized in accordance with one of the following: 1. *Pipe* sizing tables or sizing equations in accordance with Section G2413.4 or G2413.5, as applicable. 2. The sizing tables included in a *listed piping* system's manufacturer's installation instructions. 3. ~~Other *approved*~~ *Approved* engineering methods.	**SECTION G2413** **PIPE SIZING** **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 or G2413.5, as applicable.~~ ~~2. The sizing tables included in a *listed piping* system's manufacturer's installation instructions.~~ ~~3. *Approved engineering methods*.~~	Minor updates to base code. No change to Houston amendment.
	G2413.4 (402.4) Sizing tables and equations. This section applies to piping materials other than noncorrugated stainless steel tubing. Where Tables G2413.4(1) through G2413.4(21) are used to size *piping* or *tubing*, the *pipe* length shall be determined in accordance with Section G2413.4.1, G2413.4.2 or G2413.4.3. Where Equations 24-3 and 24-4 are used to size *piping* or *tubing*, the *pipe* or *tubing* shall have smooth inside walls and the pipe length shall be determined in accordance with Section G2413.4.1, G2413.4.2 or G2413.4.3. 1. Low-pressure gas equation [Less than 1 1/2 pounds per square inch (psi) (10.3 kPa)]: **(Equation** $D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{C_r \times L}\right)^{0.206}}$ **24-3)** 2. High-pressure gas equation [1.~~5~~ 1/2 psi (10.3 kPa) and above]:		Minor updates and wordsmithing.

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	(Equation 24-4) $D = \frac{Q^{0.381}}{18.93\left[\frac{(P_1^2 - P_2^2) \times Y}{C_r \times L}\right]^{0.206}}$ where: *D* = Inside diameter of *pipe*, inches (mm). *Q* = Input rate *appliance(s)*, cubic feet per hour at 60ºF (16ºC) and 30-inch mercury column. *P1* = Upstream pressure, psia (*P1* + 14.7). *P2* = Downstream pressure, psia (*P2* + 14.7). *L* = Equivalent length of *pipe*, feet. ΔH = *Pressure drop*, inch water column (27.7 inch water column = 1 psi).		
	G2413.5 (402.5) Noncorrugated stainless steel tubing. Noncorrugated stainless steel tubing shall be sized in accordance with Equations 24-3 and 24-4 of Section 2413.4 in conjunction with Section 2413.4.1, 2413.4.2 or 2413.4.3.		New requirements for noncorrugated stainless steel tubing.
{EDITORIAL NOTE: **DELETE SECTION G2413.6 (402.6) IN ITS ENTIRETY.}**	**G2413.5~~6~~ (402.5~~6~~) Allowable pressure drop.** The design pressure loss in any *piping system* under maximum ~~probable flow conditions~~ demand, from the *point of delivery* to the inlet connection of ~~the *appliance*~~, all *appliances* served, shall be such that the supply pressure at ~~the~~ each *appliance* inlet is greater than or equal to the minimum pressure required by the *appliance*.		Base code renumbering and minor wordsmithing. Previous Houston amendment modified and relocated to G2413.7.
	G2413.6~~7~~ (402.6~~7~~) 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~~ joints are welded or brazed. 2. The *piping* is joined by fittings *listed* to ANSI LC4/CSA 6.32 and installed in accordance with the manufacturer's instructions. ~~2~~3. The piping joints are flanged and pipe-to-flange connections are made by welding or brazing. ~~3~~4. The *piping* is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation. 4~~5~~. The *piping* is a temporary installation for buildings under construction.	**G2413.7 (402.7) Maximum 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 allowed by Section 1210.5 of the *Plumbing Code*. ~~one or more of the following conditions are met:~~ ~~1. The *piping* joints are welded or brazed.~~ ~~2. The *piping* is joined by fittings *listed* to ANSI LC4/CSA 6.32 and installed in accordance with the manufacturer's instructions.~~ ~~3. The *piping* joints are flanged and pipe-to-flange connections are made by welding or brazing.~~ ~~4. The *piping* is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.~~ ~~5. The *piping* is a temporary installation for buildings under construction.~~	Base code renumbering and updates to operating pressure requirements. Houston amendment has been modified from previous version in Section G2413.6. Provides requirements for operating pressures to comply with the Houston Plumbing Code.
	G2413.6~~7~~.1 (402.6~~7~~.1) ~~Liquefied petroleum gas systems~~**Operation below -5°F (-21°C).**		Base code renumbering and section renamed.

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	G2414.2 (403.2) Used materials. *Pipe*, fittings, *valves* or other materials shall not be used again unless they are free ~~of~~ **from** foreign materials and have been ascertained to be adequate for the service intended.		Minor wordsmithing change.
	~~**G2414.3 (403.3) Other materials.** Material not covered by the standards specifications listed herein shall be investigated and tested to determine that it is safe and suitable for the proposed service, and, in addition, shall be recommended for that service by the manufacturer and shall be *approved* by the *code official*.~~		Base code section removed.
	~~G2414.4~~ **G2414.3 (403.3) Metallic pipe.**		Base code renumbering.
	~~G2414.4.1~~ **G2414.3.1 (403.3.1) Cast iron.**		Base code renumbering.
	~~G2414.4.2~~ **G2414.3.2 (403.3.2) Steel.** Steel, stainless steel and wrought-iron *pipe* shall not be ~~at least of standard weight (Schedule 40)~~lighter than Schedule 10 and shall comply with the dimensional standards of ASME B36.10, 10M and one of the following standards: 1. ~~ASME B 36.10, 10M~~ ASTM A53/A53M. 2. ASTM A~~ 53/A 53M~~ 106. 3. ASTM A~~ 106~~ 312.		Base code renumbering and updates to section clarifying steel pipe requirements.
	~~G2414.5~~ **G2414.4 (403.4) Metallic tubing.** ~~Seamless copper, aluminum alloy and steel t~~*Tubing* shall not be used with gases corrosive to ~~such~~ the tubing materials~~.~~		Base code renumbering and updates to section requirements.
	~~G2414.5.1~~ **G2414.4.1 (403.4.1) Steel tubing.**		Base code renumbering.
	~~G2414.5.2~~ **G2414.4.2 (403.4.2) Stainless steel.** Stainless steel tubing shall comply with ASTM A268 or ASTM A269.		Base code renumbering and new stainless steel tubing requirements.
	~~G2414.5.3~~ **G2414.4.3 (403.4.3) Copper or copper-alloy tubing.**		Base code renumbering.

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	~~G2414.5.4~~ **G2414.4.4 (403.4.5) Corrugated stainless steel tubing.**		Base code renumbering.
	~~G2414.6~~ **G2414.5 (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~~ Polyamide pipe, tubing and fittings~~, other than polyethylene~~, shall be identified and conform to ~~the 2008 edition of~~ ASTM ~~D 2513~~ F2945. Such pipe shall be marked "Gas" and "ASTM ~~D 2513~~ F2945." Polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) plastic pipe, tubing and fittings shall not be used to supply fuel gas.		Base code renumbering and minor wordsmithing.
	~~G2414.6.1~~ **G2414.5.1 (403.5.1) Anodeless risers.**		Base code renumbering.
	~~G2414.6.2~~ **G2414.5.2 (403.5.2) LP-gas systems.**		Base code renumbering.
	~~G2414.6.3~~ **G2414.5.3 (403.5.3) Regulator vent piping.**		Base code renumbering.
	~~G2414.7~~ **G2414.6 (403.6) Workmanship and defects.** *Pipe, tubing* and fittings shall be clear and free from cutting burrs and defects in structure or threading, and shall be thoroughly brushed, and chip and scale blown. Defects in *pipe* ~~or~~, *tubing* ~~or~~ and fittings shall not be repaired. Defective *pipe*, *tubing* ~~or~~ and fittings shall be replaced. (See Section G2417.1.2.)		Base code renumbering and minor wordsmithing.
	~~G2414.8~~ **G2414.7 (403.7) Protective coating.**		Base code renumbering.
	~~G2414.9~~ **G2414.8 (403.8) Metallic pipe threads.**		Base code renumbering.

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	~~G2414.9.1~~ **G2414.8.1 (403.8.1) Damaged threads.**		Base code renumbering.
	~~G2414.9.2~~ **G2414.8.2 (403.8.2) Number of threads.**		Base code renumbering.
	~~TABLE G2414.9.2~~ **TABLE G2414.8.2(403.8.2)** **SPECIFICATIONS FOR THREADING METALLIC PIPE**		Base code renumbering.
	~~G2414.9.3~~ **G2414.8.3 (403.8.3) Threaded joint ~~compounds~~ sealing.** Threaded joints shall be made using a thread joint sealing material. Thread joint ~~compounds~~ sealing materials shall be nonhardening and shall be resistant to the ~~action of liquefied petroleum gas or to any other~~ chemical constituents of the gases to be ~~conducted~~ conveyed through the *piping*. Thread joint sealing materials shall be compatible with the pipe and fitting materials on which the sealing materials are used.		Base code renumbering and updates to thread sealing requirements.
	~~G2414.10~~ **G2414.9 (403.9) Metallic piping joints and fittings.** The type of *piping* joint used shall be suitable for ~~–~~the pressure-temperature conditions and shall be selected giving consideration to joint tightness and mechanical strength under the service conditions. The joint shall be able to sustain the maximum end force caused by the internal pressure and any additional forces ~~due to~~caused by temperature expansion or contraction, vibration, fatigue, or to the weight of the *pipe* and its contents.		Base code renumbering and minor wordsmithing.
	~~G2414.10.1~~ **G2414.9.1 (403.9.1) Pipe joints.** Schedule 40 and heavier ~~P~~*pipe* joints shall be threaded, flanged, brazed, welded or assembled with press-connect fittings listed in accordance with ANSI LC4/CSA 6.32. Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing or welded~~ing~~. Where nonferrous *pipe* is brazed, the *brazing* materials shall have a melting point in excess of 1,000ºF (538ºC). Brazing alloys shall not contain more than 0.05-percent phosphorus.		Base code renumbering and minor updates to pipe joint requirements.
	~~G2414.10.2~~ **G2414.9.2 (403.9.2) Copper tubing joints.** Copper ~~T~~*tubing* joints shall be ~~made~~assembled with *approved gas tubing* fittings~~,~~ ~~or~~shall be brazed with a material having a melting point in excess of 1,000ºF (538ºC) or ~~made~~assembled with press-connect fittings ~~complying with ANSI LC 4~~listed in accordance with ANSI LC4/CSA 6.32. *Brazing alloys* shall not contain more than 0.05-percent phos *Brazing* alloys shall not contain more than 0.05-percent phosphorus.		Base code renumbering with minor wordsmithing and updated reference standard.
	~~G2414.10.3~~ **G2414.9.3 (403.9.3) Stainless steel tubing joints.** Stainless steel tubing joints shall be welded, assembled with approved tubing fittings, brazed with a material having a melting point in excess of 1,000°F (538°C), or assembled with press-connect fittings listed in accordance with ANSI LC4/CSA 6.32.		Base code renumbering and updated steel tubing joint requirements.

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	~~G2414.10.4~~ **G2414.9.4 (403.10.4) Flared joints.**		Base code renumbering.
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. 4. Cast-iron bushings shall be rohibited. 5. Special fittings. Fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless or compressiontype *tubing* fittings shall be: used within the fitting manufacturer's pressuretemperature recommendations; used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion or contraction; and shall be *approved.* 6. Where pipe fittings are drilled and tapped in the field, the operation shall be in accordance with all of the following: 6.1 The operation shall be performed on systems having operating pressures of 5 psi (34.5 kPa) or less. 6.2 The operation shall be performed by the gas supplier or the gas supplier's designated representative. 6.3 The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier. 6.4 The fittings shall be located outdoors. 6.5 The tapped fitting assembly shall be inspected and proven to be free of leakage.	**~~G2414.10.5~~ G2414.9.5 (403.9.5) Metallic fittings.** Metallic fittings~~,~~ shall comply with the following: 1. Fittings used with steel, stainless steel or wrought-iron *pipe* shall be steel, stainless steel, copper alloy, malleable iron or cast iron. 2. Fittings used with copper or copper alloy *pipe* shall be copper or copper alloy. 3. Cast-iron bushings shall be prohibited. 4. 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*. 5. Where pipe fittings are drilled and tapped in the field, the operation shall be in accordance with all of the following: 5.1. The operation shall be performed on systems having operating pressures of 5 psi (34.5 kPa) or less. 5.2. The operation shall be performed by the gas supplier or the gas supplier's designated representative. 5.3. The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier. 5.4. The fittings shall be located outdoors. 5.5. The tapped fitting assembly shall be inspected and proven to be free of leakage.	**SECTION G2414** **PIPING MATERIALS** **G2414.9.5 (403.9.5) Metallic fittings.** Metallic fittings shall comply with the following: 1. Fittings used with steel, stainless steel or wrought-iron *pipe* shall be steel, stainless 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. ~~3~~4. Cast-iron bushings shall be prohibited. ~~4~~5. 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; and shall be *approved.* ~~5~~6. Where pipe fittings are drilled and tapped in the field, the operation shall be in accordance with all of the following: ~~5~~6.1. The operation shall be performed on systems having operating pressures of 5 psi (34.5 kPa) or less. ~~5~~6.2. The operation shall be performed by the gas supplier or the gas supplier's designated representative. ~~5~~6.3. The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier. ~~5~~6.4. The fittings shall be located outdoors. ~~5~~6.5. The tapped fitting assembly shall be inspected and proven to be free of leakage.	Base code renumbering and minor updates to requirements. No change to Houston amendment.
	~~G2414.11~~ G2414.10 (403.10) Plastic piping, joints and fittings. Plastic *pipe, tubing* and fittings shall be joined in accordance with the manufacturers' instructions. Such joints shall comply with the following: 1. The joints shall be designed and installed so that the longitudinal pull-out resistance of the joint~~s~~ will be ~~at least~~ greater than or equal to the tensile strength of the plastic *piping* material. 2. Heat-fusion joints shall be made in accordance with qualified procedures that have been established and proven by test to produce gas-tight joints ~~at least~~ as strong as or stronger than the *pipe* or *tubing* being joined. Joints shall be made with		Base code renumbering and minor wordsmithing. New reference standard and requirements for polyamide heat fusion fittings.

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	the joining method recommended by the *pipe* manufacturer. Polyethylene ~~Heat~~ heat fusion fittings shall be marked "**ASTM D2513**." Polyamide heat fusion fittings shall be marked "**ASTM F2945**." 3. Where compression-type *mechanical joints* are used, the gasket material in the fitting shall be compatible with the plastic *piping* and with the gas distributed by the system. An internal tubular rigid stiffener shall be used in conjunction with the fitting. The stiffener shall be flush with the end of the *pipe* or *tubing* and shall extend ~~at least~~ to or beyond the outside end of the compression fitting when installed. The stiffener shall be free of rough or sharp edges and shall not be a force ~~-~~fit in the plastic. Split tubular stiffeners shall not be used. 4. Plastic *piping* joints and fittings for use in *liquefied petroleum gas piping systems* shall be in accordance with NFPA 58.		
	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, plugs and caps. 2. Brazed fittings. 3. Welded fittings. 4. Fittings *listed* to ANSI LC~~-~~1/CSA 6.26 or ANSI LC~~-~~4/**CSA 6.32**.		Minor update to requirements and reference standard.
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.		**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 any point where the *pipe* enters the building.	No change to Houston amendment.
	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 1 1/2 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 (~~5~~ 102 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 (~~5~~ 102 mm) above the bottom framing member and not less than 4 inches (~~5~~ 102 mm) below the top framing member.		Update to correct metric measurements.
	G2415.8 (404.8) Piping in solid floors. *Piping* in solid floors shall be laid in channels in the floor and covered in a manner that will allow access to the *piping* with a minimum amount of damage to the building. Where such *piping* is subject to exposure to excessive moisture or corrosive substances, the *piping* shall be protected in an *approved* manner. As an alternative to installation in channels, the *piping* shall be installed in a conduit of Schedule 40 steel, wrought iron, PVC or ABS pipe in accordance with Section G2415.6~~8~~.1 or G2415.6~~8~~.2.		Base code renumbering.

	G2415.8.1 (404.8.1) Conduit with one end terminating outdoors. The conduit shall extend into an occupiable portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the *gas piping* shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall extend not less than 2 inches (51 mm) beyond the point where the *pipe* emerges from the floor. If the end sealing is capable of withstanding the full pressure of the gas *pipe,* the conduit shall be designed for the same pressure as the *pipe*. Such conduit shall extend not less than 4 inches (102 mm) outside the building, shall be vented above grade to the outdoors and shall be installed so as to prevent the entrance of water and insects.		Minor wordsmithing change.
	G2415.9 (404.9) Above-ground piping outdoors. *Piping* installed outdoors shall be elevated not less than 3 1/2 inches (~~152~~ 89 mm) above ground and where installed across roof surfaces, shall be elevated not less than 3 1/2 inches (~~152~~ 89 mm) above the roof surface. *Piping* installed above ground, outdoors, and installed across the surface of roofs shall be securely supported and located where it will be protected from physical damage. Where passing through an outside wall, the *piping* shall ~~also~~ be protected against corrosion by coating or wrapping with an inert material. Where *piping* is encased in a protective pipe sleeve, the annular space between the *piping* and the sleeve shall be sealed.		Update to correct metric measurement.
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~~ Steel 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~~ accordance with Sections G2415.11.1 through G2415.11.5.		Base code provisions for corrosion protection have been restructured into subsections of G2415. Previous Houston amendment has been relocated to Section G2415.11.3, no changes.
	G2415.11.1 (404.11.1) ~~Prohibited use~~ **Galvanizing.** ~~Uncoated threaded or socket-welded joints shall not be used in *piping* in contact with soil or where internal or external crevice corrosion is known to occur~~ Zinc coating shall not be deemed adequate protection for underground gas piping.		Base code provisions for corrosion protection have been restructured into subsections of G2415.
	G2415.11.2 (404.11.2) ~~Protective coatings and wrapping~~**Protection methods.** ~~Pipe protective coatings and wrappings shall be *approved* for the application and shall be factory applied.~~Underground piping shall comply with one or more of the following: ~~**Exception:** Where installed in accordance with the manufacturer's instructions, field application of coatings and wrappings shall be permitted for pipe nipples, fittings and locations where the factory coating or wrapping has been damaged or necessarily removed at joints.~~ **1.** The piping shall be made of corrosion-resistant material that is suitable for the environment in which it will be installed. **2.** Pipe shall have a factory-applied, electrically-insulating coating. Fittings and joints between sections		Base code provisions for corrosion protection have been restructured into subsections of G2415.

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	of coated pipe shall be coated in accordance with the coating manufacturer's instructions. **3.** The piping shall have a cathodic protection system installed and the system shall be monitored and maintained in accordance with an approved program.		
	G2415.11.3 (404.11.3) Dissimilar metals. Where dissimilar metals are joined underground, an insulating coupling or fitting shall be used.	**G2415.11.3 (404.11.3) Dissimilar metals.** Where dissimilar metals are joined ~~underground~~, an insulating coupling or fitting shall be used.	Base code provisions for corrosion protection have been restructured into subsections of G2415. No change to Houston amendment, relocated from Section G2415.11.
	G2415.11.4 (404.11.4) Protection of risers. Steel risers connected to plastic piping shall be cathodically protected by means of a welded anode, except where such risers are anodeless risers.		Base code provisions for corrosion protection have been restructured into subsections of G2415.
	~~**G2415.11.5 (404.11.5) Prohibited use.** Uncoated threaded or socket-welded joints shall not be used in *piping* in contact with soil or where internal or external crevice corrosion is known to occur.~~		Base code section relocated.
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.	**G2415.12.1 (404.12.1) Individual out~~side~~ door appliances.** Individual lines to outdoor lights, grills ~~or~~ and other *appliances* shall be installed not less than 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 ~~door~~ appliances.** Individual lines to outdoor lights, grills and 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.	Update wording to be in line with base code, no major change to Houston amendment.
	G2415.14 (404.14) Piping underground beneath buildings. *Piping* installed underground beneath buildings is prohibited except where the *piping* is encased in a conduit of wrought iron, plastic pipe, steel pipe, a piping or encasement system listed for installation beneath buildings, or other *approved* conduit material designed to withstand the superimposed loads. The conduit shall be protected from corrosion in accordance with Section G2415.11 and shall be installed in accordance with Section G2415.14.1 or G2415.14.2.		Minor update to requirements for piping under buildings.
	G2415.16 (404.16) Location of outlets. The unthreaded portion of *piping outlets* shall extend not less than I inch (25 mm) through finished ceilings and walls and where extending through floors~~,~~ or outdoor patios and slabs, shall ~~not~~ be not less than 2 inches (51 mm) above them. The *outlet* fitting or *piping* shall be securely supported. *Outlets* shall not be placed behind doors. *Outlets* shall be located in the room or space where the *appliance* is installed. **Exception:** *Listed* and *labeled* flush-mounted-type quick-disconnect devices and *listed* and *labeled gas convenience outlets* shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing change.
	G2415.17.2 (404.17.2) Connections. Connections made outdoors and underground between metallic and plastic *piping* shall be made only with transition fittings conforming to ASTM D-2513 Category I or ASTM F-1973.		Minor wordsmithing change.

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	G2415.17.3 (404.17.3) Tracer. A yellow ~~-~~ insulated copper tracer wire or other *approved* conductor, or a product specifically designed for that purpose, shall be installed adjacent to underground nonmetallic *piping*. *Access* shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic *piping*. The tracer wire size shall ~~not~~ be not less than 18 AWG and the insulation type shall be suitable for direct burial.		Minor update to tracer requirements.
	G2415.18 (404.18) Pipe ~~cleaning~~ debris removal. The interior of *piping* shall be clear of debris. The use of a flammable or combustible gas to clean or remove debris from a *piping system* shall be prohibited.		Minor change in code requiring pipe to be clear of debris.
	G2416.2 (405.2) Metallic pipe. Metallic pipe bends shall comply with the following: 1. Bends shall be made only with bending tools and procedures intended for that purpose. 2. ~~All b~~Bends shall be smooth and free from buckling, cracks or other evidence of mechanical damage. 3. The longitudinal weld of the pipe shall be near the neutral axis of the bend. 4. Pipe shall not be bent through an arc of more than 90 degrees (1.6 rad). 5. The inside radius of a bend shall be not less than six times the outside diameter of the pipe.		Minor wordsmithing change.
	G2416.3 (405.3) Plastic pipe. Plastic pipe bends shall comply with the following: 1. The pipe shall not be damaged and the internal diameter of the pipe shall not be effectively reduced. 2. Joints shall not be located in pipe bends. 3. The radius of the inner curve of such bends shall ~~not~~ be not less than 25 times the inside diameter of the pipe. 4. Where the *piping* manufacturer specifies the use of special bending tools or procedures, such tools or procedures shall be used.		Minor wordsmithing change.
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 *anodeless 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.		**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 *anodeless risers* or service head adapter risers that are installed in accordance with the manufacturer's 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.	No change to Houston amendment.

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3. Plastic pipe shall be permitted under outdoor patio, walkway, and driveway slabs provided that the burial depth complies with Section G2415.10.		3. Plastic pipe shall be permitted under outdoor patio, walkway, and driveway slabs provided that the burial depth complies with Section G2415.12.	
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 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.		**G2417.1.1 (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 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.	No change to Houston amendment.

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	G2417.1.4 (406.1.4) Section testing. A *piping system* shall be permitted to be tested as a complete unit or in sections. ~~Under no circumstances shall a~~ A *valve* in a line shall not be used as a bulkhead between gas in one section of the *piping system* and test medium in an adjacent section, except where a double block and bleed valve system is installed. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve ~~-~~closing mechanism, is designed to safely withstand the test pressure.		Minor wordsmithing change.
	G2417.2 (406.2) Test medium. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used as a test medium.		Minor wordsmithing change.
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.		**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.	Minor update to Houston amendment removing requirement for test gauge pressure range.
G2417.4.2 (406.4.2) Test duration. The test duration shall be not less than ~~10~~ 15 minutes.		**G2417.4.2 (406.4.2) Test duration.** The test duration shall be not less than ~~10~~ 15 minutes.	No change to Houston amendment.
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.		**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	No change to Houston amendment.

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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.		gauges incremented for 2 percent or less of the required test pressure.	
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.*		**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. The components of the supporting *equipment* shall be designed and installed so that they will not be disengaged by movement of the supported *piping.*	No change to Houston amendment.
	SECTION G2419 (408) **DRIPS AND SLOPED PIPING** **G2419.1 (408.1) Slopes.** *Piping* for other than dry gas conditions shall be sloped not less than 1/4 inch in 15 feet (6.43 mm in 4572 mm) to prevent traps.		Update to correct metric measurement.
	G2419.2 (408.2) Drips. Where wet gas exists, a *drip* shall be provided at any point in the line of pipe where *condensate* could collect. A *drip* shall ~~**also**~~ be provided at the outlet of the *meter* and shall be installed so as to constitute a trap wherein an accumulation of *condensate* will shut off the flow of gas before the *condensate* will run back into the *meter*.		Minor wordsmithing change.
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.		**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 with a 3 inch minimum length ~~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.	Update to Houston amendment to correlate UPC requirements for 3in. minimum.

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<table>
<tr>
<td>{EDITORIAL NOTE: DELETE FIGURE G2419.4 AND REPLACE WITH FIGURE 1211.8 OF THE 2012 UNIFORM PLUMBING CODE.}</td>
<td></td>
<td>[EDITORIAL NOTE: DELETE FIGURE G2419.4 AND REPLACE WITH FIGURE 1212.9 OF THE 2021 UNIFORM PLUMBING CODE.]</td>
<td>No change to Houston amendment.</td>
</tr>
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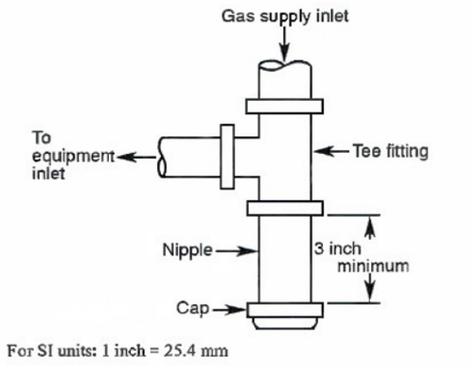
<td> 

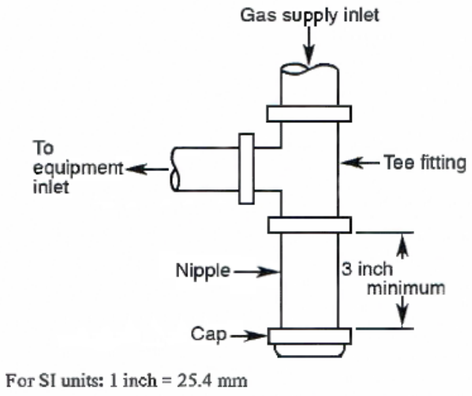
FIGURE G2419.4 ~~(408.4)~~
METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP
[NFPA 54: FIGURE 9.6.7]</td>
<td></td>
<td> 

FIGURE G2419.4 ~~(408.4)~~
METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP
[NFPA 54: FIGURE 9.6.7]</td>
<td>No change to Houston amendment.</td>
</tr>
<tr>
<td></td>
<td>TABLE G2420.1.1 (409.1.1)
MANUAL GAS VALVE STANDARDS
<table>
<tr><th rowspan="2">VALVE STANDARDS</th><th rowspan="2">APPLIANCE SHUTOFF VALVE APPLICATION UP TO 1/2 psig PRESSURE</th><th colspan="4">OTHER VALVE APPLICATIONS</th></tr>
<tr><th>UP TO 1/2 psig PRESSURE</th><th>UP TO 2 psig PRESSURE</th><th>UP TO 5 psig PRESSURE</th><th>UP TO 125 psig PRESSURE</th></tr>
<tr><td>ANSI Z21.15/CGA 9.1</td><td>X</td><td>—</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>ASME B16.44</td><td>X</td><td>X</td><td>X[a]</td><td>X[b]</td><td>—</td></tr>
<tr><td>ASME B16.33</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
</table>
For SI: 1 pound per square inch gauge = 6.895 kPa.
a. If labeled 2G.
b. If labeled 5G.</td>
<td></td>
<td>Minor update to reference standard.</td>
</tr>
<tr>
<td></td>
<td>G2420.5.1 (409.5.1) Located within same room. The shutoff valve shall be located in the same room as the appliance. The shutoff valve shall be within 6 feet (1829 mm) of the appliance, and shall be installed upstream of the union, connector or quick disconnect device it serves. Such shutoff valves shall be provided with access. Shutoff valves serving movable appliances, such as cooking appliances and clothes dryers, shall be considered to be provided with access where installed behind such appliances. Appliance shutoff valves located in the firebox of a fireplace shall be installed in accordance with the appliance manufacturer's instructions.</td>
<td></td>
<td>Updated requirements for shutoff valves to be provided with access.</td>
</tr>
</table>

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	G2420.6 (409.7) Shutoff valves in tubing systems. Shutoff valves installed in tubing systems shall be rigidly and securely supported independently of the tubing.		New requirements for shutoff valves serving tubing systems.
	SECTION G2421 (410) **FLOW CONTROLS** **G2421.1 (410.1) Pressure regulators.** A line *pressure regulator* shall be installed where the *appliance* is designed to operate at a lower pressure than the supply pressure. *Line gas pressure regulators* shall be *listed* as complying with ANSI Z21.80**/CSA 6.22**. *Access* shall be provided to *pressure regulators*. *Pressure regulators* shall be protected from physical damage. *Regulators* installed on the exterior of the building shall be *approved* for outdoor installation.		Updated reference standard.
	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 lock-up (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. The tee fitting is not required where the MP regulator serves an appliance that has a pressure test port on the gas control inlet side and the appliance is located in the same room as the MP regulator. 7. Where connected to rigid *piping*, a union shall be installed within 1 foot (304 mm) of either side of the MP *regulator*.		Updated requirements for MP pressure regulators.
	G2421.3.1 (410.3.1) Vent piping. Vent *piping* for relief vents and breather vents shall be constructed of materials allowed for *gas piping* in accordance with Section G2414. Vent *piping* shall be not smaller than the vent connection on the pressure-regulating device. Vent *piping* serving relief vents and combination relief and breather vents shall be run independently to the outdoors and shall serve only a single device vent. Vent *piping* serving only breather vents is permitted to be connected in a manifold arrangement where sized in accordance with an *approved* design that minimizes backpressure in the event of diaphragm rupture. *Regulator* vent		Minor wordsmithing change.

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	piping shall not exceed the length specified in the *regulator* manufacturer's ~~**installation**~~ instructions.		
	G2421.4 (410.4) Excess flow valves. Where automatic *excess flow valves* are installed, they shall be listed ~~for the application~~ in accordance with ANSI Z21.93/CSA 6.30 and shall be sized and installed in accordance with the manufacturer's instructions.		Minor wordsmithing change and new referenced standard provided.
	SECTION G2422 (411) **APPLIANCE CONNECTIONS** **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. 3. Listed and labeled *appliance connectors* in compliance with ANSI Z21.24**/CSA 6.10** 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 in compliance with **ANSI Z21.41/CSA 6.9** used in conjunction with *listed* and *labeled appliance connectors*. 5. *Listed* and *labeled* convenience outlets in compliance with **ANSI Z21.90/CSA 6.24** 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.		Minor wordsmithing change and new referenced standard provided.
	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/**CSA 6.16** 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.		Update to reference standard.
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*.	No change to Houston amendment.

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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 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.		Minor wordsmithing to base code. Previous Houston amendment removed to go with base code provisions.
	G2425.15.4 (501.15.4) Clearances. *Chimney*s and vents shall have airspace *clearance* to combustibles in accordance with Chapter 10 and the *chimney* or vent manufacturer's installation instructions. **Exception:** *Masonry chimneys* without the required air-space *clearances* shall be permitted to be used if lined or relined with a *chimney* lining system *listed* for use in *chimneys* with reduced *clearances* in accordance with UL 1777. The *chimney clearance* shall be not less than **~~that~~** permitted by the terms of the *chimney* liner listing and the manufacturer's instructions.		Minor wordsmithing changes.
	G2426.4 (502.4) Insulation shield. Where vents pass through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) shall be installed to provide *clearance* between the vent and the insulation material. The *clearance* shall ~~not~~ be not less than the *clearance* to combustibles specified by the vent manufacturer's installation instructions. Where vents pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the insulation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a *listed* vent system shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	G2426.7 (502.7) Protection against physical damage. In *concealed locations*, where a vent is installed through holes or notches in studs, joists, rafters or similar members less than 1 1/2 inches (38 mm) from the nearest edge of the member, the vent 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		Minor wordsmithing changes.

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	cover the area of the vent where the member is notched or bored and shall extend ~~a minimum of~~ **not less than** 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist or rafter.		
	G2427.2 (503.2) Venting systems required. Except as permitted in Sections ~~**G2427.2.1, G2427.2.2 and**~~G2425.8, **G2427.2.1 and G2427.2.2,** all *appliances* shall be connected to *venting systems*.		Base code renumbering.
	G2427.2.1 (503.2.3) Direct-vent appliances. *Listed direct-vent appliances* shall be installed in accordance with the manufacturer's instructions. ~~and Section G2427.8, Item 3~~ Through-the-wall vent terminations for listed direct-vent *appliances* shall be in accordance with **Section G2427.8**.		Updated vent requirements.
	G2427.2.2 (503.2.4) Appliances with integral vents. *Appliances* incorporating integral venting means shall be installed in accordance with ~~the manufacturer's instructions and~~ **Section G2427.8**, Items 1 and 2.		Minor wordsmithing changes.
	G2427.3.3 (503.3.3) Mechanical draft systems. Mechanical *draft* systems shall comply with the following: 1. Mechanical *draft* systems shall be listed **in accordance with UL 378** and shall be installed in accordance with the manufacturer's instructions for both the *appliance* and the mechanical *draft* system. 2. *Appliances* requiring venting shall be permitted to be vented by means of mechanical *draft* systems of either forced or induced *draft* design. 3. Forced *draft* systems and all portions of induced *draft* systems under positive pressure during operation shall be designed and installed so as to prevent leakage of flue or *vent gases* into a building. 4. *Vent connectors* serving *appliances* vented by natural *draft* shall not be connected into any portion of mechanical *draft* systems operating under positive pressure. 5. Where a mechanical *draft* system is employed, provisions shall be made to prevent the flow of gas to the *main burners* when the *draft* system is not performing so as to satisfy the operating requirements of the *appliance* for safe performance. 6. ~~The exit terminals of mechanical *draft* systems shall be not less than 7 feet (2134 mm) above finished ground level where located adjacent to public walkways and shall be located as specified in Section G2427.8, Items 1 and 2.~~		Minor updates to base code and new standard referenced.

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	TABLE G2427.4 (503.4) **TYPE OF VENTING SYSTEM TO BE USED** **APPLIANCES** / **TYPE OF VENTING SYSTEM** Listed Category I *appliances Listed* appliances equipped with draft hood Appliances listed for use with Type B gas vent — Type B gas vent (Section G2427.6) *Chimney* (Section G2427.5) Single-wall metal pipe (Section G2427.7) *Listed* chimney lining system for gas venting (Section G2427.5.2) Special gas vent listed for these appliances (Section G2427.4.2) *Listed* vented wall furnaces — Type B-W gas vent (Sections G2427.6, G2436) Category II, Category III and Category IV *appliances* — As specified or furnished by manufacturers of *listed appliances* (Sections G2427.4.1, G2427.4.2) ~~Category III *appliances*~~ — ~~As specified or furnished by manufacturers of *listed appliances* (Sections G2427.4.1, G2427.4.2)~~ ~~Category IV *appliances*~~ — ~~As specified or furnished by manufacturers of *listed appliances* (Sections G2427.4.1, G2427.4.2)~~ Unlisted *appliances* — Chimney (Section G2427.5) Decorative *appliances* in vented fireplaces — Chimney Direct-vent *appliances* — See Section G2427.2.1 *Appliances* with integral vent — See Section G2427.2.2		Minor updates to venting system table.
	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. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed in accordance with UL 1738.		Updates to plastic pipe labeling requirements.
	G2427.4.1.1 (503.4.1.1) (IFGS) Plastic vent joints. Plastic *pipe* and fittings used to vent *appliances* shall be installed in accordance with the *appliance* manufacturer's instructions. Plastic pipe venting materials listed and labeled in accordance with UL 1738 shall be installed in accordance with the vent manufacturer's instructions. Where a primer is required, it shall be of a contrasting color.		Updates to plastic pipe labeling requirements.
	G2427.4.2 (503.4.2) Special gas vent. Special gas *vent* shall be *listed* and labeled in accordance with UL 1738 and installed in accordance with the special gas *vent* manufacturer's instructions.		Updates to gas vent labeling requirements.
	G2427.5 (503.5) Masonry, metal and factory-built chimneys. Masonry, metal and factory-built *chimneys* shall comply with Sections G2427.5.1 through G2427.5.9**10**.		Base code renumbering.
	G2427.5.1 (503.5.1) Factory-built chimneys. Factory-built *chimneys* shall be listed in accordance with UL 103 ~~and installed in accordance with the manufacturer's instructions~~. Factory-built *chimneys* used to vent *appliances* that operate at a positive vent pressure shall be *listed* for such application.		Update to code for factory-built chimneys to be listed.
	G2427.5.2 (503.5.3) Masonry chimneys. Masonry *chimneys* shall be built and installed in accordance with NFPA 211 and shall be lined with an *approved* clay *flue lining*, a ~~listed~~ *chimney* lining system listed and labeled in accordance with UL 1777 or other *approved* material that will resist corrosion, erosion, softening or cracking from vent gases at temperatures up to 1,800ºF (982ºC).		Update to code for masonry chimneys to be listed.

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	Exception: Masonry *chimney* flues serving *listed* gas *appliances* with *draft hoods*, Category I *appliances* and other gas *appliances listed* for use with Type B vents shall be permitted to be lined with a *chimney* lining system specifically *listed* for use only with such *appliances*. The liner shall be installed in accordance with the liner manufacturer's instructions. A permanent identifying label shall be attached at the point where the connection is to be made to the liner. The label shall read: "This *chimney* liner is for *appliances* that burn gas only. Do not connect to solid or liquid fuel-burning appliances or incinerators."		
	G2427.5.4 (503.5.5) Size of chimneys. The effective area of a *chimney* venting system serving *listed appliances* with *draft hoods*, Category I *appliances*, and other *appliances* listed for use with Type B vents shall be determined in accordance with one of the following methods: 1. The provisions of **Section G2428**. 2. ~~For sizing an individual *chimney* venting system for~~The effective areas of the vent connector and chimney flue of a venting system serving a single *appliance* with a *draft hood*~~, the effective areas of the *vent connector* and *chimney* flue~~ shall be not less than the area of the *appliance flue collar* or *draft hood* outlet, nor greater than seven times the *draft hood* outlet area. 3. ~~For sizing a *chimney* venting system connected to~~The effective area of a chimney flue or a venting system serving two *appliances* with *draft hoods*.~~, the effective area of the *chimney* flue shall be not less than the area of the larger *draft hood* outlet plus 50 percent of the area of the smaller *draft hood* outlet, nor greater than seven times the smallest *draft hood* outlet area.~~ 4. *Chimney venting systems* using mechanical *draft* shall be sized in accordance with *approved* engineering methods. 5. Other *approved* engineering methods.		Updates to chimney sizing requirements.
	G2427.5.5.1 (503.5.6.1) Chimney lining. *Chimneys* shall be lined in accordance with **NFPA 211**. ~~**Exception:** Where an existing chimney complies with **Sections G2427.5.5** through **G2427.5.5.3** and its sizing is in accordance with **Section G2427.5.4**, its continued use shall be allowed where the *appliance* vented by such *chimney* is replaced by an *appliance* of similar type, input rating and efficiency.~~		Base code exception has been removed.
	G2427.5.5.2 (503.5.6.2) Cleanouts. Cleanouts shall be examined ~~to determine if they will~~ and where they do not remain tightly closed when not in use, they shall be repaired or replaced.		Minor updates to cleanout requirements.
	G2427.5.6.4 (503.5.7.4) Combination gas- and oil fuel-burning appliances. ~~A~~Where a single chimney flue serves a *listed* combination gas- and oil fuel-burning *appliance*~~, shall be permitted to be connected to a single *chimney* flue. The *chimney* flue shall be sized to properly vent the~~		Updates to requirements.

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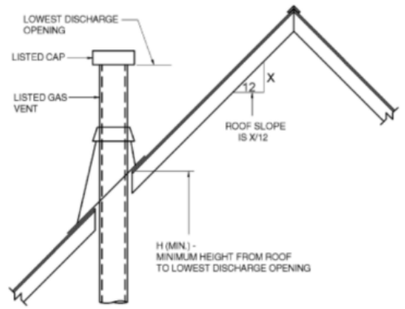
	~~*appliance*.~~ such flue shall be sized in accordance with the *appliance* manufacturer's instructions.		
	G2427.5.8 (503.5.9) Cleanouts. Where a *chimney* that formerly carried flue products from liquid or solid fuel-burning appliances is used with an *appliance* using *fuel gas*, an accessible cleanout shall be provided. The cleanout shall have a tight-fitting cover and be installed so its upper edge is ~~at least~~ not less than 6 inches (152 mm) below the lower edge of the lowest *chimney* inlet opening.		Minor wordsmithing change.
	G2427.5.10 (503.5.11) Insulation shield. Where a factory-built chimney passes through insulated assemblies, an insulation shield constructed of steel having a thickness of not less than 0.0187 inch (0.475 mm) (nominal 26 gage) shall be installed to provide clearance between the chimney and the insulation material. The clearance shall be not less than the clearance to combustibles specified by the chimney manufacturer's installation instructions. Where chimneys pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the installation materials and shall be secured in place to prevent displacement. ~~Insulation shields provided as part of a *listed* chimney system shall be installed in accordance with the manufacturer's installation instructions.~~		New requirements for insulation shields for factory-built chimneys.
	G2427.6 (503.6) Gas vents. Gas vents shall comply with Sections G2427.6.1 through G2427.6.1~~1~~2. (See Section G2403, **General** Definitions.)		Base code renumbering and minor update.
	G2427.6.1 (503.6.1) Materials. Type B and BW gas vents shall be listed in accordance with UL 441. Vents for listed combination gas- and oil-burning appliances shall be listed in accordance with UL 641.		New requirements for Type B and BW gas vent materials.
	G2427.6.~~1~~2 (503.6.~~1~~2) Installation, general.		Base code renumbering.
	G2427.6.~~2~~3 (503.6.~~2~~3) Type B-W vent capacity.		Base code renumbering.
	G2427.6.~~3~~4 (503.6.~~4~~5) Gas vent terminations. A gas vent shall terminate in accordance with one of the following: 1. Gas vents that are 12 inches (305 mm) or less in size and located not less than 8 feet (2438 mm) from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure G2427.6.~~3~~4. 2. Gas vents that are over 12 inches (305 mm) in size or are located less than 8 feet (2438 mm) from a vertical		Base code renumbering.

	wall or similar obstruction shall terminate not less than 2 feet (610 mm) above the highest point where they pass through the roof and not less than 2 feet (610 mm) above any portion of a building within 10 feet (3048 mm) horizontally. 3. As provided for direct-vent systems in Section G2427.2.1. 4. As provided for *appliances* with integral vents in Section G2427.2.2. 5. As provided for mechanical *draft* systems in Section G2427.3.3.		
	 **ROOF SLOPE** / **H (minimum) ft** Flat to 6/12 — 1.0 Over 6/12 to 7/12 — 1.25 Over 7/12 to 8/12 — 1.5 Over 8/12 to 9/12 — 2.0 Over 9/12 to 10/12 — 2.5 Over 10/12 to 11/12 — 3.25 Over 11/12 to 12/12 — 4.0 Over 12/12 to 14/12 — 5.0 Over 14/12 to 16/12 — 6.0 Over 16/12 to 18/12 — 7.0 Over 18/12 to 20/12 — 7.5 Over 20/12 to 21/12 — 8.0 For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm. **FIGURE G2427.6.~~3~~4 (503.6.~~4~~5)** **TERMINATION LOCATIONS FOR GAS VENTS WITH LISTED CAPS 12 INCHES OR LESS IN SIZE ~~AT LEAST~~NOT LESS THAN 8 FEET FROM A VERTICAL**		Base code renumbering and minor wordsmithing to figure.
	G2427.6.~~3~~4.1 (503.6.~~4~~5.1) Decorative shrouds.		Base code renumbering.

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	G2427.6.4~~5~~5 (503.6.~~5~~6) Minimum height. A Type B or L gas vent shall terminate ~~at least~~not less than 5 feet (1524 mm) in vertical height above the highest connected *appliance draft hood* or *flue collar*. A Type B-W gas vent shall terminate not less than 12 feet (3658 mm) in vertical height above the bottom of the wall *furnace*.		Base code renumbering and minor wordsmithing.
	G2427.6.~~5~~6 (503.6.~~6~~7) Roof terminations.		Base code renumbering.
	G2427.6.~~6~~7 (503.6.~~7~~8) Forced air inlets.		Base code renumbering.
	G2427.6.~~7~~8 (503.6.~~8~~9) Exterior wall penetrations.		Base code renumbering.
	G2427.6.~~8~~9 (503.6.~~9~~10) Size of gas vents. *Venting systems* shall be sized and constructed in accordance with Section**s** G2428 ~~or~~**7.6.9.1** ~~other approved engineering methods~~**through G2427.6.9.4** and the ~~**gas vent and**~~ *appliance* manufacturer's installation instructions.		Base code renumbering and minor updates.
	G2427.6.~~8~~9.1 (503.6.~~9~~10.1) Category I appliances. The sizing of *natural draft venting systems* serving one or more *listed appliances* equipped with a *draft hood* or *appliances listed* for use with Type B gas vent, installed in a single story of a building, shall be in accordance with one of the following methods: 1. The provisions of **Section G2428**. 2. For sizing an individual gas vent for a single, *draft hood*-equipped *appliance*, the effective area of the vent *connector* and the gas vent shall be not less than the area of the *appliance draft hood* outlet, nor greater than seven times the *draft hood* outlet area. 3. For sizing a gas vent connected to two *appliances* with *draft hoods*, the effective area of the vent shall be not less than the area of the larger *draft hood* outlet plus 50 percent of the area of the smaller *draft hood* outlet, nor greater than seven times the smaller *draft hood* outlet area. 4. *Approved* engineering ~~practices~~ methods.		Base code renumbering and minor wordsmithing.
	G2427.6.~~8~~9.2 (503.6.~~9~~10.2) Vent offsets.		Base code renumbering.

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	G2427.6.~~8~~9.3 (503.6.~~9~~10.3) Category II, III and IV appliances		Base code renumbering.
	G2427.6.~~8~~9.4 (503.6.~~9~~10.4) Mechanical draft.		Base code renumbering.
	G2427.6.~~9~~10 (503.6.1~~1~~2) Support of gas vents.		Base code renumbering.
	G2427.6.1~~0~~1 (503.6.1~~2~~3) Marking.		Base code renumbering.
	G2427.6.1~~1~~2 (503.6.1~~3~~4) Fastener penetrations.		Base code renumbering.
	G2427.7.3 (503.7.3) Termination. Single-wall metal pipe shall terminate ~~at least~~ not less than 5 feet (1524 mm) in vertical height above the highest connected *appliance draft hood* outlet or *flue collar*. Single-wall metal pipe shall extend ~~at least~~ not less than 2 feet (610 mm) above the highest point where it passes through a roof of a building and ~~at least~~ not less than 2 feet (610 mm) higher than any portion of a building within a horizontal distance of 10 feet (3048 mm). An *approved* cap or roof assembly shall be attached to the terminus of a single-wall metal pipe.		Minor wordsmithing changes.
	G2427.7.7 (503.7.7) Single-wall penetrations of combustible walls. ~~S~~A single-wall metal pipe shall not pass through a combustible exterior wall unless guarded at the point of passage by a ventilated metal thimble not smaller than the following: 1. For *listed appliances* with *draft hoods* and *appliances listed* for use with Type B gas vents, the thimble shall be not less than 4 inches (102 mm) larger in diameter than the metal pipe. Where there is a run of not less than 6 feet (1829 mm) of metal pipe in the open between the *draft hood* outlet and the thimble, the thimble shall be permitted to be not less than 2 inches (51 mm) larger in diameter than the metal pipe. 2. For unlisted *appliances* having *draft hoods*, the thimble shall be not less than 6 inches (152 mm) larger in diameter than the metal pipe.		Minor wordsmithing changes.

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	3. For residential and low-heat *appliances*, the thimble shall be not less than 12 inches (305 mm) larger in diameter than the metal pipe. **Exception:** In lieu of thimble protection, all *combustible material* in the wall shall be removed a sufficient distance from the metal pipe to provide the specified *clearance* from such metal pipe to *combustible material*. Any material used to close up such opening shall be noncombustible.		
	G2427.7.9 (503.7.9) Size of single-wall metal pipe. A venting system constructed of single-wall metal pipe shall be sized in accordance with one of the following methods and the *appliance* manufacturer's instructions: 1. For a draft-hood-equipped *appliance*, in accordance with Section G2428. 2. For a venting system for a single *appliance* with a *draft hood*, the areas of the connector and the pipe each shall be not less than the area of the *appliance flue collar* or *draft hood* outlet, whichever is smaller. The vent area shall ~~not~~ be not greater than seven times the *draft hood* outlet area. 3. ~~Other *approved*~~ *Approved* engineering methods.		Minor wordsmithing changes.
	G2427.8 (503.8) Venting system ~~termination location~~terminal clearances. ~~The location of venting system terminations shall comply with the following (see Appendix C):~~The clearances for through-the-wall direct-vent and nondirect-vent terminals shall be in accordance with **Figure G2427.8** and **Table G2427.8**. **Exception:** The clearances in **Table G2427.8** shall not apply to the *combustion air* intake of a direct-vent *appliance*. 1. ~~A mechanical *draft* venting system shall terminate not less than 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 not less than 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 not less than 12 inches (305 mm) above finished ground level.~~ 3. ~~The clearances for through-the-wall, direct-vent terminals shall be in accordance with **Table G2427.8**.~~ 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~~		Requirements for venting system termination have been updated and new figures added for update.

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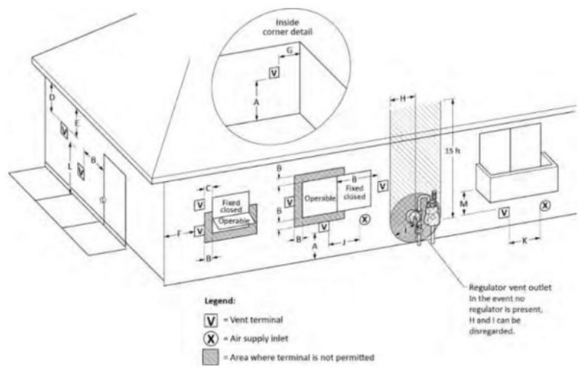
	~~apply. Drains for *condensate* shall be installed in accordance with the appliance and vent manufacturer's instructions.~~ 5. ~~Vent systems for Category IV appliances that terminate through an outside wall of a building and discharge flue gases perpendicular to the adjacent wall shall be located not less than 10 feet (3048 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 (7620 mm) or more below operable openings.~~		
	 FIGURE G2427.8 (503.8) THROUGH-THE-WALL VENT TERMINAL CLEARANCES		New figure for vent terminal clearances.

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~~TABLE G2427.8 (503.8)~~
~~THROUGH-THE-WALL, DIRECT-VENT TERMINATION CLEARANCES~~

~~DIRECT-VENT APPLIANCE INPUT RATING (Btu/hr)~~	~~THROUGH-THE-WALL VENT TERMINAL CLEARANCE FROM ANY AIR OPENING INTO THE BUILDING (inches)~~
~~< 10,000~~	~~6~~
~~≥ 10,000 ≤ 50,000~~	~~9~~
~~> 50,000 ≤ 150,000~~	~~12~~
~~> 150,000~~	~~In accordance with the appliance manufacturer's instructions and not less than the clearances specified in **Section G2427.8**, Item 2~~

~~For SI: 1 inch = 25.4 mm, 1 Btu/hr = 0.2931 W.~~

TABLE G2427.8(503.8)
THROUGH-THE-WALL VENT TERMINAL CLEARANCES

FIGURE CLEARANCE	CLEARANCE LOCATION	MINIMUM CLEARANCES FOR DIRECT-VENT TERMINALS	MINIMUM CLEARANCES FOR NONDIRECT-VENT TERMINALS
A	Clearance above finished grade level, veranda, porch, deck or balcony	12 inches	
B	Clearance to window or door that is openable	6 inches: Appliances ≤ 10,000 Btu/hr 9 inches: Appliances > 10,000 Btu/hr ≤ 50,000 Btu/hr 12 inches: Appliances > 50,000 Btu/hr ≤ 150,000 Btu/hr Appliances > 150,000 Btu/hr, in accordance with the appliance manufacturer's instructions and not less than the clearances specified for nondirect-vent terminals in Row B	4 feet below or to side of opening or 1 foot above opening
C	Clearance to nonopenable window	None unless otherwise specified by the appliance manufacturer	
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet from the centerline of the terminal	None unless otherwise specified by the appliance manufacturer	
E	Clearance to unventilated soffit	None unless otherwise specified by the appliance manufacturer	
F	Clearance to outside corner of building	None unless otherwise specified by the appliance manufacturer	
G	Clearance to inside corner of building	None unless otherwise specified by the appliance manufacturer	
H	Clearance to each side of centerline extended above regulator vent outlet	3 feet up to a height of 15 feet above the regulator vent outlet	

New table for vent termination requirements.

	I | Clearance to service regulator vent outlet in all directions | 3 feet for gas pressures up to 2 psi; 10 feet for gas pressures above 2 psi J | Clearance to nonmechanical air supply inlet to building and the combustion air inlet to any other appliance | Same clearance as specified for Row B K | Clearance to a mechanical air supply inlet | 10 feet horizontally from inlet or 3 feet above inlet L | Clearance above paved sidewalk or paved driveway located on public property | 7 feet and shall not be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard M | Clearance to underside of veranda, porch deck or balcony | 12 inches where the area beneath the veranda, porch deck or balcony is open on not less than two sides. The vent terminal is prohibited in this location where only one side is open. For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa, 1 Btu/h = 0.293 W.		
	G2427.9 (503.9) Condensation drainage. Provisions shall be made to collect and dispose of *condensate* from *venting systems* serving Category II and IV *appliances* and noncategorized condensing *appliances*. Drains for *condensate* shall be installed in accordance with the *appliance* and vent manufacturer's instructions. ~~in accordance with Section G2427.8, Item 4. Where local experience indicates that condensation is a problem, provisions shall be made to drain off and dispose of *condensate* from *venting systems* serving Category I and III *appliances* in accordance with Section G2427.8, Item 4.~~		Updates to condensate drainage requirements.
	G2427.10.3.1 (503.10.3.1) Single draft hood and fan-assisted. A *vent connector* for an *appliance* with a single *draft hood* or for a Category I fan-assisted *combustion* system *appliance* shall be sized and installed in accordance with **Section G2428** or ~~other~~ *approved* engineering methods.		Minor wordsmithing changes.
	G2427.10.3.2 (503.10.3.2) Multiple draft hood. ~~For~~ Where a single *appliance* having more than one *draft hood* outlet or *flue collar* is installed, the manifold shall be constructed according to the instructions of the *appliance* manufacturer. Where there are no instructions, the manifold shall be designed and constructed in accordance with *approved* engineering methods~~practices~~. As an alternate method, the effective area of the manifold shall equal the combined area of the *flue collars* or *draft hood* outlets and the *vent connectors* shall have a rise of not less than 12 inches (305 mm).		Minor wordsmithing changes.
	G2427.10.3.3 (503.10.3.3) Multiple appliances. Where two or more *appliances* are connected to a common *vent* or *chimney*, each *vent connector* shall be sized in accordance with Section G2428 or ~~other~~ *approved* engineering methods. As an alternative method applicable only when~~n~~**re** all of the *appliances* are *draft hood* equipped, each *vent connector* shall have an effective area not less than the area of the *draft hood* outlet of the *appliance* to which it is connected.		Minor wordsmithing changes.

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	G2427.10.3.4 (503.10.3.4) Common connector/manifold. Where two or more *appliances* are vented through a common *vent connector* or vent manifold, the common *vent connector* or vent manifold shall be located at the highest level consistent with available headroom and the required *clearance* to *combustible materials* and shall be sized in accordance with **Section G2428** or ~~other~~ *approved* engineering methods. As an alternate method applicable only where there are two *draft hood*-equipped *appliances*, the effective area of the common *vent connector* or vent manifold and all junction fittings shall be not less than the area of the larger *vent connector* plus 50 percent of the area of the smaller *flue collar* outlet.		Minor wordsmithing changes.
	G2427.10.4 (503.10.4) Two or more appliances connected to a single vent or chimney. Where two or more *vent connectors* enter a common ~~**gas**~~ vent, *chimney* flue, or single-wall metal pipe, the smaller connector shall enter at the highest level consistent with the available headroom or *clearance* to *combustible material*. *Vent connectors* serving Category I *appliances* shall not be connected to any portion of a *mechanical draft* system operating under positive static pressure, such as those serving Category III or IV *appliances*.		Minor wordsmithing changes.
	G2427.10.7 (503.10.7) Connector junctions. Where *vent connectors* are joined together, the connection shall be made with a tee or wye fitting manufactured for the purpose.		New requirements for vent connection junctions.
	~~G2427.10.7~~ **G2427.10.8 (503.10.8) Slope.** A *vent connector* shall be installed without dips or sags and shall slope upward toward the vent or *chimney* ~~at least~~ not less than 1/4 inch per foot (21 mm/m). **Exception:** *Vent connectors* attached to a mechanical *draft* system installed in accordance with the *appliance* and *draft* system manufacturers' instructions.		Base code renumbering and minor wordsmithing.
	~~G2427.10.8~~ **G2427.10.9 (503.10.9) Length of vent connector.**		Base code renumbering.
	~~G2427.10.9~~ **G2427.10.10 (503.10.10) Support.**		Base code renumbering.
	~~G2427.10.10~~ **G2427.10.11 (503.10.11) Chimney connection.**		Base code renumbering.

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	~~G2427.10.11~~ **G2427.10.12 (503.10.12) Inspection.**		Base code renumbering.
	~~G2427.10.12~~ **G2427.10.13 (503.10.13) Fireplaces.**		Base code renumbering.
	~~G2427.10.13~~ **G2427.10.14 (503.10.14) Passage through ceilings, floors or walls.**		Base code renumbering.
	G2427.13 (503.13) Manually operated dampers. A manually operated *damper* shall not be placed in the vent *connector* for any *appliance*. Fixed baffles and balancing baffles shall not be classified as manually operated *dampers*.		Minor update to include balancing baffles.
	G2427.13.1 (503.13.1) Balancing baffles. Balancing baffles shall be *listed* in accordance with **UL 378** and shall be mechanically locked in the desired position before placing the *appliance* in operation.		New section for balancing baffle requirements.
	G2427.14 (503.14) Automatically operated vent dampers. An automatically operated vent damper shall be ~~of a *listed* type~~.		Minor wordsmithing changes.
	G2427.15 (503.15) Obstructions. Devices that retard the flow of *vent gases* shall not be installed in a *vent connector*, *chimney* or vent. The following shall not be considered as obstructions: 1. *Draft regulators* and safety *controls* specifically *listed* for installation in *venting systems* and installed in accordance with the manufacturer's instructions. 2. *Approved draft regulators* and safety *controls* that are designed and installed in accordance with *approved* engineering methods. 3. *Listed* heat reclaimers and automatically operated vent dampers installed in accordance with the manufacturer's instructions. 4. *Approved* economizers, heat reclaimers and recuperators installed in *venting systems* of *appliances* not required to be equipped with *draft hoods*, provided that the *appliance* manufacturer's instructions cover the installation of such a device in the venting system and performance in accordance with **Sections G2427.3** and **G2427.3.1** is obtained. 5. Vent dampers serving *listed* appliances installed in accordance with **Sections G2428.2.1** and **G2428.3.1** or ~~other~~ *approved* engineering methods.		Minor wordsmithing changes.

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	NA. Vent configuration is not ~~permit~~ allowed due to potential for *condensate* formation or pressurization of the venting system, or not applicable due to physical or geometric restraints.		Minor wordsmithing changes.
	G2428.2.2 (504.2.2) Minimum size. Where the vent size determined from the tables is smaller than the *appliance draft hood outlet* or *flue collar*, the smaller size shall be permitted to be used provided that all of the following requirements are met: 1. The total vent height (H) is ~~at least~~not less than 10 feet (3048 mm). 2. Vents for *appliance draft hood* outlets or *flue collars* 12 inches (305 mm) in diameter or smaller are not reduced more than one table size. 3. Vents for *appliance draft hood* outlets or *flue collars* larger than 12 inches (305 mm) in diameter are not reduced more than two table sizes. 4. The maximum capacity listed in the tables for a fan-assisted *appliance* is reduced by 10 percent (0.90 × maximum table capacity). 5. The *draft hood* outlet is greater than 4 inches (102 mm) in diameter. Do not connect a 3-inch-diameter (76 mm) vent to a 4-inch-diameter (102 mm) *draft hood* outlet. This provision shall not apply to fan-assisted *appliances*.		Minor wordsmithing changes.
	G2428.2.16 (504.2.16) Engineering calculations. ~~For~~ Where a *vent* ~~heights~~ height is less than 6 feet (1829 mm) ~~and~~ or greater than shown in the tables, an engineering ~~methods~~ method shall be used to calculate the *vent* ~~capacities~~ capacity.		Minor wordsmithing changes.
	G2428.2.17 (504.2.17) Height entries. Where the actual height of a vent falls between entries in the height column of the applicable table in Tables G2428.2(1) and G2428.2(2), either interpolation shall be used or the lower appliance input rating shown in the table entries shall be used for FAN Max and NAT Max column values and the higher appliance input rating shall be used for the FAN M~~I~~Nin column values.		Minor wordsmithing changes.
	G2428.3.1 (504.3.1) Vent obstructions. These venting tables shall not be used where obstructions, as described in Section G2427.15, are installed in the venting system. The installation of vents serving listed *appliances* with vent dampers shall be in accordance with the *appliance* manufacturer's instructions or in accordance with the following: 1. The maximum capacity of the *vent connector* shall be determined using the NAT Max column. 2. The maximum capacity of the vertical vent or *chimney* shall be determined using the FAN+NAT column when~~n~~re the second *appliance* is a fan-assisted *appliance*, or the NAT+NAT column when~~n~~re the second *appliance* is equipped with a *draft hood*. 3. The minimum capacity shall be determined as if the *appliance* were a fan-assisted *appliance*.		Minor wordsmithing changes.

	3.1. The minimum capacity of the *vent connector* shall be determined using the FAN Min column. 3.2. The FAN+FAN column shall be used when~~n~~re the second *appliance* is a fan-assisted *appliance*, and the FAN+NAT column shall be used when~~n~~re the second *appliance* is equipped with a *draft hood*, to determine whether the vertical vent or *chimney* configuration is not permitted (NA). Where the vent configuration is NA, the vent configuration shall not be permitted and an alternative venting configuration shall be utilized.		
	G2428.3.5 (504.3.5) Common vertical vent offset. Where the common vertical vent is *offset*, the maximum capacity of the common vent shall be reduced in accordance with Section G2428.3.6. The horizontal length of the common vent *offset* (*Lo*) shall not exceed 1 1/2 feet for each inch (18 mm per mm) of common vent diameter (*D*). Where multiple *offsets* occur in a common vent, the total horizontal length of all *offsets* combined shall not exceed 1 1/2 feet for each inch (18 mm~~/mm~~ per mm) of the common vent diameter (*D*).		Minor wordsmithing changes.
	G2428.3.9.1 (504.3.9.1) Tee and wye fittings. Tee and wye fittings connected to a common gas vent shall be considered ~~as~~ to be part of the common gas vent and shall be constructed of materials consistent with that of the common gas vent.		Minor wordsmithing changes.
	G2428.3.14 (504.3.18) Multiple input rate appliances. ~~For *appliances* with more than one input rate, the~~The minimum *vent connector* capacity (FAN Min) for *appliances* with more than one input rate shall be determined from the tables and shall be less than the lowest *appliance* input rating.~~, and the~~The maximum *vent connector* capacity (FAN Max or NAT Max) for *appliances* with more than one input rate shall be determined from the tables and shall be greater than the highest *appliance* input rating.		Minor updates to requirements for multiple input rate appliances.
	G2428.3.17 (504.3.21) Connector maximum and minimum size. *Vent connectors* shall not be increased in size more than two sizes greater than the listed *appliance* categorized vent diameter, *flue collar* diameter or *draft hood* outlet diameter. *Vent connectors* for draft-hood-equipped *appliances* shall not be smaller than the *draft hood* outlet diameter. Where a *vent connector* size(s) determined from the tables for a fan-assisted *appliance(s)* is smaller than the *flue collar* diameter, the use of the smaller size(s) shall be permitted provided that the installation complies with all of the following conditions: 1. *Vent connectors* for fan-assisted *appliance flue collars* 12 inches (305 mm) in diameter or smaller are not reduced by more than one table size [for e~~.g.~~xample, 12 inches to 10 inches (305 mm to 254 mm) is a one-size reduction] and those larger than 12 inches (305 mm) in diameter are not reduced more than two table sizes [for e~~.g.~~xample, 24 inches to 20 inches (610 mm to 508 mm) is a two-size reduction].		Minor wordsmithing changes.

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	2. The fan-assisted *appliance(s)* is common vented with a draft-hood-equipped *appliance(s)*. 3. The vent *connector* has a smooth interior wall.		
	G2428.3.18 (504.3.22) Component commingling. ~~All~~ ~~c~~Combinations of pipe sizes~~,~~ and combinations of single-wall and double-wall metal pipe shall be allowed within any connector run(s) or within the common vent, provided that all of the appropriate tables permit all of the desired sizes and types of pipe, as if they were used for the entire length of the subject connector or vent. Where single-wall and Type B double-wall metal pipes are used for *vent connectors* within the same venting system, the common vent must be sized using Table G2428.3(2) or G2428.3(4), as appropriate.		Minor wordsmithing changes.
	G2428.3.20 (504.3.24) Multiple sizes permitted. Where a table permits more than one diameter of pipe to be used for a connector or vent, all of the permitted sizes shall be permitted to be used.		Minor wordsmithing changes.
	SECTION G2432 (602) **DECORATIVE APPLIANCES FOR INSTALLATION IN FIREPLACES** **G2432.1 (602.1) General.** Decorative *appliances* for installation in *approved* solid fuel-burning *fireplaces* shall be ~~tested~~*listed* in accordance with ANSI Z21.60/**CSA 6.26** and shall be installed in accordance with the manufacturer's instructions. Manually lighted natural gas decorative *appliances* shall be ~~tested~~*listed* in accordance with ANSI Z21.84.		Minor wordsmithing changes and update to reference standard.
	G2432.2 (602.2) Flame safeguard device. Decorative *appliances* for installation in *approved* solid fuel-burning *fireplaces*, with the exception of those ~~tested~~ *listed* in accordance with **ANSI Z21.84**, shall utilize a direct ignition device, an ignitor or a *pilot* flame to ignite the fuel at the *main burner*, and shall be equipped with a *flame safeguard* device. The *flame safeguard* device shall automatically shut off the fuel supply to a *main burner* or group of *burners* when the means of ignition of such *burners* becomes inoperative.		Minor wordsmithing changes.
	SECTION G2434 (604) **VENTED GAS FIREPLACES (DECORATIVE APPLIANCES)** **G2434.1 (604.1) General.** Vented gas *fireplaces* shall be ~~tested~~ *listed* in accordance with **ANSI Z21.50/CSA 2.22**, shall be installed in accordance with the manufacturer's instructions and shall be designed and equipped as specified in **Section G2432.2**.		Minor wordsmithing changes.
	SECTION G2434 (604) **VENTED GAS FIREPLACES** **(DECORATIVE APPLIANCES)** **G2434.1 (604.1) General.** Vented gas *fireplaces* shall be ~~tested~~ *listed* in accordance with ANSI Z21.50/**CSA 2.22**, shall be installed in accordance with the manufacturer's instructions and shall be designed and equipped as specified in Section G2432.2.		Minor wordsmithing changes and update to reference standard.

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	SECTION G2435 (605) **VENTED GAS FIREPLACE HEATERS** **G2435.1 (605.1) General.** Vented gas *fireplace* heaters shall be installed in accordance with the manufacturer's instructions, shall be ~~tested~~ *listed* in accordance with ANSI Z21.88**/CSA 2.33** and shall be designed and equipped as specified in Section G2432.2.		Minor wordsmithing changes and update to reference standard.
	SECTION G2436 (608) **VENTED WALL FURNACES** **G2436.1 (608.1) General.** *Vented wall furnaces* shall be ~~tested~~ *listed* in accordance with **ANSI Z21.86/CSA 2.32** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	SECTION G2437 (609) **FLOOR FURNACES** **G2437.1 (609.1) General.** *Floor furnaces* shall be ~~tested~~ *listed* in accordance with **ANSI Z21.86/CSA 2.32** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	G2437.2 (609.2) Placement. The following provisions apply to *floor furnaces*: 1. Floors. *Floor furnaces* shall not be installed in the floor of any doorway, stairway landing, aisle or passageway of any enclosure, public or private, or in an exitway from any such room or space. 2. Walls and corners. The register of a *floor furnace* with a horizontal warm air outlet shall not be placed closer than 6 inches (152 mm) to the nearest wall. A distance of ~~at least~~ not less than 18 inches (457 mm) from two adjoining sides of the *floor furnace* register to walls shall be provided to eliminate the necessity of occupants walking over the warm-air discharge. The remaining sides shall be permitted to be placed not closer than 6 inches (152 mm) to a wall. Wall-register models shall not be placed closer than 6 inches (152 mm) to a corner. 3. Draperies. The *furnace* shall be placed so that a door, drapery, or similar object cannot be nearer than 12 inches (305 mm) to any portion of the register of the *furnace*. 4. Floor construction. *Floor furnaces* shall not be installed in concrete floor construction built on grade. 5. *Thermostat.* The controlling *thermostat* for a *floor furnace* shall be located within the same room or space as the *floor furnace* or shall be located in an adjacent room or space that is permanently open to the room or space containing the *floor furnace*.		Minor wordsmithing changes.
	G2437.4 (609.4) Clearance. The lowest portion of the *floor furnace* shall have not less than a 6-inch (152 mm) *clearance* from the grade level; except where the lower 6-inch (152 mm) portion of the *floor furnace* is sealed by the manufacturer to prevent entrance of water, the minimum *clearance* shall be ~~**reduced to**~~ not less than 2 inches (51 mm). Where such *clearances* cannot be provided, the ground below and to the sides shall be excavated to form a pit under the *furnace* so that the required *clearance* is provided beneath the lowest portion of the *furnace*. A 12-inch (305 mm) minimum clearance shall be provided on all sides except the *control* side, which shall have an 18-inch (457 mm) minimum *clearance*.		Minor wordsmithing changes.

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	SECTION G2438 (613) CLOTHES DRYERS **G2438.1 (613.1) General.** *Clothes dryers* shall be ~~tested~~ *listed* in accordance with ANSI Z21.5.1/**CSA 7.1** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.
	G2439.3 (614.4) Exhaust installation. Exhaust ducts for *clothes dryers* shall terminate on the outside of the building and shall be equipped with a backdraft *damper*. Screens shall not be installed at the duct termination. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. *Clothes dryer* exhaust ducts shall not be connected to a *vent connector*, vent or *chimney*. *Clothes dryer* exhaust ducts shall not extend into or through ducts or plenums. Clothes dryer exhaust ducts shall be sealed in accordance with Section M1601.4.1.		New requirements for clothes dryer exhaust ducts to be sealed.
	G2439.3.1 (614.4.1) Exhaust termination outlet and passageway. The passageway of dryer exhaust duct terminals shall be undiminished in size and shall provide an open area of not less than 12.5 square inches (8065 mm^2).		New requirements for dryer exhaust duct termination.
	G2439.5 (614.7) Makeup air. Installations exhausting more than 200 cfm (0.09 m^3/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 m^2) for *makeup air* shall be provided in the closet enclosure, or *makeup air* shall be provided by other *approved* means.~~		Minor update to makeup air requirements. Closet installation moved to new subsection G2439.5.1.
	G2439.5.1 (614.7.1) Closet installation. Where a closet is designed for the installation of a *clothes dryer*, an opening having an area of not less than 100 square inches (645 mm^2) for *makeup air* shall be provided in the closet enclosure, or *makeup air* shall be provided by other *approved* means.		Closet requirements for makeup air relocated to new subsection.
	G2439.6 (614.8) Protection required. Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the *clothes dryer* exhaust duct. Shield plates shall be placed on the finished face of all framing members where there is less than 1 1/4 inches (32 mm) between the duct and the finished face of the framing member. Protective shield plates shall be constructed of steel, shall have a minimum thickness of 0.062 inch (1.6 mm) and shall extend ~~a minimum of~~ not less than 2 inches (51 mm) above sole plates and below top plates.		Minor wordsmithing changes.
	G2439.7.1 (614.9.1) Material and size. Exhaust ducts shall have a smooth interior finish and shall be constructed of metal ~~a minimum of~~ not less than 0.016~~-~~ inch (0.4 mm) in thickness. The exhaust duct size shall be 4 inches (102 mm) nominal in diameter.		Minor wordsmithing changes.
	G2439.7.2 (614.9.2) 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 1/8 inch (3.2 mm) into the inside of the duct. Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.		Updated requirements for dryer ducts enclosed in wall or ceiling cavaties.

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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.		**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.	No change to Houston amendment.
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.			Previous Houston amendment removed to go with base code requirements.
	G2439.7.6 (614.9.6) Exhaust duct required. Where space for a *clothes dryer* is provided, an exhaust duct system shall be installed. Where the *clothes dryer* is not installed at the time of occupancy, the exhaust duct shall be capped at the location of the future dryer. **Exception:** Where a *listed* condensing *clothes dryer* is installed prior to occupancy of the structure.		Minor wordsmithing changes.
	G2440.6 (615.6) Heat and time controls. Sauna heaters shall be equipped with a *thermostat* ~~which~~ that will limit room temperature to 194ºF (90ºC). If the *thermostat* is not an integral part of the sauna heater, the heat-sensing element shall be located within 6 inches (152 mm) of the ceiling. If the heat-sensing element is a capillary tube and bulb, the assembly shall be attached to the wall or other support, and shall be protected against physical damage.		Minor wordsmithing changes.
	SECTION G2441 (617) **POOL AND SPA HEATERS** **G2441.1 (617.1) General.** Pool and spa heaters shall be ~~tested~~ *listed* in accordance with **ANSI Z21.56/CSA 4.7** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	SECTION G2442 (618) **FORCED-AIR WARM-AIR FURNACES** **G2442.1 (618.1) General.** Forced-air warm-air *furnaces* shall be ~~tested~~ listed in accordance with ANSI Z21.47/**CSA 2.3** or UL 795 and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.
	~~**G2442.2 (618.2) Forced-air furnaces.** The minimum unobstructed total area of the outside and return air ducts or openings to a forced-air warm-air *furnace* shall be not less than 2 square inches for each 1,000 *Btu*/h (4402 mm²/W) output rating capacity of the *furnace* and not less than that specified in the furnace manufacturer's installation instructions. The minimum unobstructed total area of supply ducts from a forced-air warm-air *furnace* shall be not less than 2 square inches for each 1,000 *Btu*/h (4402 mm²/W) output rating capacity of the furnace and not less than that specified in the *furnace* manufacturer's installation instructions.~~		Base code section removed.

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	~~**Exception:** The total area of the supply air ducts and outside and return air ducts shall not be required to be larger than the minimum size required by the *furnace* manufacturer's installation instructions.~~		
	G2442.3~~2~~2 (618.3~~2~~2) Dampers.		Base code renumbering.
	G2442.4~~3~~3 (618.4~~3~~3) Prohibited sources. Outdoor or return air for forced-air heating and cooling systems shall not be taken from the following locations: 1. Closer than 10 feet (3048 mm) from 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 there is the presence of objectionable odors, fumes or flammable vapors; 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 hazardous or insanitary location or a refrigeration machinery room as defined in the *International Mechanical Code*. 4. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with ~~Section G2442.2~~ this code, adjoining rooms or spaces shall be considered ~~as~~ to be a single room or space for the purpose of determining the volume of such 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 such room or space. 5. A room or space containing an *appliance* where such a room or space serves as the sole source of return air. **Exception:** This shall not apply where: 1. The *appliance* is a direct-vent *appliance* or an *appliance* not requiring a vent in accordance with Section G2425.8. 2. The room or space complies with the following requirements: 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 (9.6L/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.		Base code renumbering and minor wordsmithing.

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	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, provided that return-air inlets are located not less than 10 feet (3048 mm) from the firebox of such appliances. 6. A closet, bathroom, toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic. **Exceptions:** 1. Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances and serve only the kitchen area, taking return air from a kitchen area shall not be prohibited. 2. Dedicated forced-air systems serving only a garage shall not be prohibited from obtaining return air from the garage. 3. A 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.		
	G2442.~~5~~4 (618.~~5~~4) Screen.		Base code renumbering.
	G2442.~~6~~5 (618.~~6~~5) Return-air limitation.		Base code renumbering.
	G2442.~~7~~6 (618.~~7~~6) Furnace plenums and air ducts.		Base code renumbering.
	SECTION G2444 (620) **UNIT HEATERS** **G2444.1 (620.1) General.** *Unit heaters* shall be ~~tested~~ listed in accordance with ANSI Z83.8/**CSA 2.6** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.
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.			Previous Houston amendment removed to go with base code provisions.

{EDITORIAL NOTE: DELETE REMAINDER OF SECTION G2445.}			Previous Houston amendment to delete unvented room heaters has been removed to go with base code provisions.
	SECTION G2447 (623) **COOKING APPLIANCES** **G2447.1 (623.1) Cooking appliances.** Cooking *appliances* that are designed for permanent installation, including ranges, ovens, stoves, broilers, grills, fryers, griddles, hot plates and barbecues, shall be ~~tested~~ listed in accordance with ANSI Z21.1 or ANSI Z21.58/**CSA 1.6** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.
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.		**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*.	No change to Houston amendment.
	G2447.5 (623.7) Vertical clearance above cooking top. Household cooking *appliances* shall have a vertical *clearance* above the cooking top of not less than 30 inches (760 mm) to *combustible material* and metal cabinets. A minimum *clearance* of 24 inches (610 mm) is permitted where one of the following is installed: 1. The underside of the *combustible material* or metal cabinet above the cooking top is protected with not less than 1/4 -inch (6.4 mm) insulating millboard covered with sheet metal not less than 0.0122 inch (0.3 mm) thick. 2. A metal ventilating hood constructed of sheet metal not less than 0.0122 inch (0.3 mm) thick is installed above the cooking top with a *clearance* of not less than 1/4inch (6.4 mm) between the hood and the underside of the *combustible material* or metal cabinet. The hood shall have a width not less than the width of the *appliance* and shall be centered over the *appliance*. 3. A *listed* cooking *appliance* or microwave oven is installed over a *listed* cooking *appliance* and in compliance with the terms of the manufacturer's installation instructions for the upper *appliance*.		Update to correct metric measurements.
	SECTION G2448 (624) **WATER HEATERS** **G2448.1 (624.1) General.** Water heaters shall be ~~tested~~ *listed* in accordance with ANSI Z21.10.1/**CSA 4.1** ~~and~~ or ANSI Z21.10.3/**CSA 4.3** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.

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	SECTION G2449 (627) **AIR-CONDITIONING APPLIANCES** **G2449.1 (627.1) General.** Gas-fired air-conditioning *appliances* shall be ~~tested~~ *listed* in accordance with ANSI Z21.40.1**/CSA 2.91** or ANSI Z21.40.2**/CSA 2.92** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes and update to reference standard.
	G2449.4 (627.6) Installation. Air--conditioning *appliances* shall be installed in accordance with the manufacturer's instructions. Unless the *appliance* is *listed* for installation on a combustible surface such as a floor or roof, or unless the surface is protected in an *approved* manner, the *appliance* shall be installed on a surface of noncombustible construction with *noncombustible material* and surface finish, and ~~with no~~ *combustible material* shall not be against the underside thereof.		Minor wordsmithing changes.
	SECTION G2450 (628) **ILLUMINATING APPLIANCES** **G2450.1 (628.1) General.** Illuminating *appliances* shall be ~~tested~~ *listed* in accordance with **ANSI Z21.42** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	SECTION G2451 (630) **INFRARED RADIANT HEATERS** **G2451.1 (630.1) General.** Infrared radiant heaters shall be ~~tested~~ *listed* in accordance with **ANSI Z83.19** or **Z83.20** and shall be installed in accordance with the manufacturer's instructions.		Minor wordsmithing changes.
	SECTION G2452 (631) **BOILERS** **G2452.1 (631.1) Standards.** Boilers shall be *listed* in accordance with the requirements of ANSI Z21.13**/CSA 4.9** or UL 795. If applicable, the boiler shall be designed and constructed in accordance with the requirements of ASME CSD-1 and as applicable, the ASME *Boiler and Pressure Vessel Code*, Sections I, II, IV, V and IX and NFPA 85.		Update to reference standard.
	~~**SECTION G2453 (634)**~~ ~~**CHIMNEY DAMPER OPENING AREA**~~ ~~**G2453.1 (634.1) Free opening area of chimney dampers.** Where an unlisted decorative *appliance* for installation in a vented *fireplace* is installed, the *fireplace damper* shall have a permanent free opening equal to or greater than specified in **Table G2453.1**.~~		Base code section removed.
	~~**TABLE G2453.1 (634.1)**~~ ~~**FREE OPENING AREA OF CHIMNEY DAMPER FOR VENTING FLUE GASESFROM**~~ ~~**UNLISTED DECORATIVE APPLIANCES FOR INSTALLATION IN VENTED FIREPLACES**~~		Base code table removed.
	SECTION ~~G2454~~ **G2453 (635)** **OUTDOOR DECORATIVE APPLIANCES** ~~G2454.1~~ **G2453.1 (635.1) General.** Permanently fixed-in-place outdoor decorative *appliances* shall be ~~tested~~ *listed* in accordance with **ANSI Z21.97** and shall be installed in accordance with the manufacturer's instructions.		Base code renumbering and minor wordsmithing.

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2015 Houston IRC Amendments	2021 IRC – Chapter 25 – Plumbing Administration	2021 Houston IRC Amendments	Code Change Summary
	P2501.2 Application. In addition to the general administration requirements of Chapter 1, the administrative provisions of this chapter shall ~~**also**~~ apply to the plumbing requirements of Chapters 25 through 32~~3~~.		Base code renumbering.
	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, filling the *building sewer* with water and pressurizing the sewer to not less than **a** 10-foot (3048 mm) head of water. The test pressure shall not decrease during a period of not less than 15 minutes. The *building sewer* shall be water tight 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 water tight at all points.		Minor wordsmithing changes.
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.	**P2503.5.1 Rough plumbing.** DWV systems shall be tested on completion of the rough piping installation by water, by air for piping systems other than plastic, or by a vacuum of air for plastic piping systems, 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~~ 10 feet (~~1524~~ 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. 3. Vacuum test. The portion under test shall be evacuated of air by a vacuum-typepump to achieve a uniform gauge pressure of -5 pounds per square inch or a negative 10 inches of mercury column (-34 kPa). This pressure shall be held without the removal 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, by air for piping systems other than plastic, or by ~~a~~ vacuum of air for plastic piping systems, without evidence of leakage. 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 ~~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. 3. Vacuum test. The portion under test shall be evacuated of air by a vacuum-type pump to achieve a uniform gauge pressure of -5 pounds per square inch or a negative 10 inches of mercury column (-34 kPa). This pressure shall be held without the removal of additional air for a period of 15 minutes.	Minor updates and new vacuum test requirements. No change to Houston amendment.
	P2503.7 Water-supply system testing. Upon completion of the water-supply system or a section of it, the system or portion completed shall be tested and proved tight under a water pressure of not less than the working pressure of the system or, for piping systems other than plastic, by an air test of not less than 50 psi (345 kPa). This pressure shall be held for not less than 15 minutes. The water used for tests shall be obtained from a potable water source. **Exception:** For PEX piping systems, testing with a compressed gas shall be an alternative to hydrostatic testing where compressed air or other gas pressure testing is specifically authorized by the manufacturer's instructions for the PEX pipe and fittings products installed at the time the system is being		New exception for PEX piping system testing.

	tested, and compressed air or other gas testing is not otherwise prohibited by applicable codes, laws or regulations outside of this code.		

2015 Houston IRC Amendments	2021 IRC – Chapter 26 – General Plumbing Requirements	2021 Houston IRC Amendments	Code Change Summary
	SECTION P2602 **INDIVIDUAL WATER SUPPLY AND SEWAGE DISPOSAL** **P2602.1 General.** The water-distribution ~~and drainage~~ system of any building or premises where plumbing fixtures are installed shall be connected to a public water supply ~~or sewer system, respectively, if available. Where either a public water supply or sewer system, or both, are not available, or connection to them is not feasible, an individual water supply or individual (private) sewage disposal system, or both, shall be provided~~. Where a public water-supply system is not available, or connection to the supply is not feasible, an individual water supply shall be provided. Individual water supplies shall be constructed and installed in accordance with the applicable state and local laws. Where such laws do not address the requirements set forth in NGWA-01, individual water supplies shall comply with NGWA-01 for those requirements not addressed by state and local laws. Sanitary drainage piping from plumbing fixtures in buildings and sanitary drainage piping systems from premises shall be connected to a public sewer. Where a public sewer is not available, the sanitary drainage piping and systems shall be connected to a private sewage disposal system in compliance with state or local requirements. Where state or local requirements do not exist for private sewage disposal systems, the sanitary drainage piping and systems shall be connected to an approved private sewage disposal system that is in accordance with the *International Private Sewage Disposal Code*. **Exception:** Sanitary drainage piping and systems that convey only the discharge from bathtubs, showers, lavatories, clothes washers and laundry trays shall not be required to connect to a public sewer or to a private sewage disposal system provided that the piping or systems are connected to a system in accordance with Section P2910 or P2911.		General plumbing requirements have been expanded on to clarify intent and application of plumbing requirements.
	P2604.4 Protection of footings. Trenching installed parallel to footings and walls shall not extend into the bearing plane of a footing or wall. The upper boundary of the bearing plane is a line that extends downward, at an angle of 45 degrees (0.79 rad) from horizontal, from the outside bottom edge of the footing or wall.		Updated to include rad measurement.
	SECTION P2605 **SUPPORT** **P2605.1 General.** Piping shall be supported in accordance with the following:		Updated requirements for piping support, includes new requirements for horizontal pipe 4in. or larger conveying drainage or waste.

	1. Piping shall be supported to ensure alignment and prevent sagging, and allow movement associated with the expansion and contraction of the piping system. 2. Piping in the ground shall be laid on a firm bed for its entire length, except where support is otherwise provided. 3. Hangers and anchors shall be of sufficient strength to maintain their proportional share of the weight of pipe and contents and of sufficient width to prevent distortion to the pipe. Hangers and strapping shall be of *approved* material that will not promote galvanic action. ~~Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees (0.79 rad) for pipe sizes 4 inches (102 mm) and larger.~~ 4. Where horizontal pipes 4 inches (102 mm) and larger convey drainage or waste, and where a pipe fitting changes the flow direction greater than 45 degrees (0.79 rad), rigid bracing or other rigid support arrangements shall be installed to resist movement of the upstream pipe in the direction of flow. A change of flow direction into a vertical pipe shall not require the upstream pipe to be braced. 45. Piping shall be supported at distances not to exceed those indicated in Table P2605.1.		
	SECTION P2607 **WATERPROOFING OF OPENINGS** **P2607.1 Pipes penetrating roofs.** Where a pipe penetrates a roof, a flashing of lead, copper, galvanized steel or an *approved* elastomeric material shall be installed in a manner that prevents water entry into the building. Counterflashing into the opening of pipe serving as a vent terminal shall not reduce the required internal cross-sectional area of the vent pipe to less than the internal cross-sectional area of one pipe size smaller.		Minor wordsmithing change.

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	TABLE P2701.1 **PLUMBING FIXTURES, FAUCETS AND FIXTURE FITTINGS** MATERIAL / STANDARD Air gap fittings for use with plumbing fixtures, appliances and appurtenances — ASME A 112.1.3 Bathtub/whirlpool pressure-sealed doors — ASME A 112.19.15 Diverters for faucets with hose spray, anti-syphon type, residential application — ASTM A 112.18.1/CSA B125.1 Enameled cast-iron plumbing fixtures — ASME A 112.19.1M/CSA B45.2 Floor drains — ASME A 112.6.3 ~~Floor-affixed supports for off-the-floor plumbing fixtures for public use~~ — ~~ASME A 112.6.1M~~ Framing-affixed supports for off-the-floor water closets with concealed tanks — ASME A 112.6.2 Hose connection vacuum breaker — ASSE 1052 Hot water dispensers, household storage type, electrical — ASSE 1023 Household disposers — ASSE 1008 Hydraulic performance for water closets and urinals — ASME A 112.19.2/CSA B45.1 Individual automatic compensating valves for individual fixture fittings — ASME A 112.18.1/CSA B125.1 Individual shower control valves anti-scald — ASSE 1016/ASME A 112.1016/CSA B125.16 Macerating toilet systems and related components — ASME A 112.3.4/CSA B45.9 Nonvitreous ceramic plumbing fixtures — ASME A 112.19.2/CSA B45.1 Plastic bathtub units — CSA B45.5/IAPMO Z124, ASME A112.19.2/CSA B45.1 Plastic lavatories — CSA B45.5/IAPMO Z124 Plastic shower receptors and shower stall — CSA B45.5/IAPMO Z124 Plastic sinks — CSA B45.5/IAPMO Z124 Plastic water closet bowls and tanks — CSA B45.5/IAPMO Z124 Plumbing fixture fittings — ASME A 112.18.1/CSA B125.1 Plumbing fixture waste fittings — ASME A 112.18.2/CSA B125.2, ASTM F 409 Porcelain-enameled formed steel plumbing fixtures — ASME A 112.19.1/CSA B45.2 Pressurized flushing devices for plumbing fixtures — ASSE 1037, CSA B125.3 Specification for copper sheet and strip for building construction — ASTM B 370 Stainless steel plumbing fixtures — ASME A 112.19.3/CSA B45.4 Suction fittings for use in whirlpool bathtub appliances — ASME A 112.19.7 /CSA B45.10 Temperature-actuated, flow reduction valves to individual fixture fittings — ASSE 1062 Thermoplastic accessible and replaceable plastic tube and tubular fittings — ASTM F 409 Trench drains — ASME A 112.6.3 Trim for water closet bowls, tanks and urinals — ASME A 112.19.5/CSA B45.15 Vacuum breaker wall hydrant-frost-resistant, automatic-draining type — ASSE 1019 Vitreous china plumbing fixtures — ASME A 112.19.2/CSA B45.1 Wall-mounted and pedestal-mounted, adjustable and pivoting lavatory and sink carrier systems — ASME A 112.19.12 Water closet flush tank fill valves — ASSE 1002/ASME A112.1002/CSA B125.12, CSA B125.3 Whirlpool bathtub appliances — ASME A 112.19.7 /CSA B45.10		Update to table to remove ASME standard.
	P2702.4 Carriers for wall-hung water closets. Carriers for wall-hung water closets shall conform to ASME ~~**A112.6.1 or ASME**~~ A112.6.2.		Minor update to remove ASME standard.
	SECTION P2704 ~~**ACCESS TO CONNECTIONS**~~ **SLIP-JOINT CONNECTIONS** **P2704.1** ~~General~~**Slip joints.** ~~Slip joints shall be made with an *approved* elastomeric gasket and shall be installed only on the trap outlet, trap inlet and within the trap seal. Fixtures with concealed slip-joint connections shall be provided with an access panel or utility space not less than 12 inches (305 mm) in its smallest dimension or other *approved* arrangement so as to provide access to the slip connections for inspection and repair~~Slip-joint connections shall be installed only for tubular waste piping and only between the trap outlet of a fixture and the connection to the		Requirements for slip-joint connections has been restructured, no major change to requirements.

	drainage piping. Slip-joint connections shall be made with an *approved* elastomeric sealing gasket. Slip-joint connections shall be accessible. Such access shall provide an opening that is not less than 12 inches (305 mm) in its smallest dimension.		
P2708.1 General. Shower compartments shall have not less than 1024 square inches (0.827 m²) ~~900 square inches (0.6 m²)~~ 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 m²) ~~900 square inch (0.6 m²)~~ 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 m²).	**SECTION P2708** **SHOWERS** **P2708.1 General.** Shower compartments shall have not less than 900 square inches (0.6 m²) 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 **that** the required 900-square-inch (0.6 m²) dimension is maintained when the seat is in the folded-up position. 2. 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 m²).	**SECTION P2708** **SHOWERS** **P2708.1 General.** Shower compartments shall have not less than 1024 square inches (0.827 m²) ~~900 square inches (0.6 m²) 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 ~~that~~ the required 1,024 square inches (0.827 m²) ~~900 square inch (0.6 m²)~~ 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 m²).	Minor wordsmithing change. No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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 subpan 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 subpan shall be subjected to the test at the point where it is clamped to the drain.	No change to Houston amendment.
	SECTION P2713 **BATHTUBS** **P2713.1 Bathtub waste outlets and overflows.** Bathtubs shall be equipped with a waste outlet ~~and an overflow outlet. The outlets shall be connected to waste tubing or piping~~ that is not less than 1 1/2 inches (38 mm) in diameter. The waste outlet shall be equipped with a water-tight stopper. Where an overflow is installed, the overflow shall be not less than 11/2 inches (38 mm) in diameter.		Minor wordsmithing change and new requirements for overflow sizing.

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	P2708.2.1 Waste fittings. Waste fittings shall conform to ASME A112.18.2/CSA B125.2		New requirements for waste fittings to conform to ASME.
	P2708.4 Shower control valves. Individual shower and tub/shower combination valves shall be ~~equipped with control valves of the pressure balance~~ balanced-pressure, thermostatic ~~mixing~~ or combination balanced-pressure ~~balance/thermostatic mixing valve types with a high limit stop in accordance with~~/thermostatic valves that conform to the requirements of **ASSE 1016/ASME A112.1016/CSA B125.16** ~~The high limit stop shall be set to limit the water temperature to not greater than 120°F (49°C).~~ or **A112.18.1—2020/CSA B125.1—2020**. Shower control valves shall be rated for the flow rate of the installed shower head. Such valves shall be installed at the point of use. Shower and tub/shower combination valves required by this section shall be equipped with a means to limit the maximum setting of the valve to 120°F (49°C), which shall be field adjusted in accordance with the manufacturer's instructions to provide water at a temperature not to exceed 120ºF (49°C). In-line thermostatic valves shall not be ~~used~~ utilized for compliance with this section.		Shower control valve requirements have been updated per ASSE and ASME standards.
	P2709.4.1 Waste fittings. Flanged drains shall conform to ASME A112.18.2/CSA B125.2.		New requirements for waste fittings to conform to ASME.
	P2713.3 Bathtub and whirlpool bathtub valves. ~~Hot water supplied to bathtubs~~ Bathtubs and whirlpool ~~bathtubs~~ bathub valves shall ~~be limited to a temperature of not greater than 120°F (49°C)~~ have or be supplied by a water-temperature limiting device that conforms to ASSE 1070/**ASME A112.1070/CSA B125.70** ~~or CSA B125.3~~, except where such ~~protection is otherwise provided by a~~ valves are combination tub/shower ~~valve~~ valves in accordance with **Section P2708.4**. The water-temperature-limiting device required by this section shall be equipped with a means to limit the maximum setting of the device to 120ºF (49ºC), and, where adjustable, shall be field adjusted in accordance with the manufacturer's instructions to provide hot water at a temperature not to exceed 120ºF (49ºC). Access shall be provided to water-temperature-limiting devices that conform to **ASSE 1070/ASME A112.1070/CSA B125.70**. **Exception:** Access is not required for nonadjustable water-temperature-limiting devices that conform to **ASSE 1070/ASME A112.1070/CSA B125.70** and are integral with a fixture fitting, provided that the fixture fitting itself can be accessed for replacement.		Bathtub valve requirements have been updated per ASSE and ASME standards.
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.		**P2717.2 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.	No change to Houston amendment.

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	P2721.2 Bidet water temperature. The discharge water temperature from a bidet fitting shall be limited to not greater than 110°F (43°C) by a water-temperature-limiting device conforming to ASSE 1070/**ASME A112.1070/CSA B125.70** ~~or CSA B125.3~~.		Update to reference standard.
	P2722.5 Water closet personal hygiene devices. Personal hygiene devices integral to water closets or water closet seats shall conform to ASME A112.4.2/**CSA B45.16**.		Update to reference standard.
SECTION P2725 **~~NONLIQUID SATURATED TREATMENT SYSTEMS~~ RESERVED** {**EDITORIAL NOTE:** DELETE AND RESERVE THE CONTENTS OF THIS SECTION.}			Previous Houston amendment to remove composting toilets has been removed to go with base code requirements.

2015 Houston IRC Amendments	2021 IRC – Chapter 28 – Water Heaters	2021 Houston IRC Amendments	Code Change Summary
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.	**P2801.6 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 tank 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. A plastic pan ~~shall not be installed beneath a gas-fired water heater~~ beneath a gas-fired water heater shall be constructed of material having a flame spread index of 25 or less and a smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723.	**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. A plastic pan beneath a gas-fired water heater shall be constructed of material having a flame spread index of 25 or less and a *smoke-developed index* of 450 or less when tested in accordance with ASTM E84 or UL 723.	Update to pan requirements for gas-fired water heaters. No change to Houston amendment.
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.		**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 P2906.5. 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.	No change to Houston amendment.
	SECTION P2802 **SOLAR WATER HEATING SYSTEMS** **P2802.1 Water temperature control.** Where heated water is discharged from a solar thermal system to a hot water distribution system, a ~~thermostatic~~ temperature-actuated mixing valve complying with **ASSE 1017** shall be installed to temper the water to a temperature of not greater than 140°F (60°C). Solar thermal systems supplying hot water for both space heating and domestic uses shall comply with **Section P2803.2**. A temperature indicating device shall be installed to indicate the temperature of the water discharged from the outlet of the mixing valve. The ~~thermostatic~~ temperature-actuated mixing valve required by this section shall not		Minor wordsmithing changes.

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	be a substitute for water-temperature limiting devices required by **Chapter 27** for specific fixtures.		
	P2803.2 Temperature control. Where a combination water heater-space heating system requires water for space heating at temperatures exceeding 140°F (60°C), a ~~master thermostatic~~ temperature-actuated mixing valve complying with **ASSE 1017** shall be installed to temper the water to a temperature of not greater than 140°F (60°C) for domestic uses.		Minor wordsmithing changes.
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.~~	**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~~ installed with insert fittings. The outlet end of such tubing shall be fastened in place.	**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, or to a location approved by the Authority Having Jurisdiction. 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 installed with insert fittings. The outlet end of such tubing shall be fastened in place.	Minor update to require insert fittings on relief-valve discharge piping. Houston amendment updated to provide AHJ ability to approve location of discharge.

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TABLE P2902.3
APPLICATION FOR BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow Prevention Assemblies			
Double check backflow prevention assembly and double check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage Sizes 3/8" – 16"	ASSE 1015, AWWA C510, CSA B64.5, CSA B64.5.1
Double check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage Sizes 2" – 16"	ASSE 1048
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only Sizes 1/2" – 2"	ASSE 1020, CSA B64.1.2
Reduced pressure principle backflow prevention assembly and reduced pressure principle fire protection backflow prevention assembly	High or low hazard	Backpressure or backsiphonage Sizes 3/8" – 16"	ASSE 1013, AWWA C511, CSA B64.4, CSA B64.4.1
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (Fire sprinkler systems)	ASSE 1047
Spill-resistant vacuum breaker	High or low hazard	Backsiphonage only Sizes 1/4" – 2"	ASSE 1056, CSA B64.1.3
Backflow Preventer Plumbing Devices			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	ASSE 1002/ ASME A112.1002/ CSA B125.12, CSA B125.3
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage Sizes 1/4" – 3/8"	ASSE 1012, CSA B64.3
Dual-check-valve-type backflow preventers	Low hazard	Backpressure or backsiphonage Sizes 1/4" – 1"	ASSE 1024, CSA B64.6
Hose-connection backflow preventer	High or low hazard	Low head backpressure, rated working pressure backpressure or backsiphonage Sizes 1/2" – 1"	ASSE 1052, CSA B64.2.1.1
Hose-connection vacuum breaker	High or low hazard	Low head backpressure or backsiphonage Sizes 1/2", 3/4", 1"	ASSE 1011, CSA B64.2, CSA B64.2.1
Laboratory faucet backflow preventer	High or low hazard	Low head backpressure and backsiphonage	ASSE 1035, CSA B64.7
Pipe-applied atmospheric-type vacuum breaker	High or low hazard	Backsiphonage only Sizes 1/4" – 4"	ASSE 1001, CSA B64.1.1
Vacuum breaker wall hydrants, frost-resistant, automatic-draining type	High or low hazard	Low head backpressure or backsiphonage Sizes 3/4" – 1"	ASSE 1019, CSA B64.2.2
Other Means Or Methods			
Air gap	High or low hazard	Backsiphonage only	ASME A112.1.2
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	High or low hazard	Backsiphonage or backpressure	ASME A112.1.3

For SI: 1 inch = 25.4 mm.
a. Low hazard—See Pollution (Section R202). High hazard—See Contamination (Section R202).
b. See Backpressure (Section R202). See Backpressure, Low Head (Section R202). See Backsiphonage (Section R202).

Minor changes to table to update reference standards.

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TABLE P2902.3
APPLICATION FOR BACKFLOW PREVENTERS

DEVICE	DEGREE OF HAZARD[a]	APPLICATION[b]	APPLICABLE STANDARDS
Backflow Prevention Assemblies			
Double-check backflow prevention assembly and double-check fire protection backflow prevention assembly	Low hazard	Backpressure or backsiphonage sizes 3/8″ – 16″	**ASSE 1015**, **AWWA C510**, **CSA B64.5**, **CSA B64.5.1**
Double-check detector fire protection backflow prevention assemblies	Low hazard	Backpressure or backsiphonage sizes 2″ – 16″	**ASSE 1048**
Pressure vacuum breaker assembly	High or low hazard	Backsiphonage only sizes 1/2″ – 2″	**ASSE 1020**, **CSA B64.1.2**
Reduced pressure principle backflow prevention assembly and reduced pressure principle fire protection backflow prevention assembly	High or low hazard	Backpressure or backsiphonage sizes 3/8″ – 16″	**ASSE 1013**, **AWWA C511**, **CSA B64.4**, **CSA B64.4.1**
Reduced pressure detector fire protection backflow prevention assemblies	High or low hazard	Backsiphonage or backpressure (~~Fire~~automatic sprinkler systems)	**ASSE 1047**
Spill-resistant vacuum breaker	High or low hazard	Backsiphonage only sizes 1/4″ – 2″	**ASSE 1056**, **CSA B64.1.3**
Backflow Preventer Plumbing Devices			
Antisiphon-type fill valves for gravity water closet flush tanks	High hazard	Backsiphonage only	**ASSE 1002/ASME A112.1002/CSA B125.12**, **CSA B125.3**
Backflow preventer with intermediate atmospheric vents	Low hazard	Backpressure or backsiphonage sizes 1/4″ – 3/8″	**ASSE 1012**, **CSA B64.3**
Backflow preventer with intermediate atmospheric vent and pressure-reducing valve	Low hazard	Backpressure or backsiphonage Sizes 1/4″ – 3/8″	**ASSE 1081**
Dual-check-valve-type backflow preventers	Low hazard	Backpressure or backsiphonage sizes 1/4″ – 1″	**ASSE 1024**, **CSA B64.6**

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	Hose-connection backflow preventer | High or low hazard | Low head backpressure, rated working pressure backpressure or backsiphonage sizes $^1/_2$" – 1" | **ASSE 1052, CSA B64.2.1.1** Hose-connection vacuum breaker | High or low hazard | Low head backpressure or backsiphonage sizes $^1/_2$", $^3/_4$", 1" | **ASSE 1011, CSA B64.2, CSA B64.2.1** Laboratory faucet backflow preventer | High or low hazard | Low head backpressure and backsiphonage | **ASSE 1035, CSA B64.7** Pipe-applied atmospheric-type vacuum breaker | High or low hazard | Backsiphonage only sizes $^1/_4$" – 4" | **ASSE 1001, CSA B64.1.1** Vacuum breaker wall hydrants, frost-resistant, automatic-draining type | High or low hazard | Low head backpressure or back siphonage sizes $^3/_4$" – 1" | **ASSE 1019, CSA B64.2.2** **Other Means or Methods** Air gap | High or low hazard | Backsiphonage only | **ASME A112.1.2** Air gap fittings for use with plumbing fixtures, appliances and appurtenances | High or low hazard | Backsiphonage or backpressure | **ASME A112.1.3** For SI: 1 inch = 25.4 mm. a. Low hazard—See "***Pollution***" (Section R202). High hazard—See "***Contamination***" (Section R202). b. See "***Backpressure***" (Section R202). See "***Backpressure, Low Head***" (Section R202). See "***Backsiphonage***" (Section R202).		
	P2902.3.3 Backflow preventer with intermediate atmospheric vent. Backflow preventers with intermediate atmospheric vents shall conform to **ASSE 1012**, **ASSE 1081** or **CSA B64.3**. These devices shall be permitted to be installed where subject to continuous pressure conditions. These devices shall be prohibited as a means of protection where any hazardous chemical additives are introduced downstream of the device. The relief opening shall discharge by *air gap* and shall be prevented from being submerged.		Updated to include new reference standard.
	P2902.3.6 Double -check backflow prevention assemblies. Double -check backflow prevention assemblies shall conform to ASSE 1015, **CSAB64.5,** CSA ~~**B64.5, CSA**~~ B64.5.1 or AWWA C510. Double—check detector fire protection backflow prevention assemblies shall conform to ASSE 1048. These assemblies shall be capable of operating under continuous pressure conditions.		Minor wordsmithing change.
	P2902.4.1 Fill valves. Flush tanks shall be equipped with an antisiphon fill valve conforming to ASSE 1002**/ASME A112.1002/CSA B125.12** or CSA B125.3. The critical level of the fill valve shall be located not less than 1 inch (25 mm) above the top of the flush tank overflow pipe.		Updated to include new reference standard.
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 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 principle		**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 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 principle	No change to Houston amendment.

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backflow prevention assembly complying with ASSE 1013, CSA B64.4 or AWWA C511.		backflow prevention assembly complying with ASSE 1013, AWWA C511 or CSA B64.4.	
	P2902.5.4 Connections to automatic fire sprinkler systems. The potable water supply to automatic fire sprinkler systems shall be protected against backflow by a double--check backflow prevention assembly, a double--check fire protection backflow prevention assembly, a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly. **Exception:** Where sprinkler systems are installed ~~as a portion of the water distribution system~~ in accordance with ~~the requirements of this code and are not provided with a fire department conn~~Section **P2904.1**, backflow protection for the water supply system shall not be required.		Minor updates to exception to clarify intent of requirements.
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 principle backflow prevention assembly complying with ASSE 1013.		**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 principle backflow prevention assembly complying with ASSE 1013.	Houston amendment updated to remove requirements so all direct systems comply with ASSE 1013.
	P2902.6.3 Relief port piping. The indirect waste receptor and drainage piping shall be sized to drain the maximum discharge flow rate from the relief port as published by the backflow preventer manufacturer. The termination of the piping from the relief port or air gap fitting of the backflow preventer shall discharge to an *approved* indirect waste receptor or to the outdoors where it will not cause damage or create a nuisance.		Relief port piping has been updated to include sizing requirements.
	SECTION P2903 **WATER SUPPLY SYSTEM** **P2903.1 Water supply system design criteria.** The water service and water distribution systems shall be designed and ~~pipe sizes shall be selected such that under conditions of~~sized for peak demand~~, the capacities at the point of outlet discharge shall be not less than~~ using values shown in Table P2903.1.		Minor update to water supply sizing design to clarify intent of sizing.

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.

TABLE P2903.2
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS[b]

PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY
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	1.6 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 to be 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

Minor wordsmithing to table footnote.

No change to Houston amendment.

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		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 hand-held shower spray-shall be considered to be a shower head. b. Consumption tolerances shall be determined from referenced standards.	
	P2903.3.1 Pumps handling drinking water. Pumps intended to supply drinking water shall conform to **NSF 61**.		New section for pumps serving drinking water to conform to NSF 61.
	~~**P2903.3.1**~~**P2903.3.2 Maximum pressure.**		Base code renumbering.
	P2903.5 Water hammer. The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer's instructions. Water-hammer arrestors shall conform to ASSE 1010.		Updated to require water-hammer arrestor where quick-closing valves are used.
	P2903.7 Size of water-service mains, branch mains and risers. The size of the water service pipe shall be not less than 3/4 inch (19 mm) diameter. The size of water service mains, branch mains and risers shall be determined from the water supply demand [gpm (L/m)], available water pressure [psi (kPa)] and friction loss caused by the water meter and *developed length* of pipe [feet (m)], including *equivalent length* of fittings. The size of each water distribution system shall be determined according to design methods conforming to acceptable engineering practice, such as those methods in Appendix P and shall be *approved* by the ~~code~~ building official.		Minor wordsmithing changes.
	TABLE P2903.8.1 **MANIFOLD SIZING**[a] PLASTIC: Nominal Size ID (inches) | Maximum gpm[a,b]; METALLIC: Nominal Size ID (inches) | Maximum gpm[a,b] 3/4 | 17 | 3/4 | 11 1 | 29 | 1 | 20 1 1/4 | 46 | 1 1/4 | 31 1 1/2 | 66 | 1 1/2 | 44 For SI: 1 inch = 25.4 mm, 1 gallon per minute = 3.785 L/m, 1 foot per second = 0.3048 m/s. ~~Note~~ a. See Table P2903.6~~(1)~~ for w.s.f.u and Table 2903.6(1) for gallon-per-minute (gpm) flow rates. ~~a~~b. Based on velocity limitation: plastic-12 fps; metal-8 fps.		Minor changes to table footnotes.
	P2903.8.2 Minimum size. Where the *developed length* of the distribution line is 60 feet (18 288 mm) or less, and the available pressure at the meter is not less than 40 pounds per square inch (276 kPa), the size of individual distribution lines shall be not less than 3/8 inch (10 mm) diameter. Certain fixtures such as one-piece water closets and whirlpool bathtubs shall require a larger size where specified by the manufacturer. ~~If~~ Where a water heater is fed from the end of a cold water manifold, the manifold shall be one size larger than the water heater feed.		Minor wordsmithing changes.

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<table>
<tr>
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<td>P2903.9.4 Valve requirements. Valves shall be compatible with the type of piping material installed in the system. Valves shall conform to one of the standards ~~listed~~ indicated in Table P2903.9.4 or shall be approved. Valves intended to supply drinking water shall meet the requirements of NSF 61.</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td></td>
<td>TABLE P2903.9.4
VALVES
<table><tr><th>MATERIAL</th><th>STANDARD</th></tr><tr><td>Chlorinated polyvinyl chloride (CPVC) plastic</td><td>ASME A112.4.14, ASME A112.18.1/CSA B125.1, ASTM F 1970, CSA B125.3 MSS SP-122</td></tr><tr><td>Copper or copper alloy</td><td>ASME A112.4.14, ASME A112.18.1/CSA B125.1, ASME B16.34, CSA B125.3, MSS SP-67, MSS SP-80, MSS SP-110 MSS SP-139</td></tr><tr><td>Gray and ductile iron</td><td>ASTM A126, AWWA C500, AWWA C504, AWWA C507, MSS SP-42, MSS SP-67, MSS SP-70, MSS SP-71, MSS SP-72, MSS SP-78</td></tr><tr><td>Cross-linked polyethylene (PEX) plastic</td><td>ASME A112.4.14, ASME A112.18.1/CSA B125.1, CSA B125.3, NSF 359</td></tr><tr><td>Polypropylene (PP) plastic</td><td>ASME A112.4.14, ASTM F 2389</td></tr><tr><td>Polyvinyl chloride (PVC) plastic</td><td>ASME A112.4.14, ASTM F 1970 MSS SP-122</td></tr></table></td>
<td></td>
<td>Minor update to table to include new reference standards.</td>
</tr>
<tr>
<td></td>
<td>P2903.9.5 Valves and outlets prohibited below grade. Potable water outlets and combination stop-and-waste valves shall not be installed underground or below grade. Freezeproof yard hydrants that drain the riser into the ground are considered to be stop-and-waste valves.
Exception: Installation of freezeproof yard hydrants that drain the riser into the ground shall be permitted if the potable water supply to such hydrants is protected upstream of the hydrants in accordance with Section P2902 and the hydrants are permanently identified as nonpotable outlets by approved signage that reads as follows: ~~“Caution, Nonpotable Water. Do Not Drink.”~~“CAUTION, NONPOTABLE WATER. DO NOT DRINK.”</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
<tr>
<td>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 standalone and multipurpose wet-pipe sprinkler systems that do not include the use of 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.~~</td>
<td>SECTION P2904
DWELLING UNIT FIRE SPRINKLER SYSTEMS
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 to be 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 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~~.~~, provided that the sprinkler system complies with all of the following:
1. The system complies with NFPA 13D or Section P2904. .
2. The piping material complies with Section P2906.
3. The system does not contain antifreeze.
4. The system does not have a fire department connection.</td>
<td>SECTION P2904
DWELLING UNIT FIRE SPRINKLER SYSTEM
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 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 sprinkler system from the water distribution system, provided that the sprinkler system complies with all of the following:~~
~~1. The system complies with NFPA 13D or Section P2904.~~
~~2. The piping material complies with Section P2906.~~
~~3. The system does not contain antifreeze.~~
~~4. The system does not have a fire department connection.~~</td>
<td>Updates to base code to clarify when backflow preventers for a sprinkler system is required.

No change to Houston amendment.</td>
</tr>
</table>

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	P2904.2.1 Temperature rating and separation from heat sources. Except as provided for in **Section P2904.2.2**, sprinklers shall have a temperature rating of not less than 135°F (57°C) and not more than ~~170°F (77°C)~~225°F (107°C). Sprinklers shall be separated from heat sources as required by the sprinkler manufacturer's installation instructions.		Temperature rating for sprinklers has been increased.
	P2904.2.3 Freezing areas. Piping shall be protected from freezing as required by **Section P2603.5** or by by using one of the following: 1. A dry-pipe automatic sprinkler system that is listed for residential occupancyapplications. 2. ~~Where sprinklers are required in areas that are subject to freezing,~~ Dry-sidewall or dry-pendent sprinklers extending from a nonfreezing area into a freezing area ~~shall be installed~~.		Freeze protection for sprinkler system piping has been updated.
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.		**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.	No change to Houston amendment.
	P2904.3.2 Shutoff valves prohibited. With the exception of shutoff valves for the entire water distribution system or a single master control valve for the automatic sprinkler system that is locked in the open position, valves shall not be installed in any location where the valve would isolate piping serving one or more sprinklers.		Updated requirements for shutoff valves.
	P2904.4 Determining system design flow. The flow for sizing the sprinkler piping system shall be based on ~~the flow rating of each sprinkler in accordance with Section P2904.4.1 and the calculation in accordance with Section P2904.4.2~~ **Sections P2904.4.1** and **P2904.4.2**.		Minor wordsmithing changes.
	P2904.4.1 Determining required flow rate for each sprinkler. The minimum required flow for each sprinkler shall be determined using the sprinkler manufacturer's published data for the specific sprinkler model based on all of the following: 1. The area of coverage. 2. The ceiling configuration, in accordance with **Sections P2904.4.1.1** through **P2904.4.1.3**. 3. The temperature rating. 4. Any additional conditions specified by the sprinkler manufacturer.		Minor update to provide reference to requirements.
	P2904.4.1.1 Ceiling configurations. Manufacturer's published flow rates for sprinklers tested under a ceiling 8 feet (2438 mm) in height, in accordance with the sprinkler listing, shall be used for the following ceiling configurations, provided that the ceiling surface does not have significant irregularities, lumps or indentations and is continuous in a single plane.		New requirements for ceiling configurations.

1. Ceilings that are horizontal or that have a slope not exceeding 8 units vertical in 12 units horizontal (67 percent), without beams, provided that the ceiling height, measured to the highest point, does not exceed 24 feet (7315 mm) above the floor. Where the slope exceeds 2 units vertical in 12 units horizontal (17 percent), the highest sprinkler installed along the sloped portion of a ceiling shall be positioned above all communicating openings connecting the sloped ceiling compartment with an adjacent space.
2. Ceilings that are horizontal or that have a slope not exceeding 8 units vertical in 12 units horizontal (67 percent), with beams, provided that the ceiling height, measured to the highest point, does not exceed 24 feet (7315 mm) above the floor. Beams shall not exceed 14 inches (350 mm) in depth, and pendent sprinklers shall be installed under the beams as described at the end of this section. The compartment containing the beamed ceiling shall not exceed 600 square feet (56 m^2) in area. Where the slope does not exceed 2 units vertical in 12 units horizontal (17 percent), the highest sprinkler in the compartment shall be above all communicating openings connecting the compartment with an adjacent space. Where the slope exceeds 2 units vertical in 12 units horizontal (17 percent), the highest sprinkler installed along the sloped portion of a ceiling shall be positioned above all communicating openings connecting the sloped ceiling compartment with an adjacent space.
3. Ceilings that have a slope exceeding 2 units vertical in 12 units horizontal(17 percent) but not exceeding 8 units vertical in 12 units horizontal (67 percent), with beams of any depth, provided that the ceiling height, measured to the highest point, does not exceed 24 feet (7315 mm) above the floor. Sidewall or pendent sprinklers shall be installed in each pocket formed by beams. The compartment containing the sloped, beamed ceiling shall not exceed 600 square feet (56 m^2) in area.

Pendent, recessed pendent and flush-type pendent sprinklers installed directly under a beam having a maximum depth of 14 inches (356 mm) shall have the sprinkler deflector located not less than 1 inch (25 mm) or more than 2 inches (51 mm) below the bottom of the beam. Pendent sprinklers installed adjacent to the bottom of a beam having a maximum depth of 14 inches (356 mm) shall be positioned such that the vertical centerline of the sprinkler is not more than 2 inches (51 mm) from the edge of the beam, with the sprinkler deflector located not less than 1 inch (25 mm) or more than 2 inches (51 mm) below the bottom of the beam. Pendent sprinklers shall also be permitted to be installed less than 1 inch (25 mm) below the bottom of

	a beam where in accordance with manufacturer's instructions for installation of flush sprinklers.		
	P2904.4.1.2 Ceiling configurations with special sprinkler listings. For ceiling configurations not specified in **Section 2904.4.1.1**, the manufacturer's published flow rate for sprinklers that have been listed for protection of such configurations shall be used.		New requirements for ceiling configurations.
	P2904.4.1.3 Other ceiling configurations. For ceiling configurations not addressed by **Section P2904.4.1.1** or **P2904.4.1.2**, the flow rate shall be subject to approval by the code official.		New requirements for ceiling configurations.
	TABLE P2904.6.2(2) **MINIMUM WATER METER PRESSURE LOSS (PL_m)[a]**		Minor updates to pressure loss table.

FLOW RATE (gallons per minute, gpm)[b]	5/8-INCH METER PRESSURE LOSS (pounds per square inch, psi)	3/4-INCH METER PRESSURE LESS (pounds per square inch, psi)	1-INCH METER PRESSURE LOSS (pounds per square inch, psi)
8	~~2~~ 3	~~1~~ 3	1
10	3	~~1~~ 3	1
12	4	~~1~~ 3	1
14	~~5~~ 6	~~2~~ 5	1
16	7	~~3~~ 6	1
18	9	~~4~~ 7	~~1~~ 2
20	11	~~4~~ 9	2
~~22~~ 23	~~NP~~ 14	~~5~~ 11	~~2~~ 3
~~24~~	~~NP~~	~~5~~	~~2~~
26	~~NP~~ 18	~~6~~ 14	~~2~~ 3
~~28~~	~~NP~~	~~6~~	~~2~~
~~30~~ 31	~~NP~~ 26	~~7~~ 22	~~2~~ 4
~~32~~ 39	~~NP~~ 38	~~7~~ 35	~~3~~ 6
~~34~~	~~NP~~	~~8~~	~~3~~
~~36~~ 52	NP	~~8~~ NP	~~3~~ 10

For SI: 1 inch = 25.4 mm, 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 0.063 L/s.

NP = Not permitted unless the actual water meter pressure loss is known.

a. **Table P2904.6.2(2)** establishes conservative values for water meter pressure loss or installations where the water meter loss is unknown. Where the actual water meter pressure loss is ~~known~~published and available from the meter manufacturer, PL_m shall be the ~~actual loss~~ published pressure loss for the selected meter.
b. Flow rate from **Section P2904.4.2**. Add 5 gpm to the flow rate required by **Section P2904.4.2** where the water service pipe supplies more than one dwelling.

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	P2904.6.2.1 Available pressure equation. The pressure available to offset friction loss in the interior piping system (P_t) shall be determined in accordance with the Equation 29-1. $P_t = P_{sup} - PL_{svc} - PL_m - PL_d - PL_e - P_{sp}$ **(Equation 29-1)** where: P_t = Pressure used in applying Tables P2904.6.2(4) through P2904.6.2(9). P_{sup} = Pressure available from the water supply source. PL_{svc} = Pressure loss in the water-service pipe. (Table P2904.6.2(1)) PL_m = Pressure loss in the water meter. (Table P2904.6.2(2)) PL_d = Pressure loss from devices other than the water meter. PL_e = Pressure loss associated with changes in elevation. (Table P2904.6.2(3)) P_{sp} = Maximum pressure required by a sprinkler.		Minor updates to provide reference to necessary pressure loss tables.
	P2905.3 Hot water supply to fixtures. The *developed length* of hot water piping, from the source of the hot water to the fixtures that require hot water, shall not exceed 100 feet (30 480 mm). Water heaters and recirculating system piping shall be considered to be sources of hot water.		New requirements for hot water supply.
	TABLE P2906.4 **WATER SERVICE PIPE** MATERIAL / STANDARD Acrylonitrile butadiene styrene (ABS) plastic pipe — ASTM D 1527; ASTM D 2282 Chlorinated polyvinyl chloride (CPVC) plastic pipe — ASTM D 2846; ASTM F 441; ASTM F 442/F422M; CSA B137.6 Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) plastic pipe — ASTM F 2855 Copper or copper-alloy pipe — ASTM B 42; ASTM B 43; ASTM B 302 Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM) — ASTM B 75/B75M; ASTM B 88; ASTM B 251; ASTM B 447 Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe — ASTM F 1281; ASTM F 2262; CSA B137.10 Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE) pipe — ASTM F 1986 Cross-linked polyethylene (PEX) plastic tubing — ASTM F 876; ~~ASTM F 877~~AWWA C904; CSA B137.5 Ductile iron water pipe — AWWA C115/A21.15; AWWA C151/A21.51 Galvanized steel pipe — ASTM A 53 Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe — ASTM F 1282; CSA B137.9 Polyethylene (PE) plastic pipe — ASTM D 2104; ASTM D 2239; AWWA C901; CSA B137.1 Polyethylene (PE) plastic tubing — ASTM D 2737; AWWA C901; CSA B137.1 Polyethylene of raised temperature (PE-RT) plastic tubing — ASTM F 2769 CSA B137.18 Polypropylene (PP) plastic tubing — ASTM F 2389; CSA B137.11 Polyvinyl chloride (PVC) plastic pipe — ASTM D 1785; ASTM D 2241; ASTM D 2672; CSA B137.3 Stainless steel (Type 304/304L) pipe — ASTM A 312; ASTM A 778 Stainless steel (Type 316/316L) pipe — ASTM A 312; ASTM A 778		Minor updates to table to include new referenced standards.
	P2906.4.1 Separation of water service and building sewer. Trenching, pipe installation and backfilling shall be in accordance with Section P2604. Where water service piping is located in the same trench with the building sewer, such sewer shall be constructed of materials listed in Table P3002.1(2). Where the building sewer piping is not constructed of materials indicated in Table P3002.1(2), the water service pipe and the building sewer shall be horizontally separated by not-less than		Minor wordsmithing changes.

	5 feet (1524 mm) of undisturbed or compacted earth. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that the water service is sleeved to a point not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing. The sleeve shall be of pipe materials indicated in Table P2906.4, P3002.1(2) or P3002.2. The required separation distance shall not apply where the bottom of the water service pipe that is located within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the highest point of the top of the building sewer.		
	P2906.5 Water- distribution pipe. Water- distribution piping within *dwelling units* shall conform to NSF 61 and shall conform to one of the standards indicated in Table P2906.5. ~~Hot w~~Water- distribution pipe and tubing shall have a pressure rating of not less than 100 psi at 180°F (689 kPa at 82°C).		Minor wordsmithing changes.
	TABLE P2906.5 **WATER DISTRIBUTION PIPE** **MATERIAL** / **STANDARD** Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing — ASTM D 2846; ASTM F 441; ASTM F 442~~/~~**/F442M:** CSA B137.6 Chlorinated polyvinyl chloride/aluminum/chlorinated polyvinyl chloride (CPVC/AL/CPVC) plastic pipe — ASTM F 2855 Copper or copper-alloy pipe — ASTM B 42; ASTM B 43; ASTM B 302 Copper or copper-alloy tubing (Type K, WK, L, WL, M or WM) — ASTM B 75~~/~~**B75M:** ASTM B 88; ASTM B 251; ASTM B 447 Cross-linked polyethylene (PEX) plastic tubing — ASTM F 876; ~~ASTM F 877,~~ CSA B137.5 Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe — ASTM F 1281; ASTM F 2262; CSA B137.10 Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE) pipe — ASTM F 1986 Galvanized steel pipe — ASTM A 53 Polyethylene/aluminum/polyethylene (PE-AL-PE) composite pipe — ASTM F 1282 Polyethylene of raised temperature (PE-RT) plastic tubing — ASTM F 2769 **CSA B137.18** Polypropylene (PP) plastic pipe or tubing — ASTM F 2389; CSA B137.11 Stainless steel (Type 304/304L) pipe — ASTM A 312; ASTM A 778		Minor updates to table to include new referenced standards.

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TABLE P2906.6
PIPE FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic	ASTM D 2468
Cast-iron	ASME B16.4
Chlorinated polyvinyl chloride (CPVC) plastic	ASSE 1061; ASTM D 2846; ASTM F 437; ASTM F 438; ASTM F 439; CSA B137.6
Copper or copper alloy	~~ASSE 1061;~~ ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.26; ASME B16.51; ASSE 1061
Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)	ASTM F 1986
Fittings for cross-linked polyethylene (PEX) plastic tubing	ASSE 1061; ASTM F 877; ASTM F 1807; ASTM F 1960; ASTM F 2080; ASTM F 2098; ASTM F 2159; ASTM F 2434; ASTM F 2735; CSA B137.5
Gray iron and ductile iron	AWWA C110/A21.10; AWWA C153/A21.53
Malleable iron	ASME B16.3
Insert fittings for Polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)	ASTM F-~~1974~~281; ASTM F-~~1281~~2; ASTM F-~~1282~~974; CSA B137.9; CSA B137.10
Polyethylene (PE) plastic	ASTM D 2609; CSA B137.1
Fittings for polyethylene of raised temperature (PE-RT) plastic tubing	ASSE 1061; ASTM D2683; ASTM D3261; ASTM F1055; ASTM F 1807; ASTM F2098; ASTM F 2159; ASTM F 2735; ASTM F 2769; CSA B137.18
Polypropylene (PP) plastic pipe or tubing	ASTM F 2389; CSA B137.11
Polyvinyl chloride (PVC) plastic	ASTM D 2464; ASTM D 2466; ASTM D 2467; CSA B137.2; CSA B137.3
Stainless steel (Type 304/304L) pipe	ASTM A 312; ASTM A 778
Stainless steel (Type 316/316L) pipe	ASTM A 312; ASTM A 778
Steel	ASME B16.9; ASME B16.11; ASME B16.28

Minor updates to table to include new referenced standards.

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PIPE FITTINGS
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<tr><td>Cast iron</td><td>ASME B16.4</td></tr>
<tr><td>Chlorinated polyvinyl chloride (CPVC) plastic</td><td>ASSE 1061; ASTM D2846; ASTM F437; ASTM F438; ASTM F439; CSA B137.6</td></tr>
<tr><td>Copper or copper alloy</td><td>ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.26; ASME B16.51; ASSE 1061; ASTM F3226</td></tr>
<tr><td>Cross-linked polyethylene/aluminum/high-density polyethylene (PEX-AL-HDPE)</td><td>ASTM F1986</td></tr>
<tr><td>Fittings for cross-linked polyethylene (PEX) plastic tubing</td><td>ASSE 1061; ASTM F877; ASTM F1807; ASTM F1960; ASTM F2080; ASTM F2098; ASTM F2159; ASTM F2434; ASTM F2735; CSA B137.5</td></tr>
<tr><td>Gray iron and ductile iron</td><td>AWWA C110/A21.10; AWWA C153/A21.53</td></tr>
<tr><td>Malleable iron</td><td>ASME B16.3</td></tr>
<tr><td>Insert fittings for polyethylene/aluminum/polyethylene (PE-AL-PE) and cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX)</td><td>ASTM F1281; ASTM F1282; ASTM F1974; CSA B137.9; CSA B137.10</td></tr>
<tr><td>Polyethylene (PE) plastic</td><td>ASTM D2609; CSA B137.1</td></tr>
<tr><td>Fittings for polyethylene of raised temperature (PE-RT) plastic tubing</td><td>ASSE 1061; ASTM D2683; ASTM D3261; ASTM F1055; ASTM F1807; ASTM F2098; ASTM F2159; ASTM F2735; ASTM F2769; CSA B137.18</td></tr>
<tr><td>Polypropylene (PP) plastic pipe or tubing</td><td>ASTM F2389; CSA B137.11</td></tr>
<tr><td>Polyvinyl chloride (PVC) plastic</td><td>ASTM D2464; ASTM D2466; ASTM D2467; CSA B137.2; CSA B137.3</td></tr>
<tr><td>Stainless steel (Type 304/304L) pipe</td><td>ASTM A312; ASTM A778</td></tr>
<tr><td>Stainless steel (Type 316/316L) pipe</td><td>ASTM A312; ASTM A778</td></tr>
<tr><td>Steel</td><td>ASME B16.9; ASME B16.11; ASME B16.28</td></tr>
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<td>P2906.6.1 Saddle tap fittings. The use of saddle tap fittings and combination saddle tap and valve fittings shall be prohibited.</td>
<td></td>
<td>New requirements to prohibit use of saddle tap fittings.</td>
</tr>
<tr>
<td>P2906.8 Joint and connection tightness. Joints and connections in the plumbing system shall be gas tight and water tight for the intended use or required test pressure. No joints shall be permitted under slabs.</td>
<td></td>
<td>P2906.8 Joint and connection tightness. Joints and connections in the plumbing system shall be gastight and watertight for the intended use or required test pressure. No joints shall be permitted under slabs.</td>
<td>No change to Houston amendment.</td>
</tr>
<tr>
<td></td>
<td>P2906.9.1.3 CPVC/AL/CPVC pipe. Joint surfaces shall be clean and free from moisture, and an approved primer shall be applied. Solvent cement, orange in color and conforming to ASTM F-493, shall be applied to all joint surfaces. The joint shall be made while the cement is wet, and in accordance with ASTM D-2846 or ASTM F-493. Solvent-cemented joints shall be installed above or below ground.
Exception: A primer shall not be required where all of the following conditions apply:
1. The solvent cement used is third-party certified as conforming to ASTM F 493.
2. The solvent cement used is yellow in color.</td>
<td></td>
<td>Minor wordsmithing changes.</td>
</tr>
</table>

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	3. The solvent cement is used only for joining 1/2 - inch (12.7 mm) through 1-inch (25 mm) diameter CPVC/AL/CPVC pipe and CPVC fittings. 4. The CPVC fittings are manufactured in accordance with ASTM D 2846.		
	P2906.9.1.4 PVC plastic pipe. A purple primer, or other approved primer that conforms to ASTM F–656 shall be applied to PVC solvent-cemented joints. Solvent cement for PVC plastic pipe conforming to ASTM D–2564 shall be applied to all joint surfaces.		Minor update to primer requirements on PVC pipe.
P2906.9.1.5 Cross-linked polyethylene plastic (PEX). ~~J~~Tubing and 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.~~2~~3.	**P2906.9.1.~~5~~0 Cross-linked polyethylene plastic (PEX).**	**P2906.10 Cross-linked polyethylene plastic (PEX).** ~~J~~Tubing and joints between cross-linked polyethylene plastic tubing or fittings shall comply with Section 2906.9.1. 1 ~~or~~ through Section P2906.9.1. ~~2~~3.	Base code renumbering. No change to Houston amendment, relocated from Section P2906.9.1.5.
	P2906.~~9.1.5~~0.1 Flared joints.		Base code renumbering.
	P2906.~~9.1.5~~0.2 Mechanical joints.		Base code renumbering.
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.		**P2906.10.3 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.	No change to Houston amendment, relocated from Section P2906.9.1.5.3.
	P2906.1~~0~~1 Polypropylene (PP) plastic.		Base code renumbering.
	P2906.1~~0~~1.1 Heat-fusion joints.		Base code renumbering.
	P2906.1~~0~~1.2 Mechanical and compression sleeve joints.		Base code renumbering.
	P2906.1~~1~~2 Cross-linked polyethylene/aluminum/cross-linked polyethylene.		Base code renumbering.
	P2906.1~~1~~2.1 Mechanical joints.		Base code renumbering.
	P2906.1~~2~~3 Stainless steel.		Base code renumbering.
	P2906.1~~2~~3.1 Mechanical joints.		Base code renumbering.
	P2906.1~~2~~3.2 Welded joints.		Base code renumbering.

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	P2906.13~~4~~4 Threaded pipe joints.		Base code renumbering.
	P2906.14~~5~~5 Soldered and brazed joints. Soldered joints in copper and copper alloy tubing shall be made with fittings *approved* for water piping and shall conform to **ASTM B828**. Surfaces to be soldered shall be cleaned bright. Fluxes for soldering shall be in accordance with **ASTM B813**. Brazing fluxes shall be in accordance with **AWS A5.31M/A5.31**. Solders and fluxes used in potable water-supply systems shall have a lead content of not greater than 0.2 percent. Solder and flux joining pipe or fittings intended to supply drinking water shall conform to NSF 61.		Base code renumbering and new requirements for solder and flux joining pipe or fittings.
	P2906.15~~6~~6 Flared joints.		Base code renumbering.
	P2906.16~~7~~7 Above-ground joints.		Base code renumbering.
	P2906.17~~8~~8 Joints between different materials. Joints between different piping materials shall be made in accordance with Section P2906.17~~8~~8.1, P2906.17~~8~~8.2, **P2906.18.3** or P2906.17~~8~~8.3~~4~~4, or with a mechanical joint of the compression or mechanical sealing type having an elastomeric seal conforming to ASTM D-1869 or ASTM F—477. Joints shall be installed in accordance with the manufacturer's instructions.		Base code renumbering.
	P2906.17~~8~~8.1 Copper or copper-alloy tubing to galvanized steel pipe.		Base code renumbering.
	P2906.18.2 Joint between PVC water service and CPVC water distribution. Where a PVC water service pipe connects to a CPVC pipe at the beginning of a water distribution system, the transition shall be by a mechanical fitting, an *approved* adapter fitting, a transition fitting or by a single, solvent-cemented transition joint. A single, solvent-cemented transition joint shall be in compliance with ASTM F493 and the pipe, fitting and solvent cement manufacturers' instructions. Solvent cement joint surfaces shall be clean, free from moisture and prepared with an approved primer. Solvent cement conforming to ASTM F493 shall be applied to the joint surfaces and the joint assembled while the cement is wet.		New requirements for joints between PVC and CPVC.
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.	**P2906.17~~8~~8.2~~3~~3 Plastic pipe or tubing to other piping material.**	**P2906.18.3 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.	Base code renumbering. No change to Houston amendment, relocated from Section P2906.17.2.
	P2906.17~~8~~8.3~~4~~4 Stainless steel.		Base code renumbering.

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	P2906.1~~8~~9 Press-connected joints. Press-connected joints shall conform to one of the standards indicated in Table P2906.6. Press-type mechanical joints in copper tubing shall be made in accordance with the manufacturer's instructions. Cut tube ends shall be reamed to the full inside diameter of the tube end. Joint surfaces shall be cleaned. The tube shall be fully inserted into the press-connected fitting. Press-connected joints shall be pressed with a tool certified by the manufacturer.		Base code renumbering and minor wordsmithing.
	P2906.~~19~~20 Polyethylene of raised temperature plastic. Joints between polyethylene of raised temperature plastic tubing and fittings shall be in accordance with Sections P2906.~~19~~20.1, P2906.20.2 and P2906.20.3.		Base code renumbering.
	P2906.~~19~~20.1 Mechanical joints. Mechanical joints shall be installed in accordance with the manufacturer's instructions. Fittings for polyethylene of raised temperature plastic tubing shall comply with the applicable standards ~~listed~~ indicated in Table P2906.6 and shall be installed in accordance with the manufacturer's instructions. Polyethylene of raised temperature plastic tubing shall be factory marked with the applicable standards for the fittings that the manufacturer of the tubing specifies for use with the tubing.		Base code renumbering and minor wordsmithing.
	P2906.20.2 Heat fusion joints. Joints shall be of the socket-fusion, saddle-fusion, or butt-fusion type, and shall be joined in accordance with ASTM D2657. Joint surfaces shall be clean and free of moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM D2683 or ASTM D3261.		New requirements for heat fusion joints.
	P2906.20.3 Electrofusion joints. Joints shall be of the electrofusion type. Joint surfaces shall be clean and free of moisture and scoured to expose virgin resin. Joint surfaces shall be heated to melt temperatures for a period of time specified by the manufacturer and joined. The joint shall remain undisturbed until cool. Fittings shall be manufactured in accordance with ASTM F1055.		New requirements for electrofusion joints.
	P2906.21 Push-fit fitting joints. Push-fit fittings ~~joints~~ shall be used only on copper-tube-size outside diameter dimensioned CPVC, PEX, PE-RT and copper tubing. Push-fit fiitings~~joints~~ shall conform to ASSE 1061 and shall be installed in accordance with the manufacturer's instructions.		New requirements for push-fit fitting joints.
	P2909.2 Reverse osmosis drinking water treatment units. Point-of-use reverse osmosis drinking water treatment units, designed for residential use, shall meet the requirements of ~~NSF 58 or~~ CSA B483.1 or NSF 58. Waste or discharge from reverse osmosis drinking water treatment units shall enter the drainage system through an *air gap* or an *air gap* device that meets the requirements of NSF 58.		Minor wordsmithing change.
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		**SECTION P2910** **NONPOTABLE WATER SYSTEMS** **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,	No change to Houston amendment.

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application of nonpotable water shall comply with laws, rules and ordinances applicable in the *jurisdiction*.		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*.	
	P2910.14 Outdoor outlet access. Sillcocks, hose bibbs, wall hydrants, yard hydrants and other outdoor outlets supplied by nonpotable water shall be located in a locked vault or shall be operable only by means of a removable key.		Minor wordsmithing change.
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*.		**SECTION P2911** **ON-SITE NONPOTABLE WATER REUSE SYSTEMS** **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*.	No change to Houston amendment.
	P2911.4.4 Marking. Additional marking of collection piping conveying untreated water for reuse shall not be required beyond that required for sanitary drainage, waste and vent piping by ~~the~~ Chapter 30.		Minor wordsmithing change.
	~~2911.11.1~~ **P2911.11.1 Materials, joints and connections.**		Base code renumbering.
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*.	**SECTION P2912** **NONPOTABLE RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS** **P2912.1 General.** The provisions of this section 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~~. For nonpotable rainwater systems, the provisions of **CSA B805/ICC 805** shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater 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*.	**SECTION P2912** **NONPOTABLE RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS** **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. For nonpotable rainwater systems, the provisions of CSA B805/ICC 805 shall be an alternative for regulating the materials, design, construction and installation of systems for rainwater collection, storage, treatment and distribution of nonpotable water. The use and application of nonpotable water shall comply with the laws, rules and ordinances applicable in the *jurisdiction*.	Update to nonpotable rainwater system requirements to comply with CSA standard. No change to Houston amendment.
	P2912.15.1 Roof gutter inspection and test. Roof gutters shall be inspected to verify that the installation and slope is in accordance with Section P2912.5.1. Gutters shall be tested by pouring not less than ~~one~~**1** gallon of water (3.8 L) into the end of the gutter opposite the collection point. The gutter being tested shall not leak and shall not retain standing water.		Minor wordsmithing change.

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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~~, 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.	No change to Houston amendment.
	TABLE P3002.1(2) **UNDERGROUND BUILDING DRAINAGE AND VENT PIPE** PIPE / STANDARD Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall — ASTM D-2661; ASTM F-628; ASTM F-1488; CSA B181.1 Cast-iron pipe — ASTM A-74; **ASTM A888**; CISPI 301~~; ASTM A-888~~ Copper or copper-alloy tubing (Type K, L, M or DWV) — ASTM B-75; ASTM B-88; ASTM B-251; ASTM B-306 **Polyethylene (PE) plastic pipe (SDR-PR)** — **ASTM F714** Polyolefin pipe — **ASTM F714,** ASTM F-1412; CSA B181.3 Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall — ASTM D-2665; ASTM F-891; ASTM F-1488; CSA B181.2 Polyvinyl chloride (PVC) plastic pipe with a 3.25 inch O.D. and a solid, cellular core or composite wall — ASTM D-2949; ASTM F-1488 Stainless steel drainage systems, Type 316L — ASME A-112.3.1 For SI: 1 inch = 25.4 mm.		Minor updates to table to include new pipe type and reference standards.
	P3002.2 Building sewer. *Building sewer* piping shall be as ~~shown~~ indicated in Table P3002.2. Forced main sewer piping shall conform to one of the standards for ABS plastic pipe, copper or copper-alloy tubing, PVC plastic pipe or pressure-rated pipe indicated in Table P3002.2.		Minor wordsmithing change.

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TABLE P3002.2
BUILDING SEWER PIPE

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters, including schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with a solid, cellular core or composite wall	ASTM D 2661; ASTM F 628; ASTM F 1488
~~Cast-iron pipe~~	~~ASTM A 74; ASTM A 888; CISPI 301~~
Acrylonitrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters, including SDR 42 (PS 20), PS35, SDR 35 (PS 45), PS50, PS100, PS140, SDR 23.5 (PS 150) and PS200; with a solid, cellular core or composite wall	**ASTM D2751;** ASTM F 1488; ~~ASTM D 2751~~
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters, including PS 25, SDR 41 (PS 28), PS 35, SDR 35 (PS 46), PS 50, PS 100, SDR 26 (PS 115), PS140 and PS 200; with a solid, cellular core or composite wall	**ASTM D3034;** ASTM F 891; ASTM F 1488; ~~ASTM D 3034;~~ CSA B182.2; CSA B182.4
Cast-iron pipe	**ASTM A74; ASTM A888; CISPI 301**
Concrete pipe	ASTM C 14; ASTM C 76; CSA A257.1~~M~~; CSA A257.2~~M~~
Copper or copper-alloy tubing (Type K or L)	ASTM B 75/**B75M**; ASTM B 88; ASTM B 251
Polyethylene (PE) plastic pipe (SDR-PR)	ASTM F 714
Polyolefin pipe	ASTM F 1412; CSA B181.3
Polyvinyl chloride (PVC) plastic pipe in IPS diameters, including schedule 40, DR 22 (PS 200) and DR 24 (PS 140); with solid, cellular core or composite wall	ASTM D 2665; ASTM D 2949; ASTM D 3034; ASTM F 1412; CSA B182.2; CSA B182.4
Polyvinyl chloride (PVC) plastic pipe with a 3.25 inch O.D. and a solid, cellular core or composite wall	ASTM D 2949, ASTM F 1488
Stainless steel drainage systems, Types 304 and 316L	ASME A 112.3.1
Vitrified clay pipe	ASTM C 425; ASTM C 700

For SI: 1 inch = 25.4 mm.

Minor updates to table to include new pipe type and reference standards.

TABLE P3002.3
PIPE FITTINGS

PIPE MATERIAL	FITTING STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters	ASTM D 2661; ASTM D 3311; ASTM F 628; CSA B181.1
~~Cast iron~~	~~ASME B 16.4; ASME B 16.12; ASTM A 74; ASTM A 888; CISPI 301~~
Acrylonotrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters	ASTM D 2751
Cast-iron	**ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301**
~~Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters~~	~~ASTM D 3034~~
Copper or copper alloy	ASME B 16.15; ASME B 16.18; ASME B 16.22; ASME B 16.23; ASME B 16.26; ASME B 16.29
Gray iron and ductile iron	AWWA C 110/A21.10
Polyethylene	**ASTM D2683**
Polyolefin	ASTM F 1412; CSA B181.3
Polyvinyl chloride (PVC) plastic in IPS diameters	ASTM D 2665; ASTM D 3311; ASTM F 1866
Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters	**ASTM D3034**
Polyvinyl chloride (PVC) plastic pipe with a 3.25 inch O.D.	ASTM D 2949
PVC fabricated fittings	ASTM F 1866
Stainless steel drainage systems, Types 304 and 316L	ASME A 112.3.1
Vitrified clay	ASTM C 700

For SI: 1 inch = 25.4 mm.

Minor updates to table to include new pipe type and reference standards.

	TABLE P3002.3 PIPE FITTINGS PIPE MATERIAL / FITTING STANDARD Acrylonitrile butadiene styrene (ABS) plastic pipe in IPS diameters — ASME A112.4.4; ASTM D2661; ASTM D3311; ASTM F628; CSA B181.1 Acrylonotrile butadiene styrene (ABS) plastic pipe in sewer and drain diameters — ASTM D2751 Cast-iron — ASME B16.4; ASME B16.12; ASTM A74; ASTM A888; CISPI 301 Copper or copper alloy — ASME B16.15; ASME B16.18; ASME B16.22; ASME B16.23; ASME B16.26; ASME B16.29 Gray iron and ductile iron — AWWA C110/A21.10 Polyethylene — ASTM D2683 Polyolefin — ASTM F1412; CSA B181.3 Polyvinyl chloride (PVC) plastic in IPS diameters — ASME A112.4.4; ASTM D2665; ASTM D3311; ASTM F1866 Polyvinyl chloride (PVC) plastic pipe in sewer and drain diameters — ASTM D3034 Polyvinyl chloride (PVC) plastic pipe with a 3.25-inch O.D. — ASTM D2949 PVC fabricated fittings — ASTM F1866 Stainless steel drainage systems, Types 304 and 316L — ASME A112.3.1 Vitrified clay — ASTM C700 For SI: 1 inch = 25.4 mm.		
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.			Previous Houston amendment removed to go with base code provisions.
	P3003.2 Prohibited joints. Running threads and bands shall not be used in the drainage system. Drainage and vent piping shall not be drilled, tapped, burned or welded. The following types of joints and connections shall be prohibited: 1. Cement or concrete. 2. Mastic or hot-pour bituminous joints. 3. Joints made with fittings not *approved* for the specific installation. 4. Joints between different diameter pipes made with elastomeric rolling O-rings. 5. Solvent-cement joints between different types of plastic pipe except where provided for in Section P3003.13.4. 6. Saddle-type fittings.		Minor update to prohibited joints.
	P3003.3 ABS plastic. Joints between ABS plastic pipe or fittings shall comply with **Sections P3003.3.1** through **P3003.3.4**.		Base code renumbering.

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	P3003.3.4 Push-fit fitting joints. Push-fit DWV fittings shall be *listed* and *labeled* to **ASME A112.4.4** and shall be installed in accordance with the manufacturer's instructions.		New requirements for push-fit fitting joints.
	P3003.5 Concrete joints. Joints between concrete pipe and fittings shall be made with an elastomeric seal conforming to ASTM C-443, ASTM C-1173, CSA A257.3~~M~~ or CSA B602.		Minor wordsmithing changes.
	P3003.6.3 Soldered joints. Copper and copper-alloy joints shall be soldered in accordance with ASTM B-828. Cut tube ends shall be reamed to the full inside diameter of the tube end. ~~All j~~Joint surfaces shall be cleaned. Fluxes for soldering shall be in accordance with ASTM B-813 and shall become noncorrosive and nontoxic after soldering. The joint shall be soldered with a solder conforming to ASTM B-32.		Minor wordsmithing changes.
	P3003.9 PVC plastic. Joints between PVC plastic pipe or fittings shall comply with **Sections P3003.9.1** through **P3003.9.4**.		Base code renumbering.
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:~~ ~~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.~~	**P3003.9.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A purple primer, or other approved 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: 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 non-pressure applications in sizes up to and including 4 inches (102 mm) in diameter	**P3003.9.2 Solvent cementing.** Joint surfaces shall be clean and free from moisture. A purple primer, or other *approved* primer, that conforms to ASTM F656 shall be applied. Solvent cement not purple in color and conforming to ASTM D2564, 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 D2855. Solvent-cement joints shall be installed above or below ground. **~~Exception:~~** ~~A primer shall not be required where all of the following conditions apply:~~ ~~1. The solvent cement used is third-party certified as conforming to ASTM D2564.~~ ~~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.~~	Minor update to primer allowed by code. No change to Houston amendment.
	P3003.9.4 Push-fit joints. Push-fit joints shall conform to **ASME A112.4.4** and shall be installed in accordance with the manufacturer's instructions.		New requirements for push-fit fitting joints.
	P3003.13 Joints between different materials. Joints between different piping materials shall be made with a mechanical joint of the compression or mechanical-sealing type conforming to ASTM C-1173, ASTM C-1460 or ASTM C-1461. Connectors and adapters shall be *approved* for the application and such joints shall have an elastomeric seal conforming to ASTM C-425, ASTM C-443, ASTM C-564, ASTM C-1440, ASTM D-1869, ASTM F-477, CSA A257.3~~M~~ or CSA B602, or as required in Sections P3003.13.1 through P3003.13.6. Joints between glass pipe and other types of materials		Minor wordsmithing changes.

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	shall be made with adapters having a TFE seal. Joints shall be installed in accordance with the manufacturer's instructions.		
	P3003.13.1 Copper pipe or ~~copper-alloy~~ tubing to cast-iron hub pipe. Joints between copper pipe or ~~copper-alloy~~ tubing and cast-iron hub pipe shall be made with a copper-alloy ferrule or compression joint. The copper pipe or ~~copper-alloy~~ tubing shall be soldered to the ferrule in an *approved* manner, and the ferrule shall be joined to the cast-iron hub by a caulked joint or a mechanical compression joint.		Minor change to remove copper alloy.
	P3003.13.2 Copper pipe or ~~copper-alloy~~ tubing to galvanized steel pipe. Joints between copper pipe or ~~copper-alloy~~ tubing and galvanized steel pipe shall be made with a copper-alloy ~~fitting~~ or dielectric fitting. The copper tubing shall be soldered to the fitting in an *approved* manner, and the fitting shall be screwed to the threaded pipe.		Minor change to remove copper alloy.
	P3003.13.3 Cast-iron pipe to galvanized steel or ~~brass~~copper-alloy pipe.		Minor change to remove copper alloy.
	P3003.13.4 Plastic pipe or tubing to other piping material. Joints between different types of plastic pipe shall be made with an approved adapter fitting or by a solvent-cement joint only where a single joint is made between ABS and PVC pipes at the end of a building drainage pipe and the beginning of a building sewer pipe using a solvent cement complying with ASTM D3138. Joints between plastic pipe and other piping material shall be made with an *approved* adapter fitting. Joints between plastic pipe and cast-iron hub pipe shall be made by a caulked joint or a mechanical compression joint.		Updated requirements for joints between plastic and non-plastic piping or tubing.
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[a] | -- | -- 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.		**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[a] | -- | -- 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.	No change to Houston amendment.
	P3005.1.6 ~~Change in size~~Drainage piping size reduction in the direction of flow. The size of the drainage piping shall not be reduced in ~~**size in**~~ the direction of the flow. ~~A 4-inch by 3-inch (102 mm by 76 mm) water closet connection shall not be considered as a reduction in size.~~ The following shall not be considered a reduction in size in the direction of flow: **1.** A 4-inch by 3-inch (102 mm by 76 mm) water closet flange. **2.** A water closet bend fitting having a 4-inch (102 mm) inlet and a 3-inch (76 mm) outlet provided that the 4-		Updates to drain pipe size reduction and what's not considered a reduction in size.

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	inch leg of the fitting is upright and below, but not necessarily directly connected to, the water closet flange. **3.** An offset closet flange.		
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 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.		**P3005.2.1 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 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.	No change to Houston amendment.
	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~~ Copper-alloy cleanout plugs shall conform to ASTM A74 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.		Minor wordsmithing change.
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.~~ ~~2. A~~ two-way cleanout installation that is *approved* for meeting the requirements of Section P3005.2.3.		**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.~~ ~~2. A~~ two-way cleanout installation that is *approved* for meeting the requirements of Section P3005.2.3.	No change to Houston amendment.
	P3005.2.10.1 Cleanout equivalent. A fixture trap or a fixture with an integral trap, removable without altering the concealed piping, shall be acceptable as a cleanout equivalent.		New section providing requirements for cleanout equivalents.
	~~P3005.2.10.1~~**P3005.2.10.2 Cleanout plug trim covers.**		Base code renumbering.

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	~~P3005.2.10.2~~**P3005.2.10.3 Floor cleanout assemblies.**		Base code renumbering.
P3005.4.1 Branch and stack sizing. Branches and stacks shall be sized in accordance with Table P3005.4.1. Below grade drain pipes 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 drain pipes 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~~.	No change to Houston amendment.
	TABLE P3005.4.1 **MAXIMUM FIXTURE UNITS ALLOWED TO BE CONNECTED TO BRANCHES AND STACKS** NOMINAL PIPE SIZE (inches) / ANY HORIZONTAL FIXTURE BRANCH / ANY ONE VERTICAL STACK OR DRAIN 1 1/4 a,b -- / — / — 1 1/2 b / 3 / 4 2 b / 6 / 10 2 1/2 b / 12 / 20 3 / 20 / 48 4 / 160 / 240 For SI: 1 inch = 25.4 mm. a. 1 1/4-inch pipe size limited to a single-fixture drain ~~or trap arm~~. See Table P3201.7. b. ~~No w~~Water closets prohibited.		Minor update to table footnotes.
	P3006.3 Horizontal offsets below the lowest branch. In soil or waste stacks below the lowest horizontal branch, a change in diameter shall not be required if the offset is made at an angle not greater than 45 degrees (0.79 rad) from the vertical. If an offset greater than 45 degrees (0.79 rad) from the vertical is made, the offset and stack below it shall be sized as a *building drain* ~~(see~~ in accordance with Table P3005.4.2~~)~~.		Minor wordsmithing change.
	P3007.3 Sump design. The sump pump, ~~pit~~ sump and discharge piping shall conform to the requirements of Sections P3007.3.1 through P3007.3.5.		Minor wordsmithing change.

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	P3007.3.2 Sump ~~pit~~. The sump ~~pit~~ shall be not less than 18 inches (457 mm) in diameter and 24 inches (610 mm) deep, unless otherwise *approved*. The ~~pit~~ sump shall be accessible and located so that drainage flows into the ~~pit~~ sump by gravity. The sump ~~pit~~ shall be constructed of tile, concrete, steel, plastic or other *approved* materials. The ~~pit~~ sump bottom shall be solid and provide permanent support for the pump. The sump ~~pit~~ shall be fitted with a gas-tight removable cover that is installed ~~above grade level or floor level, or~~ not more than 2 inches (51 mm) below grade or floor level. The cover shall be adequate to support anticipated loads in the area of use. The sump ~~pit~~ shall be vented in accordance with Chapter 31.		Minor wordsmithing change.
	P3007.3.3 Discharge pipe and fittings. Discharge pipe and fittings serving sump pumps and ejectors shall be constructed of materials in accordance with Sections P3007.3.3.1 and P3007.3.3.2 ~~**and shall be approved**~~.		Minor wordsmithing change.
	P3007.6 Capacity. Sewage pumps and sewage ejectors shall have the capacity and head for the application requirements. Pumps and ejectors that receive the discharge of water closets shall be capable of handling spherical solids with a diameter of up to and including 2 inches (51 mm). Other pumps or ejectors shall be capable of handling spherical solids with a diameter of up to and including ~~1~~ 1½ inch (~~25.4~~13 mm). The minimum capacity of a pump or ejector based on the diameter of the discharge pipe shall be in accordance with Table 3007.6. **Exceptions:** 1. Grinder pumps or grinder ejectors that receive the discharge of water closets shall have a discharge opening of not less than 1 1/4 inches (32 mm). 2. Macerating toilet assemblies that serve single water closets shall have a discharge opening of not less than 3/4 inch (19 mm).		Update to capacity requirements.
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.~~	**SECTION P3008** **BACKWATER VALVES** **P3008.1** ~~Sewage backflow~~ **Where required.** 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.~~		Backwater valve requirements have been updated and the exception removed. Houston amendment no longer needed as exception has been removed.
	P3008.2 Allowable installations. Where plumbing fixtures are installed on a floor with a finished floor elevation above the elevation of the manhole cover of the next upstream manhole in the public sewer, and a backwater valve is installed in the *building drain* or horizontal branch serving such fixtures, the backwater valve shall be of the normally open type.		New section providing requirements on allowable backwater valve installation.

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	Exception: Normally closed backwater valve installations for existing buildings shall not be prohibited.		
	P3008.2~~3~~ Material. ~~Bearing parts of backwater valves shall be of corrosion-resistant material.~~ Backwater valves shall comply with ASME A112.14.1, CSA B181.1 or CSA B181.2.		Base code renumbering and update to section.
	~~**P3008.3 Seal.** Backwater valves shall be constructed to provide a mechanical seal against backflow.~~		Base code section removed.
	~~**P3008.4 Diameter.** Backwater valves, when fully opened, shall have a capacity not less than that of the pipes in which they are installed.~~		No Houston amendment.
	P3008.~~5~~4 Location. Backwater valves shall be installed so that access is provided the working parts are accessible for service and repair.		Base code renumbering and minor wordsmithing.
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.	**SECTION P3009** ~~**SUBSURFACE LANDSCAPE IRRIGATION**~~ **GRAYWATER SOIL ABSORPTION SYSTEMS** **P3009.1 Scope.** The provisions of this section shall govern the materials, design, construction and installation of subsurface ~~landscape irrigation~~ graywater soil absorption systems connected to nonpotable water from on-site water reuse systems.	**SECTION P3009** **GRAYWATER SOIL ABSORPTION 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 graywater soil absorption systems connected to nonpotable water from on-site water reuse systems.	Minor update to base code language. No change to Houston amendment.
	P3009.2 Materials. Above-ground drain, waste and vent piping for subsurface ~~landscape irrigation~~ graywater soil absorption systems shall conform to one of the standards indicated in **Table P3002.1(1)**. Subsurface ~~landscape irrigation~~ graywater soil absorption, underground building drainage and vent pipe shall conform to one of the standards indicated in **Table P3002.1(2)**.		Minor update to base code language.
	P3009.3 Tests. Drain, waste and vent piping for subsurface ~~landscape irrigation~~ graywater soil absorption systems shall be tested in accordance with **Section P2503**.		Minor update to base code language.
	P3009.4 Inspections. Subsurface ~~landscape irrigation~~ graywater soil absorption systems shall be inspected in accordance with **Section R109**.		Minor update to base code language.

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	P3009.5 Disinfection. Disinfection shall not be required for on-site nonpotable reuse water for subsurface ~~landscape irrigation~~ graywater soil absorption systems.		Minor update to base code language.
	P3009.6 Coloring. On-site nonpotable reuse water used for subsurface ~~landscape irrigation~~ graywater soil absorption systems shall not be required to be dyed.		Minor update to base code language.
	P3009.7 Sizing. The system shall be sized in accordance with the sum of the output of all water sources connected to the ~~subsurface irrigation~~ graywater soil absorption system. Where graywater collection piping is connected to subsurface ~~landscape irrigation~~ graywater soil absorption systems, graywater output shall be calculated according to the gallons-per-dayper-occupant (liters per day per occupant) number based on the type of fixtures connected. The graywater discharge shall be calculated by the following equation: $C = A \times B$ **(Equation 30-1)** where: *A*= Number of occupants: Number of occupants shall be determined by the actual number of occupants, but not less than two occupants for one bedroom and one occupant for each additional bedroom. *B*= Estimated flow demands for each occupant: 25 gallons (94.6 L) per day per occupant for showers, bathtubs and lavatories and 15 gallons (56.7 L) per day per occupant for clothes washers or laundry trays. *C*= Estimated graywater discharge based on the total number of occupants.		Minor update to base code language.
	P3009.9 Subsurface ~~landscape irrigation~~ graywater soil absorption system site location. The surface grade of soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining lot. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in **Table P3009.9**. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.		Minor update to base code language.

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	TABLE P3009.9 **LOCATION OF SUBSURFACE IRRIGATION SYSTEM** **ELEMENT** / **MINIMUM HORIZONTAL DISTANCE**: **STORAGE TANK (feet)** / **~~IRRIGATIONDISPOSAL~~ABSORPTION FIELD (feet)** Buildings: 5 / 2 Lot line adjoining private property: 5 / 5 Public water main: 10 / 10 Seepage pits: 5 / 5 Septic tanks: 0 / 5 Streams and lakes: 50 / 50 Water service: 5 / 5 Water wells: 50 / 100 For SI: 1 foot = 304.8 mm.		Minor update to base code language.
	P3009.10 Installation. Absorption systems shall be installed in accordance with **Sections P3009.10.1** through **P3009.11.1** ~~to provide landscape irrigation without surfacing of water~~.		Base code renumbering.
	SECTION P3010 **REPLACEMENT OF UNDERGROUND** **BUILDING SEWERS AND BUILDING DRAINS** **BY PIPE BURSTING METHODS** **P3010.1 General.** This section shall govern the replacement of existing *building sewer* and building drain piping by pipe-bursting methods.		Minor update to base code language.
	P3010.2 Applicability. The replacement of building sewer and building drain piping by pipe bursting methods shall be limited to gravity drainage piping of sizes 6 inches (150 mm) and smaller. The replacement piping shall be of the same nominal size as the existing piping.		Minor update to base code language.
	P3010.4 Pipe. The replacement pipe shall be made of a high-density polyethylene (HDPE) ~~that conforms to cell classification number PE3608, PE4608 or PE4710 as indicated in ASTM F 714. The pipe fittings shall be manufactured with an SDR of 17~~ and shall be in compliance with ASTM F-714.		Updated requirements for piping.
	P3010.5 Pipe fittings. Pipe fittings to be connected to the replacement ~~piping~~pipe shall be made of high-density polyethylene (HDPE) ~~that conforms to cell classification number PE3608, PE4608 or PE4710 as indicated in ASTM F 714. The pipe fittings shall be manufactured with an SDR of 17~~ and shall be in compliance with ASTM D-2683.		Updated requirements for pipe fittings.
	P3010.6 Cleanouts. Where the existing *building sewer* or building drain did not have cleanouts meeting the requirements of this code, cleanout fittings shall be installed as required by this code.		Minor update to base code language.

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	SECTION 3011 **~~REPLACEMENT~~ RELINING OF ~~UNDERGROUND~~ BUILDING SEWERS ~~BY PVC FOLD~~ AND ~~FORM METHODS~~ BUILDING DRAINS** **3011.1 General.** This section shall govern the ~~replacement~~ relining of existing building sewer ~~piping by PVC Fold and Form methods~~ and building drainage piping.		Section 3011 has been updated substantially to now govern the relining of existing building sewer and draining piping.
	3011.2 Applicability. The ~~replacement~~ relining of existing building sewer piping ~~by PVC fold and form methods~~ and building drainage piping shall be limited to gravity drainage piping 4 inches (102 mm) ~~to 18 inches (457 mm)~~ in diameter and larger. The ~~replacement~~ relined piping shall be of the same nominal size as the existing piping.		New requirements for relining of existing building sewer/drainage piping.
	3011.3 ~~Preinstallation inspection.~~ **Preinstallation requirements.** ~~The~~ Prior to commencement of the relining installation, the existing piping sections to be ~~replaced~~ relined shall be descaled and cleaned. After the cleaning process has occurred and water has been flushed through the system, the piping shall be inspected internally by a recorded video camera survey. ~~The survey shall include notations of the position of cleanouts and the depth of connections to the existing piping.~~		New requirements for relining of existing building sewer/drainage piping.
	P3011.3.1 Preinstallation recorded video camera survey. The video survey shall include verification of the project address location. The video shall include notations of the cleanout and fitting locations, and the approximate depth of the existing piping. The video shall also include notations of the length of piping at intervals not greater than 25 feet (7620 mm).		New requirements for relining of existing building sewer/drainage piping.
	3011.4 ~~Pipe.~~ Permitting. ~~The replacement piping shall be manufactured in compliance with ASTM F1504 or ASTM F1871.~~ Prior to issuing a permit for relining, the building official shall review and evaluate the preinstallation recorded video camera survey to determine whether the piping system is able to be relined in accordance with the proposed lining system manufacturer's installation requirements and applicable referenced standards.		New requirements for relining of existing building sewer/drainage piping.
	3011.5 ~~**Installation.**~~ **Prohibited applications**. ~~The piping sections to be replaced shall be cleaned and flushed. Remediation shall be performed where there is groundwater infiltration, roots, collapsed pipe, dropped joints, offsets more than 12 percent of the inside pipe diameter or other obstructions.~~ Where the preinstallation recorded video camera survey reveals that piping systems are not installed correctly, or defects exist, relining shall not be permitted. The defective portions of piping shall be exposed and repaired with pipe and fittings in accordance with this code. Defects shall include, but are not limited to, backslope or insufficient slope, complete pipe wall deterioration or complete separations such as from tree root invasion or improper support.		New requirements for relining of existing building sewer/drainage piping.
	P3011.6 ~~**Cleanouts.**~~ **Relining materials.** ~~Where the existing *building sewer* did not have cleanouts meeting the requirements of this code, cleanout fittings shall be installed as required by this code.~~ The relining materials shall be manufactured in compliance with applicable standards and certified as required in **Section P2609**. Fold-and-form pipe reline materials shall be manufactured in compliance with **ASTM F1504** or **ASTM F1871**.		New requirements for relining of existing building sewer/drainage piping.

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	P3011.7 ~~Post-installation inspection.~~ Installation. ~~The completed replacement piping shall be inspected internally by a recorded video camera survey. The video survey shall be reviewed and *approved* by the *building official* prior to pressure testing of the replacement piping system.~~ The installation of relining materials shall be performed in accordance with the manufacturer's installation instructions, applicable referenced standards and this code.		New requirements for relining of existing building sewer/drainage piping.
	P3011.7.1 Material data report. The installer shall record the data as required by the relining material manufacturer and applicable standards. The recorded data shall include but is not limited to the location of the project, relining material type, amount of product installed and conditions of the installation. A copy of the data report shall be provided to the building official prior to final approval.		New requirements for relining of existing building sewer/drainage piping.
	P3011.8 ~~Pressure testing.~~ Post-installation recorded video camera survey. ~~The replacement piping system as well as the connections to the replacement piping shall be tested in accordance with Section P2503.4.~~ The completed relined piping system shall be inspected internally by a recorded video camera survey after the system has been flushed and flow-tested with water. The video survey shall be submitted to the the building official prior to finalization of the permit. The video survey shall be reviewed and evaluated to provide verification that no defects exist. Any defects identified shall be repaired and replaced in accordance with this code.		New requirements for relining of existing building sewer/drainage piping.
	P3011.9 Certification. Certification shall be provided in writing to the building official, from the permit holder, that the relining materials have been installed in accordance with the manufacturer's installation instructions, the applicable standards and this code.		New requirements for relining of existing building sewer/drainage piping.
	P3011.10 Approval. Upon verification of compliance with the requirements of **Sections P3011.1** through **P3011.9**, the building official shall approve the installation.		New requirements for relining of existing building sewer/drainage piping.
2015 Houston IRC Amendments	**2021 IRC – Chapter 31 – Vents**	**2021 Houston IRC Amendments**	**Code Change Summary**
	SECTION P3103 **VENT TERMINALS** **P3103.1 Vent pipes terminating outdoors.** Vent pipes terminating outdoors shall be extended to the outdoors through the roof or a sidewall of the building in accordance with one of the methods identified in Sections P3103.1.1 through P3103.1.4.		New section requiring vent pipes to terminate outdoors.
	P3103.1.1 Roof extension. Open vent pipes that extend through a roof that do not meet the conditions of Section P3103.1.2 or P3103.1.3 shall ~~be~~ terminate not less than 6 inches (150 mm) above the roof or 6 inches (150 mm) above the anticipated snow accumulation, whichever is greater. ~~Where a roof is to be used for assembly, as a promenade, observation deck or sunbathing deck or for similar purposes,~~		Minor update to requirements. Assembly roof allowance has been relocated to subsection P3103.1.2.

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	~~open vent pipes shall terminate not less than 7 feet (2134 mm) above the roof.~~		
	P3103.1.2 Roof used for recreational purposes. Where a roof is to be used for assembly, as a promenade, observation deck or sunbathing deck, or for similar purposes, open vent pipes shall terminate not less than 7 feet (2134 mm) above the roof.		Assembly roof vent termination requirements have been relocated to new subsection.
	P3103.1.3 Roof extension covered. Where an open vent pipe terminates above a sloped roof and is covered by either a roof-mounted panel (such as a solar collector or photovoltaic panel mounted over the vent opening) or a roof element (such as an architectural feature or a decorative shroud), the vent pipe shall terminate not less than 2 inches (51 mm) above the roof surface. Such roof elements shall be designed to prevent the adverse effects of snow accumulation and wind on the function of the vent. The placement of a panel over a vent pipe and the design of a roof element covering the vent pipe shall provide for an open area for the vent pipe to the outdoors that is not less than the area of the pipe, as calculated from the inside diameter of the pipe. Such vent terminals shall be protected by a method that prevents birds and rodents from entering or blocking the vent pipe opening.		New section providing requirements for vent terminations that are covered.
	P3103.1.4 Sidewall vent terminal. Vent terminals extending through the wall shall terminate not less than 10 feet (3048 mm) from a lot line and not less than 10 feet (3048 mm) above the highest grade elevation within 10 feet (3048 mm) in any direction horizontally of the vent terminal. Vent pipes shall not terminate under the overhang of a structure where the overhang includes soffit vents. Such vent terminals shall be protected by a method that prevents birds and rodentsfrom entering or blocking the vent pipe opening and that does not reduce the open area of the vent pipe.		New section providing requirements for sidewall vent terminations.
	~~**P3103.6 Extension through the wall.** Vent terminals extending through the wall shall terminate not less than 10 feet (3048 mm) from the lot line and 10 feet (3048 mm) above the highest adjacent grade within 10 feet (3048 mm) horizontally of the vent terminal. Vent terminals shall not terminate under the overhang of a structure with soffit vents. Side wall vent terminals shall be protected to prevent birds or rodents from entering or blocking the vent opening.~~		Base code section removed, provisions relocated to Section P3103.1.4.
	SECTION P3105 **FIXTURE VENTS** **P3105.1 Distance of trap from vent.** Each fixture trap shall have a protecting vent located so that the slope and the *developed length* in the *fixture drain* from the trap weir to the vent fitting are within the ~~requirements set forth~~ limits indicated in Table P3105.1.		Minor wordsmithing changes.
	P3107.3 Connection at different levels. Where the *fixture drains* connect at different levels, the vent shall connect as a vertical extension of the vertical drain. The vertical drain pipe connecting the two *fixture drains* shall be considered to be the vent for the lower *fixture drain*, and shall be sized in accordance with Table P3107.3. The upper fixture shall not be a water closet.		Minor wordsmithing changes.

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	SECTION P3108 **WET VENTING** **P3108.1 Horizontal wet vent permitted.** Any combination of fixtures within two *bathroom groups* located on the same floor level shall be permitted to be vented by a horizontal wet vent. The wet vent shall be considered to be the vent for the fixtures and shall extend from the connection of the dry vent along the direction of the flow in the drain pipe to the most downstream *fixture drain* connection. Each *fixture drain* shall connect horizontally to the horizontal branch being wet vented or shall have a dry vent. Each wet-vented *fixture drain* shall connect independently to the horizontal wet vent. Only the fixtures within the *bathroom groups* shall connect to the wet-vented horizontal branch drain. Any additional fixtures shall discharge downstream of the horizontal wet vent.		Minor wordsmithing changes.
	P3108.4 Vertical wet vent permitted. A combination of fixtures located on the same floor level shall be permitted to be vented by a vertical wet vent. The vertical wet vent shall be considered to be the vent for the fixtures and shall extend from the connection of the dry vent down to the lowest *fixture drain* connection. Each wet-vented fixture shall connect independently to the vertical wet vent. All water closet drains shall connect at the same elevation. Other *fixture drains* shall connect above or at the same elevation as the water closet *fixture drains*. The dry-vent connection to the vertical wet vent shall be an individual or common vent serving one or two fixtures.		Minor wordsmithing changes.
	SECTION P3109 **WASTE STACK VENT** **P3109.1 Waste stack vent permitted.** A waste stack shall be considered to be a vent for all of the fixtures discharging to the stack where installed in accordance with the requirements of this section.		Minor wordsmithing changes.
	P3110.4 Additional fixtures. Fixtures, other than ~~**the**~~ circuit-vented fixtures**,** shall be permitted to discharge~~,~~ to the horizontal branch drain. Such fixtures shall be located on the same floor as the circuit-vented fixtures and shall be either individually or common vented.		Minor wordsmithing changes.
	SECTION P3111 **COMBINATION WASTE AND VENT SYSTEM** **P3111.1 Type of fixtures.** A combination waste and vent system shall ~~not~~ only serve ~~fixtures other than~~ floor drains, sinks, lavatories and ~~lavatories~~ drinking fountains. A combination waste and vent system shall ~~not receive the discharge of a food waste disposer~~ be considered to be the vent for those fixtures. The *developed length* of a *fixture drain* to the combination waste and vent system piping shall not exceed the limitations of Table P3105.1.		Requirements for combination waste and vent systems has been updated, new requirements for developed length of fixture drains.
	P3111.1.1 Single-fixture systems. A horizontal fixture drain shall be considered to be a combination waste and vent system provided that the fixture drain size complies with Table P3111.3.		New section for single-fixture system drain size requirements.

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	P3111.2 Installation. The only vertical pipe of a combination waste and vent system shall be the connection between ~~the~~a fixture drain and ~~the~~a horizontal combination waste and vent pipe. The length of the vertical ~~distance~~pipe shall be not greater than 8 feet (2438 mm).		Minor wordsmithing changes.
	P3111.2.1 Slope. The slope of horizontal combination waste and vent ~~pipe~~piping shall ~~have a slope of~~ be not greater than 1/2 unit vertical in 12 units horizontal (4-percent slope)~~. The minimum slope~~and shall be not less than that indicated in ~~accordance with~~ Section P3005.3~~2~~.		Minor wordsmithing changes.
	P3111.2.2 Vent ~~C~~connection. ~~The~~A combination waste and vent system shall be provided with a dry vent connected at any point within the system, or the system shall connect to a horizontal drain or building drain that serves vented fixtures located on the same floor. Combination waste and vent systems connecting to *building drains* receiving only the discharge from one or more stacks shall be provided with a dry vent. The dry vent ~~connection~~connected to the combination waste and vent pipe shall extend vertically to a point not less than 6 inches (152 mm) above the flood level rim of the highest fixture being vented by the combination waste and vent system before ~~offsetting horizontally~~horizontal offsets in the dry vent piping are allowed.		Minor wordsmithing changes.
	P3111.2.3 Vent size. The dry vent connected to the combination waste and vent system shall be sized for the total drainage fixture unit load in accordance with Section P3113~~3~~1.1.		Minor wordsmithing changes.
	~~**P3111.2.4 Fixture branch or drain.** The fixture branch or fixture drain shall connect to the combination waste and vent within a distance specified in Table P3105.1. The combination waste and vent pipe shall be considered the vent for the fixture.~~		Base code section removed.
	P3111.3 Size and length . The size of a combination drain and vent ~~pipe~~ piping shall be not less than that specified in Table P3111.3. The horizontal length of a combination drain and vent system shall be unlimited.		Minor wordsmithing changes.
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.** An 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.	No change to Houston amendment.
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*.	No change to Houston amendment.

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	P3114.8 Prohibited installations. *Air admittance valves* shall not be used to vent sumps or tanks except where the vent system for the sump or tank has been designed by an engineer. Air admittance valves shall not be installed on outdoor vent terminals for the sole purpose of reducing clearances to gravity or mechanical air intakes.		Updated requirements for air admittance valves.

2015 Houston IRC Amendments	2021 IRC – Chapter 32 – Traps	2021 Houston IRC Amendments	Code Change Summary
	SECTION P3201 **FIXTURE TRAPS** **P3201.1 Design of traps.** Traps shall be ~~-~~of standard design, shall have smooth uniform internal waterways, shall be self-cleaning and shall not have interior partitions except where integral with the fixture. Traps shall be constructed of lead, cast iron, copper or copper alloy or *approved* plastic. Copper or copper~~-~~alloy traps shall be not less than No. 20 gage (0.8 mm) thickness. Solid connections, slip joints and couplings shall be permitted to be used on the trap inlet, trap outlet, or within the trap seal. Traps having S~~s~~lip~~-~~joint~~s~~ connections shall ~~be accessible~~comply with Section P2704.1.		Minor wordsmithing changes and new reference for slip-joints requirements in traps.

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	~~1½~~ 2 2
More than 5.7 gpm up to 12.3 gpm	3
More than 12.3 gpm up to 25.8 gpm	4
More than 25.8 gpm up to 55.6 gpm	
Water closet	3

For SI: 1 inch = 25.4 mm.

TABLE P3201.7
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Shower (based on the total flow rate through showerheads and body sprays) Flow rate:	
5.7 gpm and less	~~1½~~ 2 2
More than 5.7 gpm up to 12.3 gpm	3
More than 12.3 gpm up to 25.8 gpm	4
More than 25.8 gpm up to 55.6 gpm	
Water closet	3

For SI: 1 inch = 25.4 mm.

No change to Houston amendment.

2015 Houston IRC Amendments	2021 IRC – Chapter 33 – Storm Drainage	2021 Houston IRC Amendments	Code Change Summary
	SECTION P3302 **SUBSOIL DRAINS** **P3302.1 Subsoil drains.** Subsoil drains shall be open-jointed, horizontally split or perforated pipe conforming to one of the standards ~~listed~~ **indicated** in Table P3302.1. Such drains shall be not less than 4 inches (102 mm) in diameter. Where the building is subject to backwater, the subsoil drain shall be protected by an accessibly located backwater valve. Subsoil drains shall discharge to a trapped area drain, sump, dry well or *approved* location above ground. The subsoil sump shall not be required to have either a gas-tight cover or a vent. The sump and pumping system shall comply with Section P3303.		Minor wordsmithing changes.

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	SECTION P3303 **SUMPS AND PUMPING SYSTEMS** **P3303.1 Pumping system.** The sump pump, ~~pit~~ **sump** and discharge piping shall conform to Sections P3303.1.1 through P3303.1.4.		Minor wordsmithing changes.
	P3303.1.2 Sump pit. The sump ~~pit~~ shall be not less than 18 inches (457 mm) in diameter and 24 inches (610 mm) deep, unless otherwise *approved*. The ~~pit~~ sump shall be accessible and located so that all drainage flows into the ~~pit~~ sump by gravity. The sump ~~pit~~ shall be constructed of tile, steel, plastic, cast~~-~~ iron, concrete or other *approved* material, with a removable cover adequate to support anticipated loads in the area of use. The ~~pit~~ sump floor shall be solid and provide permanent support for the pump.		Minor wordsmithing changes.

2015 Houston IRC Amendments	2021 IRC	2021 Houston IRC Amendments	Code Change Summary
{**EDITORIAL NOTE:** DELETE CHAPTERS 34-43 IN THEIR ENTIRETY.}		[**EDITORIAL NOTE:** DELETE CHAPTERS 34-43 IN THEIR ENTIRETY.]	No change to Houston amendment deleting "electrical" chapters in IRC. Electrical work shall be per the Houston Electrical Code.

2015 Houston IRC Amendments	2021 IRC – Chapter 44 – Referenced Standards	2021 Houston IRC Amendments	Code Change Summary
{**EDITORIAL NOTE:** PORTIONS OF THIS CHAPTER NOT SHOWN SHALL REMAIN AS SET FORTH IN THE 2015 IRC.}		[**EDITORIAL NOTE:** PORTIONS OF THIS CHAPTER NOT SHOWN SHALL REMAIN AS SET FORTH IN THE 2021 IRC.]	No change to Houston amendment.

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	AAMA American Architectural Manufacturers Association 1900 E. Golf Road, Suite 1250 Schaumburg, IL 60173 **450—20: Voluntary Performance Rating Method for Mulled Fenestration Assemblies** **R609.8** **506—16: Voluntary Specifications for Hurricane Impact and Cycle Testing of Fenestration Products** **R609.6.1** **711—20: Voluntary Specification for Self-adhering Flashing Used for Installation of Exterior Wall Fenestration Products** **R703.4** **712—14: Voluntary Specification for Mechanically Attached Flexible Flashing** **R703.4** **714—20: Voluntary Specification for Liquid Applied Flashing Used to Create a Water-resistive Seal around Exterior Wall Openings in Buildings** **R703.4** **AAMA/NSA 2100—20: Specifications for Sunrooms** **R301.2.1.1.1** **AAMA/WDMA/CSA 101/I.S.2/A440—17: North American Fenestration Standards/Specifications for Windows, Doors and Skylights** **R308.6.9, R609.3, N1102.4.33**		Updates to reference standards.
	ACCA Air Conditioning Contractors of America 1330 Braddock Place, Suite 350 Alexandria, VA 22314 **ANSI/ACCA 1 Manual D—2016: Residential Duct Systems** **Table R301.2(1), M1601.1, M1602.2** **ANSI/ACCA 2 Manual J—2016: Residential Load Calculation** **N1103.7, M1401.3** **ANSI/ACCA 3 Manual S—2014: Residential Equipment Selection** **N1103.7, M1401.3**		Updates to reference standards.
	ACI American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48331 **318—19: Building Code Requirements for Structural Concrete** **R402.2, Table R404.1.2(2), Table R404.1.2(5), Table R404.1.2(6), Table R404.1.2(7), Table R404.1.2(8), R404.1.3, R404.1.3.1, R404.1.3.3, R404.1.3.4, R404.1.4.2, R404.5.1, R608.1, R608.1.1, R608.1.2, R608.2, R608.5.1, R608.6.1, R608.8.2, R608.9.2, R608.9.3** **332—20: Residential Code Requirements for Structural Concrete** **R402.2, R403.1, R404.1.3, R404.1.3.4, R404.1.4.2, R506.1**		Updates to reference standards.

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	AISI American Iron and Steel Institute 25 Massachusetts Avenue, NW Suite 800 Washington, DC 20001 **AISI S100—16 (2020) w/S2—20: North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020), with Supplement 2, 2020 Edition** **R608.9.2, R608.9.3** **AISI S220—20: North American Standard for Cold-Formed Steel Nonstructural Framing, 2020** **R702.3.3** **AISI S230—18: Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings, 2018** **R301.1.1, R301.2.1.1, R301.2.2.7, R301.2.2.8, R603.6, R603.9.4.1, R603.9.4.2, Figure 608.9(11), R608.9.2, R608.9.3, R608.10** **AISI S240—20: North American Standard for Cold-Formed Steel Structural Framing, 2020** **R505.1.3, R603.6, R702.3.3, R804.3.6**		Updates to reference standards.
	AMCA Air Movement and Control Association ~~International~~ 30~~0~~ West University ~~Drive~~ Arlington Heights, IL 60004 ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ **ANSI/AMCA 210-ANSI/ASHRAE 51—07;** **Laboratory Methods of Testing Fans for Aerodynamic Performance Rating** Table M1506.~~2~~3 **AMCA** Air Movement and Control Association International, 30 West University Drive, Arlington Heights, IL 60004 **ANSI/AMCA 210-ANSI/ASHRAE 51—16: Laboratory Methods of Testing Fans for Aerodynamic Performance Rating** **Table M1504.2, M1505.3**		Updates to reference standards.
	~~**AMD** Association of Millwork Distributors Standards 10047 Robert Trent Parkway New Port Richey, FL 34655-4649~~ ~~Standard reference number / Title / Referenced in code section number~~ ~~AMD 100—2013 Structural Performance Ratings of Side Hinged Exterior Door Systems and Procedures for Component Substitution R609.3~~		Updates to reference standards.
	ANCE Association of the Electric Sector, Av. Lázaro Cardenas No. 869, Col. Nueva Industrial Vallejo, C.P. 07700 México D.F. ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ **UL/CSA/ANCE 60335-2—2012NMX-J-521/2-40-ANCE—2014/CAN/CSA-22.2 No. 60335-2-40—12 /UL 60335-2-40:** **Standard ~~for~~of Household and Similar Electric Appliances, Part 2-40: Particular Requirements for ~~Motor compressors~~Heat Pumps, Air-Conditioners and Dehumidifiers** M1403.1, M1412.1, M1413.1	~~**ANCE** Association of Standardization and Certification, Av. Lázaro Cárdenas No. 869, Fraccion 3, Col. Nva. Industrial Vallejo, México, D.F.~~ ~~**NMX-J-521/2-40-ANCE—2014/CAN/CSA-22.2 No. 60335-2-40—12/UL 60335-2-40: Safety of Household and Similar Electric Appliances, Part 2-40: Particular Requirements for Heat Pumps, Air Conditioners and Dehumidifiers**~~ ~~M1403.1, M1412.1, M1413.1~~	Updates to reference standards. New Houston amendment to remove ANCE as reference standard. Change accepted during public comment.

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ANSI

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036

A108.1A—17: Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar
R702.4.1

A108.1B—2017: Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex Portland Mortar
R702.4.1

A108.4—09: Installation of Ceramic Tile with Organic Adhesives or Water-Cleanable Tile-setting Epoxy Adhesive
R702.4.1

A108.5—19: Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex Portland Cement Mortar
R702.4.1

A108.6—19: Installation of Ceramic Tile with Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy
R702.4.1

A108.11—10: Interior Installation of Cementitious Backer Units
R702.4.1

A118.1—18: American National Standard Specifications for Dry-set Portland Cement Mortar
R702.4.1

A118.3—20: American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy, and Water-cleanable Tile-setting Epoxy Adhesive
R702.4.1

A118.4—18: American National Standard Specifications for Modified Dry-Set Cement Mortar
R606.2.11

A118.10—14: Specification for Load-bearing, Bonded, Waterproof Membranes for Thin-set Ceramic Tile and Dimension Stone Installation
P2709.2, P2709.2.4

A136.1—19: American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile
R702.4.1

A137.1—19: American National Standard Specifications for Ceramic Tile
R702.4.1

ANSI 117—2020: Standard Specifications for Structural Glued Laminated Timber of Softwood Species
R502.1.3, R602.1.3, R802.1.3

ANSI/CSA FC 1—2014: Fuel Cell Technologies—Part 3-100: Stationary Fuel Cell Power Systems—Safety
M1903.1

LC1/CSA 6.26—2016: Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)
G2411.3, G2414.4.4, G2415.5

LC4/CSA 6.32—12: Press-connect Metallic Fittings for Use in Fuel Gas Distribution Systems
G2414.9.1, G2414.9.2, G2414.9.3, G2415.5

Z21.1—2016: Household Cooking Gas Appliances
M1503.2, G2447.1

Z21.5.1/CSA 7.1—2017: Gas Clothes Dryers—Volume I—Type I Clothes Dryers
G2438.1

Updates to reference standards.

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Z21.8—94 (R2012): Installation of Domestic Gas Conversion Burners
G2443.1

Z21.10.1/CSA 4.1—2012: Gas Water Heaters—Volume I—Storage Water Heaters with Input Ratings of 75,000 Btu per hour or Less
G2448.1

Z21.10.3/CSA 4.3—2017: Gas Water Heaters—Volume III—Storage Water Heaters with Input Ratings above 75,000 Btu per hour, Circulating and Instantaneous
G2448.1

Z21.11.2—2016: Gas-fired Room Heaters—Volume II—Unvented Room Heaters
G2445.1

Z21.13/CSA 4.9—2017: Gas-fired Low-pressure Steam and Hot Water Boilers
G2452.1

Z21.15/CSA 9.1—09(R2014): Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves
Table G2420.1.1

Z21.22—99 (R2003): Relief Valves for Hot Water Supply Systems—with Addenda Z21.22a—2000 (R2003) and 21.22b—2001 (R2003)
P2804.2, P2804.7

Z21.24/CSA 6.10—2015: Connectors for Gas Appliances
G2422.1, G2422.2

Z21.40.1/CSA 2.91—96 (R2017): Gas-fired, Heat-activated Air-conditioning and Heat Pump Appliances
G2449.1

Z21.40.2/CSA 2.92—96 (R2017): Gas-fired Work Activated Air-conditioning and Heat Pump Appliances (Internal Combustion)
G2449.1

Z21.41/CSA 6.9-2014: Quick Disconnect Devices for Use with Gas Fuel Appliances
G2422.1

Z21.42—2013: Gas-fired Illuminating Appliances
G2450.1

Z21.47/CSA 2.3—2016: Gas-fired Central Furnaces
G2442.1

Z21.50/CSA 2.22—2016: Vented Decorative Gas Fireplaces
G2434.1

Z21.54—2014: Gas Hose Connectors for Portable Outdoor Gas-fired Appliances
G2422.1

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Z21.56/CSA 4.7—17: Gas-fired Pool Heaters
G2441.1

Z21.58—95/CSA 1.6—2015: Outdoor Cooking Gas Appliances
G2447.1

Z21.60/CSA 2.26—2017: Decorative Gas Appliances for Installation in Solid Fuel-burning Fireplaces
G2432.1

Z21.69/CSA 6.16—2015: Connectors for Movable Gas Appliances
G2422.1.5

Z21.75/CSA 6.27—2016: Connectors for Outdoor Gas Appliances and Manufactured Homes
G2422.1

Z21.80/CSA 6.22—11(R2016): Line Pressure Regulators
G2421.1

Z21.84—2017: Manually Lighted, Natural Gas Decorative Gas Appliances for Installation in Solid Fuel-burning Appliances
G2432.1, G2432.2

Z21.86/CSA 2.32—2016: Vented Gas-fired Space Heating Appliances
G2436.1, G2437.1, G2446.1

Z21.88/CSA 2.33—16: Vented Gas Fireplace Heaters
G2435.1

Z21.90/CSA 6.24-2015: Gas Convenience Outlets and Optional Enclosures
G2422.1

Z21.91—2017: Ventless Firebox Enclosures for Gas-fired Unvented Decorative Room Heaters
G2445.7.1

Z21.93/CSA 6.30—2017: Excess Flow Valves for Natural Gas and Propane Gas with Pressures up to 5 psig
G2421.4

Z21.97—2014: Outdoor Decorative Gas Appliances
G2453.1

Z83.6—90 (R1998): Gas-fired Infrared Heaters
G2451.1

Z83.8/CSA 2.6—2016: Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters, and Gas-fired Duct Furnaces
G2444.1

Z83.19—2009 (R2014): Gas-fired High-intensity Infrared Heaters
G2451.1

Z83.20—08: Gas-fired Low-intensity Infrared Heaters Outdoor Decorative Appliances
G2451.1

Z97.1—2014: Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test
R308.1.1, R308.3.1

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	APA APA—The Engineered Wood Association 7011 South 19th Street Tacoma, WA 98466 **ANSI/A190.1—2017: Structural Glued-laminated Timber** **R502.1.3, R602.1.3, R802.1.2** **ANSI/APA PRG 320—2019: Standard for Performance-rated Cross Laminated Timber** **R502.1.6, R602.1.6, R802.1.6** **ANSI/APA PRP 210—2019: Standard for Performance-rated Engineered Wood Siding** **R604.1, Table R703.3(1), R703.3.4** **ANSI/APA PRR 410—2016: Standard for Performance-rated Engineered Wood Rim Boards** **R502.1.7, R602.1.7, R802.1.7** **ANSI/APA PRS 610.1—2018: Standard for Performance-Rated Structural Insulated Panels in Wall Applications** **R602.1.11, R610.3, R610.4** **APA E30—19: Engineered Wood Construction Guide** **Table R503.2.1.1(1), R503.2.2, R803.2.2, R803.2.3**		Updates to reference standards.
	APSP Pool & Hot Tub Alliance (formerly the Association of Pool & Spa Professionals) 211 Eisenhower Avenue, Suite 500 Alexander, VA 22314 **ANSI/APSP/ICC 14—2019: American National Standard for Portable Electric Spa Energy Efficiency** **N1103.11** **ANSI/APSP/ICC 15a—2011: American National Standard for Residential Swimming Pool and Spas—Includes Addenda A Approved January 9, 2013** **N1103.12**		Updates to reference standards.
	ASCE/SEI American Society of Civil Engineers Structural Engineering Institute Reston, VA 20191-4400 **7—16 with Supplement 1: Minimum Design Loads and Associated Criteria for Buildings and Other Structures** **Table R608.7.1.1(1)(1A), Table R608.7.1.1(2)(1B), Table R608.7.1.1(3)(1C), R301.2.1.1, R301.2.1.2, R301.2.1.2.1, R301.2.1.5, R301.2.1.5.1, Table R608.6(1), Table R608.6(2), Table R608.6(3), Table R608.6(4), R608.9.2, R608.9.3, R609.2, R609.6.2** **24—14: Flood-resistant Design and Construction** **R301.2.4, R301.2.4.1, R322.1, R322.1.1, R322.1.6, R322.1.9, R322.2.2, R322.3.3** **32—01: Design and Construction of Frost-protected Shallow Foundations** **R403.1.4.1**		Updates to reference standards.

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	ASHRAE ASHRAE 180 Technology Parkway NW Peachtree Corners, GA 30092 **ASHRAE 34—2019: Designation and Safety Classification of Refrigerants** **M1411.1** **ASHRAE 193—2010(RA 2014): Method of Test for Determining Airtightness of HVAC Equipment** **N1103.3.4.1** **ASHRAE—2001: 2001 ASHRAE Handbook of Fundamentals** **Table N1105.4.2(1)** **ASHRAE—2021: ASHRAE Handbook of Fundamentals** **N1102.1.5, P3001.2, P3101.4**	**ASHRAE** ASHRAE 180 Technology Parkway NW Peachtree Corners, GA 30092 **ASHRAE 34—20192022: Designation and Safety Classification of Refrigerants** M1411.1	Updates to reference standards. New Houston amendment to update ASHRAE 34 to the 2022 edition.

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	ASME American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990 A18.1—2020: Safety Standard for Platforms and Stairway Chair Lifts R321.2 A112.1.2—2012 (R2022): Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water Connected Receptors) P2717.1, Table P2902.3, P2902.3.1 A112.1.3—2000 (Reaffirmed 2020): Air Gap Fittings for Use with Plumbing Fixtures, Appliances and Appurtenances Table P2701.1, P2717.1, Table P2902.3, P2902.3.1 A112.3.1—2007(R2022): Stainless Steel Drainage Systems for Sanitary, DWV, Storm and Vacuum Applications Above and Below Ground Table P3002.1(1), Table P3002.1(2), Table P3002.2, Table P3002.3, Table P3302.1 A112.3.4—2020/CSA B45.9—20: Macerating Toilet Systems and Related Components Table P2701.1, P3007.5 A112.4.1—2019: Water Heater Relief Valve Drain Tubes P2804.6.1 A112.4.3—1999 (R2020): Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System P3003.14 A112.4.4—2017: Plastic Push-Fit Drain, Waste, and Vent (DWV) Fittings Table P3002.3, P3003.9.4 A112.4.14—2004 (R2019): Manually Operated Valves for Use in Plumbing Systems Table P2903.9.4 A112.6.2—2022: Framing-affixed Supports for Off-the-floor Water Closets with Concealed Tanks Table P2701.1, P2702.4 A112.6.3—2019: Floor and Trench Drains Table P2701.1 A112.14.1—03(2022): Backwater Valves P3008.3 A112.18.1—2020/CSA B125.1—2020: Plumbing Supply Fittings Table P2701.1, P2708.5, P2722.1, P2722.3, P2902.2, Table P2903.9.4 A112.18.2—2019/CSA B125.2—2019: Plumbing Waste Fittings Table P2701.1, P2702.2 A112.18.3M—2002(R2020): Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings P2708.5, P2722.3 A112.18.6—2021/CSA B125.6—21: Flexible Water Connectors P2906.7		Updates to reference standards.

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A112.19.1—2020/CSA B45.2—2020: Enameled Cast-iron and Enameled Steel Plumbing Fixtures
Table P2701.1, P2711.1

A112.19.2—2020/CSA B45.1—2020: Ceramic Plumbing Fixtures
Table P2701.1, P2705.1, P2711.1, P2712.1, P2712.2, P2712.9

A112.19.3—2021/CSA B45.4—08 (R2021): Stainless Steel Plumbing Fixtures
Table P2701.1, P2705.1, P2711.1, P2712.1

A112.19.5—2021/CSA B45.15—2021: Flush Valves and Spuds for Water-closets, Urinals and Tanks
Table P2701.1

A112.19.7—2012/CSA B45.10—2012 (R2021): Hydromassage Bathtub Systems
Table P2701.1

A112.19.12—2019: Wall-mounted and Pedestal-mounted, Adjustable, Elevating, Tilting, and Pivoting Lavatory and Sink, and Shampoo Bowl Carrier Systems and Drain Waste Systems
Table P2701.1, P2711.4, P2714.2

A112.19.14—2013 (R2018): Six-Liter Water Closets Equipped with Dual Flushing Device
P2712.1

A112.19.15—2012 (R2017): Bathtub/Whirlpool Bathtubs with Pressure-sealed Doors
Table P2701.1, P2713.2

A112.36.2M—1991 (R2017): Cleanouts
P3005.2.10.2

ASME A17.1—2019/CSA B44—2019: Safety Code for Elevators and Escalators
R321.1

ASME A112.4.2—2020/CSA B45.16—20: Water-closet Personal Hygiene Devices
P2722.5

ASSE 1002—2020/ASME A112.1002—2020/CSA B125.12—20: Anti-Siphon Fill Valves
Table P2701.1, Table P2902.3, P2902.4.1

ASSE 1016—2020/ASME 112.1016—2020/CSA B125.16—2020: Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations
Table P2701.1, P2708.4, P2722.2

ASSE 1070—2020/ASME A112.1070—2020: Performance Requirements for Water-temperature-limiting Devices
P2713.3, P2721.2

B1.20.1—2019: Pipe Threads, General-purpose (Inch)
G2414.9, P3003.3.3, P3003.6.4, P3003.7.1, P3003.9.3

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B16.3—2021: Malleable-iron-threaded Fittings, 150 and 300
Table P2906.6

B16.4—2021: Gray-iron-threaded Fittings
Table P2906.6, Table P3002.3

B16.9—2018: Factory-made, Wrought-steel Buttwelding Fittings
Table P2906.6

B16.11—2021: Forged Fittings, Socket-welding and Threaded
Table P2906.6

B16.12—2009 (R2019): Cast-iron-threaded Drainage Fittings
Table P3002.3

B16.15—2018: Cast Alloy Threaded Fittings: Classes 125 and 250
Table P2906.6, Table P3002.3

B16.18—2018: Cast-copper-alloy Solder Joint Pressure Fittings
Table P2906.6, Table P3002.3

B16.22—2018: Wrought-copper and Copper-alloy Solder Joint Pressure Fittings
Table P2906.6, Table P3002.3

B16.23—2021: Cast-copper-alloy Solder Joint Drainage Fittings (DWV)
Table P3002.3

B16.26—2018: Cast-copper-alloy Fittings for Flared Copper Tubes
Table P2906.6, Table P3002.3

B16.28—1994: Wrought-steel Buttwelding Short Radius Elbows and Returns
Table P2906.6

B16.29—2017: Wrought-copper and Wrought-copper-alloy Solder Joint Drainage Fittings (DWV)
Table P3002.3

B16.33—2012 (R2017): Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (Sizes $^{1}/_{2}$ through 2)
Table G2420.1.1

B16.34—2020: Valves—Flanged, Threaded and Welding End
Table P2903.9.4

B16.44—2012 (R2017): Manually Operated Metallic Gas Valves for Use in Above-ground Piping Systems up to 5 psi
Table G2420.1.1

B16.51—2018: Copper and Copper Alloy Press-Connect Pressure Fittings
Table M2101.1, M2103.3, Table P2906.6

B36.10M—2018: Welded and Seamless Wrought-steel Pipe
G2414.4.2

BPVC—2019: ASME Boiler and Pressure Vessel Code (Sections I, II, IV, V, VI and VIII)
M2001.1.1, G2452.1

CSD-1—2021: Controls and Safety Devices for Automatically Fired Boilers
M2001.1.1, G2452.1

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	ASSE ASSE International 18927 Hickory Creek Drive, Suite 220 Mokena, IL 60448 **1001—2017: Performance Requirements for Atmospheric-type Vacuum Breakers** **Table P2902.3, P2902.3.2** **1003—2011: Performance Requirements for Water-pressure-reducing Valves for Domestic Water Distribution Systems** **P2903.3.1** **1008—2006: Performance Requirements for Plumbing Aspects of Residential Food Waste Disposer Units** **Table P2701.1** **1010—2004: Performance Requirements for Water Hammer Arresters** **P2903.5** **1011—2016: Performance Requirements for Hose Connection Vacuum Breakers** **Table P2902.3, P2902.3.2** **1012—2009: Performance Requirements for Backflow Preventers with Intermediate Atmospheric Vent** **Table P2902.3, P2902.3.3, P2902.5.1, P2902.5.5.3** **1013—2017: Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers** **Table P2902.3, P2902.3.5, P2902.5.1, P2902.5.5.3** **1015—2017: Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies** **Table P2902.3, P2902.3.6** **1017—2009: Performance Requirements for Temperature-actuated Mixing Valves for Hot Water Distribution Systems** **P2724.1, P2802.1, P2803.2** **1018—2001: Performance Requirements for Trap Seal Primer Valves; Potable Water Supplied** **P3201.2.1.1, P3201.2.1.2**		Updates to reference standards.

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1019—2011 (R2016): Performance Requirements for Freeze-resistant, Wall Hydrants, Vacuum Breaker, Draining Types
Table P2701.1, Table P2902.3, P2902.3.2

1020—2004: Performance Requirements for Pressure Vacuum Breaker Assembly
Table P2902.3, P2902.3.4

1023—1979: Performance Requirements for Hot Water Dispensers, Household-storage-type—Electrical
Table P2701.1

1024—2017: Performance Requirements for Dual Check Backflow Preventers, Anti-siphon-type, Residential Applications
Table P2902.3, P2902.3.7

1035—2008: Performance Requirements for Laboratory Faucet Backflow Preventers
Table P2902.3, P2902.3.2

1044—2015: Performance Requirements for Trap Seal Primer Devices Drainage Types and Electronic Design Types
P3201.2.1.3

1047—2011: Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies
Table P2902.3, P2902.3.5

1048—2011: Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies
Table P2902.3, P2902.3.6

1050—2009: Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems
P3114.1

1051—2009: Performance Requirements for Individual and Branch-type Air Admittance Valves for Plumbing Drainage Systems
P3114.1

1052—2016: Performance Requirements for Hose Connection Backflow Preventers
Table P2701.1, Table P2902.3, P2902.3.2

1056—2013: Performance Requirements for Spill-resistant Vacuum Breakers
Table P2902.3, P2902.3.4

1060—2016: Performance Requirements for Outdoor Enclosures for Fluid-conveying Components
P2902.6.1

1061—2015: Performance Requirements for Push Fit Fittings
Table P2906.6, P2906.21

1062—2017: Performance Requirements for Temperature-actuated, Flow Reduction (TAFR) Valves for Individual Supply Fittings
Table P2701.1, P2724.2

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1066—1997: Performance Requirements for Individual Pressure Balancing In-line Valves for Individual Fixture Fittings
P2722.4

1072—2007: Performance Requirements for Barrier-type Floor Drain Trap Seal Protection Devices
P3201.2.1.4

1081—2014: Performance Requirements for Backflow Preventers with Integral Pressure Reducing Boiler Feed Valve and Intermediate Atmospheric Vent Style for Domestic and Light Commercial Water Distribution Systems
Table P2902.3, P2902.3.3

ASSE 1002—2020/ASME A112.1002—2020/CSA B125.12—20: Anti-Siphon Fill Valves
Table P2701.1, Table P2902.3, P2902.4.1

ASSE 1016—2020/ASME 112.1016—2020/CSA B125.16—2020: Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations
Table P2701.1, P2708.4, P2722.2

ASSE 1037—2015/ASME A112.1037—2015/CSA B125.37—15: Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures
Table P2701.1

ASSE 1070—2020/ASME A112.1070—2020/ CSA B125.70—20: Performance Requirements for Water-temperature-limiting Devices
P2713.3, P2721.2, P2724.1

ASTM ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Standard number	Referenced Reference Title	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

ASTM ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

A36/A36M—14: Specification for Carbon Structural Steel
R608.5.2.2

A53/A53M—2018: Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated Welded and Seamless
R407.3, Table M2101.1, G2414.4.2, Table P2906.4, Table P2906.5, Table P3002.1(1)

A74—2017: Specification for Cast-iron Soil Pipe and Fittings
Table P3002.1(1), Table P3002.1(2), Table P3002.2, Table P3002.3, P3005.2.6, Table P3302.1

ASTM ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

E90—2009(2016): Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
AU401.1, AU501.1

Updates to reference standards.

No change to Houston amendment including ASTM E90 as reference standard.

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A106/A106M—2018: Specification for Seamless Carbon Steel Pipe for High-temperature Service
Table M2101.1, G2414.4.2

A123/A123M—2017: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
Table 507.2.3

A126—04(2014): Gray Iron Castings for Valves, Flanges and Pipe Fittings
Table P2903.9.4

A153/A153M—2016A: Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
R317.3, Table 507.2.3, Table R606.3.4.1, R703.6.3, R905.7.5, R905.8.6

A167—99(2009): Specification for Stainless and Heat-resisting Chromium-nickel Steel Plate, Sheet and Strip
Table R606.3.4.1

A240/A240M—17: Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications
Table R905.10.3(1)

A254—2010(2018): Specification for Copper Brazed Steel Tubing
Table M2101.1, G2414.5.1

A268/A268M—2010(16): Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
G2414.5.2

A269/A269M—2015A: Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
G2414.5.2

A307—2014E1: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
Table R507.2.3, R608.5.2.2

A312—2018: Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes
Table P2906.4, Table P2906.5, Table P2906.6, P2906.13.2

A463/A463M—15: Standard Specification for Steel Sheet, Aluminum-coated by the Hot-dip Process
Table R905.10.3(2)

A539—99: Specification for Electric-resistance-welded Coiled Steel Tubing for Gas and Fuel Oil Lines
M2202.1

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A641/A641M—09a(2014): Specification for Zinc-coated (Galvanized) Carbon Steel Wire
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A706M—2016: Specification for Low-alloy Steel Deformed and Plain Bars for Concrete Reinforcement
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A755M—2016E1: Specification for Steel Sheet, Metallic Coated by the Hot-dip Process and Prepainted by the Coil-coating Process for Exterior Exposed Building Products
Table R905.10.3(2)

A778M—2016: Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products
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A792/A792M—10(2015): Specification for Steel Sheet, 55% Aluminum-zinc Alloy-coated by the Hot-dip Process
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A875/A875M—13: Specification for Steel Sheet, Zinc-5%, Aluminum Alloy-coated by the Hot-dip Process
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A888—2018: Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Application
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A924M—2017A: Standard Specification for General Requirements for Steel Sheet, Metallic-coated by the Hot-dip Process
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A996M—2016: Specifications for Rail-steel and Axle-steel Deformed Bars for Concrete Reinforcement
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A1003/A1003M—15: Standard Specification for Steel Sheet, Carbon, Metallic and Nonmetallic-coated for Cold-formed Framing Members
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B42—2015A: Specification for Seamless Copper Pipe, Standard Sizes
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B75/B75M—11: Specification for Seamless Copper Tube
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B88—2016: Specification for Seamless Copper Water Tube
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B280—13: Standard Specification for Seamless Copper Tube for Air-Conditioning and Refrigeration Field Service
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B302—2017: Specification for Threadless Copper Pipe, Standard Sizes
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B306—13: Specification for Copper Drainage Tube (DWV)
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B447—12a: Specification for Welded Copper Tube
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B695—2004(2016): Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
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B813—2016: Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
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C4—2004(2018): Specification for Clay Drain Tile and Perforated Clay Drain Tile
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C14—15a: Specification for Non-reinforced Concrete Sewer, Storm Drain and Culvert Pipe
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C22/C22M—2015: Specification for Gypsum
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C27—1998(2018): Specification for Standard Classification of Fireclay and High-alumina Refractory Brick
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C28/C28M—10(2015): Specification for Gypsum Plasters
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C33/C33M—2018: Specification for Concrete Aggregates
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C34—2017: Specification for Structural Clay Load-bearing Wall Tile
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C35/C35M—(2014): Specification for Inorganic Aggregates for Use in Gypsum Plaster
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C55—2017: Specification for Concrete Building Brick
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C56—2013(2017): Standard Specification for Structural Clay Nonloadbearing Tile
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C59/C59M—00(2015): Specification for Gypsum Casting Plaster and Molding Plaster
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C61/C61M—00(2015): Specification for Gypsum Keene's Cement
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C62—2017: Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
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C73—2017: Specification for Calcium Silicate Face Brick (Sand Lime Brick)
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C94/C94M—2017A: Standard Specification for Ready-mixed Concrete
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C126—2017: Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
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C129—2017: Specification for Nonload-bearing Concrete Masonry Units
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C143/C143M—15A: Test Method for Slump of Hydraulic Cement Concrete
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C145—85: Specification for Solid Load-bearing Concrete Masonry Units
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C150/C150M—2018: Specification for Portland Cement
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C199—1984(2016): Test Method for Pier Test for Refractory Mortar
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C207—2018: Specification for Hydrated Lime for Masonry Purposes
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C208—2012(2017)E1: Specification for Cellulosic Fiber Insulating Board
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C212—2017: Standard Specification for Structural Clay Facing Tile
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C216—2017A: Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
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C315—2007(2016): Specification for Clay Flue Liners and Chimney Pots
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C406/C406M—2015: Specifications for Roofing Slate
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C411—2017: Test Method for Hot-surface Performance of High-temperature Thermal Insulation
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C443—2012(2017): Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
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C475M—2017: Specification for Joint Compound and Joint Tape for Finishing Gypsum Wallboard
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C503M—2015: Standard Specification for Marble Dimension Stone
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C557—2003(2017): Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing
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C564—14: Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
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C568M—2015: Standard Specification for Limestone Dimension Stone
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C578—2018: Specification for Rigid, Cellular Polystyrene Thermal Insulation
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C587—2004(2018): Specification for Gypsum Veneer Plaster
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C615/C615M—2018E1: Standard Specification for Granite Dimension Stone
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C616/C616M—2015: Standard Specification for Quartz-based Dimension Stone
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C629/C629M—2015: Standard Specification for Slate Dimension Stone
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C631—09(2014): Specification for Bonding Compounds for Interior Gypsum Plastering
R702.2.1

C645—2018: Specification for Nonstructural Steel Framing Members
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C652—2017A: Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
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C841—2003(2018): Standard Specification for Installation of Interior Lathing and Furring
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C842—05(2015): Standard Specification for Application of Interior Gypsum Plaster
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C844—2015: Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster
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C887—13: Specification for Packaged, Dry, Combined Materials for Surface Bonding Mortar
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C926—2018B: Specification for Application of Portland Cement-based Plaster
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C933—2018: Specification for Welded Wire Lath
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C1002—2018: Specification for Steel Self-piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
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C1029—15: Specification for Spray-applied Rigid Cellular Polyurethane Thermal Insulation
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C1032—2018: Specification for Woven Wire Plaster Base
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C1063—2018B: Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-based Plaster
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C1088—2018: Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
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C1107/C1107M—2017: Standard Specification for Packaged Dry, Hydraulic-cement Grout (Nonshrink)
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C1116/C116M—10(2015): Standard Specification for Fiber-reinforced Concrete and Shotcrete
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C1157—11/C1157M—2017: Standard Performance Specification for Hydraulic Cement
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C1167—2011(2017): Specification for Clay Roof Tiles
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C1173—2018: Specification for Flexible Transition Couplings for Underground Piping Systems
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C1177/C1177M—2017: Specification for Glass Mat Gypsum Substrate for Use as Sheathing
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C1363—11: The Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
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C1364—2017: Standard Specification for Architectural Cast Stone
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C1405—2016: Standard Specification for Glazed Brick (Single Fired, Brick Units)
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C1440—2017: Specification for Thermoplastic Elastomeric (TPE) Gasket Materials for Drain, Waste and Vent (DWV), Sewer, Sanitary and Storm Plumbing Systems
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C1460—2017: Specification for Shielded Transition Couplings for Use with Dissimilar DWV Pipe and Fittings Above Ground
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C1461—2008(2017): Specification for Mechanical Couplings Using Thermoplastic Elastomeric (TPE) Gaskets for Joining Drain, Waste and Vent (DWV) Sewer, Sanitary and Storm Plumbing Systems for Above and Below Ground Use
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C1492—2003(2016): Specification for Concrete Roof Tile
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C1513—2018: Standard Specification for Steel Tapping Screws for Cold-formed Steel Framing Connections
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C1540—2018: Specification for Heavy Duty Shielded Couplings Joining Hubless Cast-iron Soil Pipe and Fittings
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C1634—2017: Standard Specification for Concrete Facing Brick
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C1658/C1658M—2018: Standard Specification for Glass Mat Gypsum Panels
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C1668—13a: Standard Specification for Externally Applied Reflective Insulation Systems on Rigid Duct in Heating, Ventilation, and Air Conditioning (HVAC) Systems
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C1691—2011(2017): Standard Specification for Unreinforced Autoclaved Aerated Concrete (AAC) Masonry Units
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C1693—2011(2017): Standard Specification for Autoclaved Aerated Concrete (AAC)
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D43/D43M—2000(20118): Specification for Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing
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D1227—13: Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
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D1248—2016: Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
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D1527—99(2005): Specification for Acrylonitrile-butadiene-styrene (ABS) Plastic Pipe, Schedules 40 and 80
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D1693—15: Test Method for Environmental Stress-cracking of Ethylene Plastics
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D1784—11: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
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D1785—15E1: Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
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D1970/D1970M—2017A: Specification for Self-adhering Polymer Modified Bitumen Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
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E779—2010(2018): Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
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E814—2013A(2017): Standard Test Method for Fire Tests of Penetration Firestop Systems
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E1602—2003(20117): Guide for Construction of Solid Fuel Burning Masonry Heaters
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F1960—2018: Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
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F1970—12E1: Standard Specification for Special Engineered Fittings, Appurtenances or Valves for Use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems
M2105.5, Table 2903.9.4

F1973—2013(2018): Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA 11) Fuel Gas Distribution Systems
G2415.17.2

F1974—09(2015): Specification for Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene Composite Pressure Pipe
Table P2906.6, P2906.12.1

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F1986—2001(2011): Multilayer Pipe Type 2, Compression Joints for Hot and Cold Drinking Water Systems
Table P2906.4, Table P2906.5, Table P2906.6

F2080—2016: Specification for Cold-expansion Fittings with Metal Compression-sleeves for Cross-linked Polyethylene (PEX) Pipe
Table P2906.6

F2090—17: Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms
R310.1.1, R312.2.1, R312.2.2

F2098—2015: Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings
Table M2101.1, Table P2906.6

F2159—2018: Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
Table P2906.6

F2262—09: Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene Tubing OD Controlled SDR9
Table P2906.4, Table P2906.5

F2389—2017A: Standard for Pressure-rated Polypropylene (PP) Piping Systems
Table P2906.4, Table P2906.5, Table P2906.6, P2906.11.1

F2434—14: Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing
Table P2906.6

F2623—14: Standard Specification for Polyethylene of Raised Temperature (PE-RT) SDRG Tubing
Table M2101.1

F2735—2009(2016): Standard Specification for Plastic Insert Fittings for SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing
Table M2101.1, Table P2906.6

F2769—2018: Polyethylene or Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems
Table M2101.1, Table P2906.4, Table P2906.5, Table P2906.6

F2806—10(2015): Standard Specification for Acrylonitrile-butadiene-styrene (ABS) Plastic Pipe (Metric SDR-PR)
Table M2101.1

F2855—12: Standard Specification for Chlorinated Poly (Vinyl Chloride)/Aluminum/Chlorinated Poly (Vinyl Chloride) (CPVC AL CPVC) Composite Pressure Tubing
Table P2906.4, Table P2906.5

F2945—2018: Standard Specification for Polyamide 11 Gas Pressure Pipe, Tubing and Fittings
G2414.6

F2969—12: Standard Specification for Acrylonitrile-butadiene-styrene (ABS) IPS Dimensioned Pressure Pipe
Table M2101.1

F3226/F3226M—16: Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems
Table P2906.6

F3253—2017: Standard Specification for Crosslinked Polyethylene (PEX) Tubing with Oxygen Barrier for Hot- and Cold-Water Hydronic Distribtuion Systems
Table M2101.1

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	AWC American Wood Council 222 Catoctin Circle SE, Suite 201 Leesburg, VA 20175 **ANSI/AWC NDS—2018: National Design Specification (NDS) for Wood Construction —with 2018 Supplement** **R404.2.2, R502.2, Table R503.1, R507.2.1, R602.3, R608.9.2, R608.9.3, Table R703.15.1, Table R703.15.2, R802.2** **ANSI/AWC PWF—2021: Permanent Wood Foundation Design Specification** **R317.3.2, R401.1, R404.2.3** **ANSI/AWC WFCM—2018: Wood Frame Construction Manual for One- and Two-family Dwellings** **R301.1.1, R301.2.1.1, R602.10.8.2, Figure R608.9(9), R608.9.2, R608.9.3, R608.10** **AWC STJR—2021: Span Tables for Joists and Rafters** **R502.3, R802.4.1, R802.5.1**		Updates to reference standards.
	AWPA American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 **C1—03: All Timber Products—Preservative Treatment by Pressure Processes** **R902.2** **M4—15: Standard for the Care of Preservative-treated Wood Products** **R317.1.1, R318.1.2** **U1—20: USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H** **R317.1, R402.1.2, R504.3, R703.6.3, R905.7.5, Table R905.8.5, R905.8.6**		Updates to reference standards.
	AWS American Welding Society 8669 NW 36 Street, #130 Miami, FL 33166 **A5.8M/A5.8—2011—AMD1: Specifications for Filler Metals for Brazing and Braze Welding** **P3003.6.1** **ANSI/AWS A5.31M/A5.31—2012: Specification for Fluxes for Brazing and Braze Welding Edition: 2nd** **M2103.3, M2202.2, P2906.15**		Updates to reference standards.

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	AWWA American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 **C104/A21.4—16: Cement-mortar Lining for Ductile-iron Pipe and Fittings** P2906.4 **C110/A21.10—12: Ductile-iron and Gray-iron Fittings** Table P2906.6, P3002.3 **C115/A21.15—11: Flanged Ductile-iron Pipe with Ductile-iron or Gray-iron Threaded Flanges** Table P2906.4 **C151/A21.51—17: Ductile-iron Pipe, Centrifugally Cast, for Water** Table P2906.4 **C153/A21.53—11: Ductile-iron Compact Fittings for Water Service** Table P2906.6 **C500—09: Standard for Metal-seated Gate Valves for Water Supply Service** Table P2903.9.4 **C504—15: Standard for Rubber-seated Butterfly Valves** Table P2903.9.4 **C507—15: Standard for Ball Valves, 6 In. Through 60 In. (150 mm through 1,500 mm)** Table P2903.9.4 **C510—07: Double Check Valve Backflow Prevention Assembly** Table P2902.3, P2902.3.6 **C511—17: Reduced-pressure Principle Backflow Prevention Assembly** Table P2902.3, P2902.3.5, P2902.5.1 **C901—16: Polyethylene (PE) Pressure Pipe and Tubing $^1/_2$ in. (13 mm) through 3 in. (76 mm) for Water Service** P2906.4 **C903—16: Polyethylene-aluminum-polyethylene (PE-AL-PE) Composite Pressure Pipe, 12 mm ($^1/_2$ in.) through 50 mm (2 in.), for Water Service** Table M2105.4 **C904—16: Cross-linked Polyethylene (PEX) Pressure Tubing, $^1/_2$ in. (13 mm) through 3 in. (76 mm) for Water Service** P2906.4		Updates to reference standards.
	CEN European Committee for Standardization (EN) Central Secretariat Rue de Stassart 36 B-10 50 Brussels ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ **EN 15250-2007: Slow Heat Release Appliances Fired by Solid Fuel Requirements and Test Methods** R1002.~~5~~2		Updates to reference standards.
	~~**CGSB**~~ ~~Canadian General Standards Board~~ ~~Place du Portage 111, 6B1~~ ~~11 Laurier Street~~ ~~Gatineau, Quebec, Canada KIA 1G6~~ ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ ~~CAN/CGSB-37.54—95 Polyvinyl Chloride Roofing and Waterproofing Membrane~~ R905.13.2 ~~37-GP-52M—(1984) Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric~~ R905.12.2 ~~37-GP-56M—(1980) Membrane, Modified Bituminous, Prefabricated and Reinforced for Roofing—with December 1985 Amendment~~ Table R905.11.2		Updates to reference standards.

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	CISPI Cast Iron Soil Pipe Institute 2401 Fieldcrest Drive Mundelein, IL 60060 301—18: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications Table P3002.1(1), Table P3002.1(2), Table P3002.2, Table P3002.3, Table P3302.1 310—18: Standard Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications P3003.4.3		Updates to reference standards.
	CPSC Consumer Product Safety Commission 4330 East-West Highway Bethesda, MD 20814-4408 ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ 16 CFR, Part 1201—(2002): Safety Standard for Architectural Glazing — R308.1.1, R308.3.1, Table R308.3.1(1) 16 CFR, Part 1209—(2002): Interim Safety Standard for Cellulose Insulation — R302.10.3 16 CFR, Part 1404—(2002): Cellulose Insulation — R302.10.3		Updates to reference standards.
	CSA CSA Group 8501 East Pleasant Valley Road Cleveland, OH 44131-5516 A112.18.6—2021/CSA B125.6—2021: Flexible Water Connectors P2906.7 A112.19.5—2017/CSA B45.15—2017: Flush Valves and Spuds for Water-closets, Urinals and Tanks Table P2701.1 A112.19.7—2012/CSA B45.10—2012 (R2021): Hydromassage Bathtub Systems Table P2701.1 A257.2—14: Reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings Table P3002.2, P3003.13 A257.3—14: Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets P3003.5, P3003.13 AAMA/WDMA/CSA 101/I.S.2/A440—17: North American Fenestration Standard/Specification for Windows, Doors and Unit Skylights R308.6.9, R609.3, N1102.4.3	**CSA** CSA Group 8501 East Pleasant Valley Road Cleveland, OH 44131-5516 CAN/CSA-C22.2 No. 60335-2-40—20122022: Safety of Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers M2006.1	Updates to reference standards. New Houston amendment to update CSA standard to the 2022 edition.

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ANSI/CSA FC I—2014: Fuel Cell Technologies—Part 3-100; Stationary fuel cell power systems—Safety
M1903.1

ANSI/CSA/IGSHPA C448 Series—16: Design and Installation of Ground Source Heat Pump Systems for Commercial and Residential Buildings
Table M2105.4, Table M2105.5

ASME A17.1/CSA B44—2019: Safety Code for Elevators and Escalators
R321.1

ASME A112.3.4—2013/CSA B45.9—18: Macerating Toilet Systems and Related Components
Table P2701.1, P3007.5

ASME A112.4.2—2015/CSA B45.16—15: Water-closet Personal Hygiene Device
P2722.5

ASME A112.18.1—2018/CSA B125.1—2018: Plumbing Supply Fittings
Table P2701.1, P2708.4, P2708.5, P2722.1, P2722.3, P2902.2, Table P2903.9.4

ASME A112.18.2—2019/CSA B125.2—2019: Plumbing Waste Fittings
Table P2701.1, P2702.2

ASME A112.19.1—2018/CSA B45.2—18: Enameled Cast-iron and Enameled Steel Plumbing Fixtures
Table P2701.1, P2711.1

ASME A112.19.2—2018/CSA B45.1—18: Ceramic Plumbing Fixtures
Table P2701.1, P2705.1, P2711.1, P2712.1, P2712.2, P2712.9

ASME A112.19.3—2017/CSA B45.4—2017: Stainless Steel Plumbing Fixtures
Table P2701.1, P2705.1, P2711.1, P2712.1

ASSE 1002—2020/ASME A112.1002—2020/CSA B125.12—20: Anti-Siphon Fill Valves for Water Closet Tanks
Table P2701.1, Table P2902.3, P2902.4.1

ASSE 1016—2017/ASME 112.1016—2017/CSA B125.16—2017: Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations
Table P2701.1, P2708.4, P2722.2

ASSE 1070—2015/ASME A112.1070—2015/CSA B125.70—15: Performance Requirements for Water-temperature-limiting Devices
P2713.3, P2721.2, P2724.1

B44—2019: Safety Code for Elevators and Escalators
R321.1

B55.1—2015: Test Method for Measuring Efficiency and Pressure Loss of Drain Water Heat Recovery Units
N1103.5.4

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	B55.2—2015: Drain Water Heat Recovery Units N1103.5.4 B64.1.1—11(R2016): Vacuum Breakers, Atmospheric Type (AVB) Table P2902.3, P2902.3.2 B64.1.2—11(R2016): Pressure Vacuum Breakers (PVB) Table P2902.3, P2902.3.4 B64.1.3—11(R2016): Spill Resistant Pressure Vacuum Breakers (SRPVB) Table P2902.3 B64.2—11(R2016): Vacuum Breakers, Hose Connection Type (HCVB) Table P2902.3, P2902.3.2 B64.2.1—11(R2016): Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature Table P2902.3, P2902.3.2 B64.2.1.1—11(2016): Hose Connection Dual Check Vacuum Breakers (HCDVB) Table P2902.3, P2902.3.2 B64.2.2—11(2016): Vacuum Breakers, Hose Connection Type (HCVB) with Automatic Draining Feature Table P2902.3, P2902.3.2 B64.3—11(2016): Dual Check Backflow Preventers with Atmospheric Port (DCAP) Table P2902.3, P2902.3.2, P2902.5.1 B64.4—11(2016): Backflow Preventers, Reduced Pressure Principle Type (RP) Table P2902.3, P2902.3.5 B64.4.1—11(2016): Reduced Pressure Principle for Fire Sprinklers (RPF) Table P2902.3, P2902.3.5 B64.5—11(2016): Double Check Backflow Preventers (DCVA) Table P2902.3, P2902.3.6 B64.5.1—11(2016): Double Check Valve Backflow Preventers, Type for Fire Systems (DCVAF) Table P2902.3, P2902.3.6 B64.6—11(2016): Dual Check Valve Backflow Preventers (DuC) Table P2902.3, P2902.3.7 B64.7—11(2016): Laboratory Faucet Vacuum Breakers (LFVB) Table P2902.3, P2902.3.2		

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B125.3—18: Plumbing Fittings
Table P2701.1, P2713.3, P2721.2, Table P2902.3, P2902.4.1, Table P2903.9.4

B137.1—17: Polyethylene (PE) Pipe, Tubing and Fittings for Cold Water Pressure Services
Table P2906.4, Table P2906.6

B137.2—17: Polyvinylchloride PVC Injection-moulded Gasketed Fittings for Pressure Applications
Table P2906.6

B137.3—17: Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications
Table P2906.4, Table P2906.6, P3003.9.2

B137.5—17: Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications
Table P2906.4, Table P2906.5, Table P2906.6

B137.6—17: Chlorinated polyvinylchloride CPVC Pipe, Tubing and Fittings For Hot- and Cold-water Distribution Systems
Table P2906.4, Table P2906.5, Table 2906.6

B137.9—17: Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe Systems
Table M2101.1, Table P2906.4

B137.10—17: Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PE-AL-PE) Composite Pressure Pipe Systems
Table M2101.1, Table P2906.4, Table P2906.5, Table P2906.6, P2906.12.1

B137.11—17: Polypropylene (PP-R) Pipe and Fittings for Pressure Applications
Table P2906.4, Table P2906.5, Table P2906.6

B137.18—17: Polyethylene of Raised Temperature (PE-RT) Tubing Systems for Pressure Applications
Table M2101.1, Table M2105.4, Table M2105.5, Table P2906.4, Table P2906.5, Table P2906.6

B181.1—18: Acrylonitrile-butadiene-styrene (ABS) Drain, Waste and Vent Pipe and Pipe Fittings
Table P3002.1(1), Table P3002.1(2), Table P3002.3, P3003.3.2

B181.2—18: Polyvinylchloride (PVC) and chlorinated polyvinylchloride (CPVC) Drain, Waste and Vent Pipe and Pipe Fittings
Table P3002.1(1), Table P3002.1(2), P3003.9.2, P3008.3

B181.3—18: Polyolefin and polyvinylidene (PVDF) Laboratory Drainage Systems
Table P3002.1(1), Table P3002.1(2), Table P3002.2, Table P3002.3, P3003.11.1

B182.1—18: Plastic Drain and Sewer Pipe and Pipe Fittings
Table P3302.1

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	B182.2—18: PSM Type polyvinylchloride (PVC) Sewer Pipe and Fittings Table P3002.2, Table P3302.1 B182.4—18: Profile polyvinylchloride (PVC) Sewer Pipe & Fittings Table P3002.2, Table P3302.1 B182.6—18: Profile Polyethylene (PE) Sewer Pipe and Fittings for leak-proof Sewer Applications Table P3302.1 B182.8—18: Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings Table P3302.1 B356—10(R2015): Water Pressure Reducing Valves for Domestic Water Supply Systems P2903.3.1 B483.1—07(R2017): Drinking Water Treatment Systems P2909.1, P2909.2 B602—16: Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe P3003.3.1, P3003.4.3, P3003.5, P3003.9.1, P3003.10, P3003.12.2, P3003.13 C22.2 No. 218.1—13(R2017): Spas, Hot Tubs and Associated Equipment M2006.1 C22.2 No. 236—15: Heating and Cooling Equipment M2006.1 CAN/CSA/C22.2 No. 60335-2-40—2012: Safety of Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers M1403.1, M1412.1, M1413.1 CSA 8—93: Requirements for Gas Fired Log Lighters for Wood Burning Fireplaces G2433.1 CSA A257.1—2014: Non-reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings Table P3002.2 CSA B45.5—2017/IAPMO Z124—2017 with Errata dated August 2017: Plastic Plumbing Fixtures Table P2701.1, P2711.1, P2711.2, P2712.1 CSA B805—18/ICC 805—18: Rainwater Harvesting Systems P2912.1 CSA O325—16: Construction Sheathing R503.2.1, R602.1.8, R604.1, R803.2.1 O437-Series—93(R2011): Standards on OSB and Waferboard R503.2.1, R602.1.8, R604.1, R803.2.1		
	CSSB Cedar Shake & Shingle Bureau P. O. Box 1178 Sumas, WA 98295-1178 ~~Standard reference number~~ | ~~Title~~ | ~~Referenced in code section number~~ CSSB—97: Grading and Packing Rules for Western Red Cedar Shakes and Western Red Shingles of the Cedar Shake and Shingle Bureau | R702.6, R703.6, ~~Table R905.7.4, Table R905.8.5~~		Updates to reference standards.

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	DASMA Door & Access Systems Manufacturers Association International 1300 Sumner Avenue Cleveland, OH 44115-2851 **105—2017: Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors** **N1101.10.3** **108—2017: Standard Method for Testing Garage Doors, Rolling Doors and Flexible Doors; Determination of Structural Performance Under Uniform Static Air Pressure Difference** **R609.4** **115—2017: Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure** **R301.2.1.2**		Updates to reference standards.
	~~HPVA~~DHA Decorative Hardwoods Association (formerly HPVA) 42777 Trade West Drive Sterling, Virginia 20166 **ANSI/HPVA HP-1—2016: American National Standard for Hardwood and Decorative Plywood** **R702.5**		Updates to reference standards.
	DOC United States Department of Commerce 1401 Constitution Avenue, NW Washington, DC 20230 **PS 1—19: Structural Plywood** **R404.2.1, Table R404.2.3, R503.2.1, R602.1.8, R604.1, R803.2.1** **PS 2—18: Performance Standard for Wood Structural Panels** **R404.2.1, Table R404.2.3, R503.2.1, R602.1.8, R604.1, R803.2.1** **PS 20—05: American Softwood Lumber Standard** **R404.2.1, R502.1.1, R602.1.1, R802.1.1**		Updates to reference standards.
	DOTn **U.S.** Department of Transportation 1200 New Jersey Avenue SE East Building, 2nd floor Washington, DC 20590 ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ **49 CFR, Parts 192.281(e) & 192.283 (b) (2009): Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards** — G2414.6.1		Updates to reference standards.
	FEMA Federal Emergency Management Agency 500 C Street~~,~~ SW Washington, DC 20472 ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ **FEMA TB-2—08: Flood Damage-resistant Materials Requirements** — R322.1.8 **FEMA TB-11—01: Crawlspace Construction for Buildings Located in Special Flood Hazard Area** — R408.7		Updates to reference standards.

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	FM FM Approvals Headquarters Office Norwood, MA 02062 4450—(1989): Approval Standard for Class 1 Insulated Steel Deck Roofs—with Supplements through July 1992 R906.1 4474—2011: American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures R905.4.4.1 ANSI/FM 4880—(2017): American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials R316.6		Updates to reference standards.
	GA Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 GA-253—2018: Application of Gypsum Sheathing Table R602.3(1)		Updates to reference standards.
	HPVA Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190-~~5350~~ ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ ANSI/HPVA HP-1—20136: American National Standard for Hardwood and Decorative Plywood — R702.5		Updates to reference standards.
	HVI Home Ventilating Institute 1000 North Rand Road Suite 214 Wauconda, Il 60084 916—09 Airflow Test Procedure — Table N1103.6.1		Updates to reference standards.
	IAPMO IAPMO Group 4755 E. Philadelphia Street Ontario, CA 91761-USA ~~Standard reference number~~ / ~~Title~~ / ~~Referenced in code section number~~ CSA B45.5—117/ IAPMO Z124—112017: Plastic Plumbing Fixtures — Table P2701.1, P2711.1, P2711.2, P2712.1		Updates to reference standards.
	ICC International Code Council, Inc. 500 New Jersey Avenue NW 6th Floor Washington, DC 20001 ANSI/RESNET/ICC 301—2019: Standard for the Calculation and Labeling of the Energy Performance of Low-rise Dwelling and Sleeping Units Using the Energy Rating Index N1106.4 ANSI/RESNET/ICC 380—2019: Standard for Testing Airtightness of Building, Dwelling Unit and Sleeping Unit Enclosures; Airtightness of Heating and Cooling Air Distribution Systems and Airflow of Mechanical Ventilation Systems N1102.4.1.2		Updates to reference standards.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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	IBC—21: International Building Code® R320.1.1, R101.2, R202, R301.1.1, R301.1.3, R301.2.1.1, R301.2.2.1.1, R301.2.2.1.2, R301.3, Table R302.1(1), Table R302.1(2), R302.2.1, R302.2.2, R302.3, R308.5, R320.1, R321.3, R403.1.8, Table R602.10.3(3), Table R606.12.2.1, R609.2, R802.1.5.4, R905.10.3, G2402.3 ICC 400—17: Standard on the Design and Construction of Log Structures R301.1.1, R502.1.4, R602.1.4, R703.1, R802.1.3, N1102.1, Table N1102.4.1.1 ICC 500—2020: ICC/NSSA Standard for the Design and Construction of Storm Shelters R323.1 ICC 600—2020: Standard for Residential Construction in High-wind Regions R301.2.1.1 ICC 900/SRCC 300—2020: Solar Thermal System Standard M2301.2.2.2, M2301.2.3, M2301.2.6, M2301.2.7, M2301.2.8, M2301.2.10, M2301.4 ICC 901/SRCC 100—2020: Solar Thermal Collector Standard M2301.3.1 ICC/ANSI A117.1—17: Accessible and Usable Buildings and Facilities R321.3 IEBC—21: International Existing Building Code® R110.2 IECC—06: International Energy Conservation Code® N1101.6 IECC—21: International Energy Conservation Code® N1101.1, N1103.8, Table N1105.4.2(1) IFC—21: International Fire Code® R102.7, R324.2, M2201.7, G2402.3, G2412.2 IFGC—21: International Fuel Gas Code® G2401.1, G2402.3, G2423.1 IMC—21: International Mechanical Code® G2402.3 IPC—21: International Plumbing Code® Table R301.2(1), R903.4.1, G2402.3, P2601.1 IPMC—21: International Property Maintenance Code® R102.7 IPSDC—21: International Private Sewage Disposal Code® R322.1.7 ~~IRC—21: International Residential Code®~~ ~~T~~ ISPSC—21: International Swimming Pool and Spa Code® R327.1		
	IEEE Institute of Electrical and Electronic Engineers, Inc. 3 Park Avenue, 17th Floor New York, NY 10016-5997 515.1—2012: IEEE Standard for the Testing, Design, Installation and Maintenance of Electrical Resistance Trace Heating for Commercial Applications — N1103.5.1.2		Updates to reference standards.

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	ISO International Organization for Standardization Chemin de Blandonnet 8 CP 401 1214 Vernier Geneva, Switzerland ~~Standard reference number~~ | ~~Title~~ | ~~Referenced in code section number~~ 8336—2009: Fibre-cement Flat Sheets-product Specification and Test Methods — Table R503.2.1.1(1), Table R503.2.1.1(2), Table R602.3(2), Table R702.4.2, R703.10.1, R703.10.2 15874—2002: Polypropylene Plastic Piping Systems for Hot and Cold Water Installations — Table M2101.1		Updates to reference standards.
	MSS Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180 SP-42—2013: Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends (Glasses 150, 300 & 600) — Table P2903.9.4 SP-58—2018: Pipe Hangers and Supports—Materials, Design, Manufacture, Selection, Application and Installation — G2418.2 SP-67—2017: Butterfly Valves — Table P2903.9.4 SP-70—2011: Gray Iron Gate Valves, Flanged and Threaded Ends — Table P2903.9.4 SP-71—2018: Gray Iron Swing Check Valves, Flanged and Threaded Ends — Table P2903.9.4 SP-72—2010a: Ball Valves with Flanged or Butt-Welding Ends for General Service — P2903.9.4 SP-78—2011: Cast Iron Plug Valves, Flanged and Threaded Ends — Table P2903.9.4 SP-80—2013: Bronze Gate, Globe, Angle and Check Valves — Table P2903.9.4 SP-110—2010: Ball Valves, Threaded, Socket Welded, Solder Joint, Grooved and Flared Ends — Table P2903.9.4 SP-122—2017: Plastic Industrial Ball Valves — Table P2903.9.4 SP-139—2014: Copper Alloy Gate, Globe, Angle, and Check Valves for Low Pressure/ Low Temperature Plumbing Applications — Table P2903.9.4		Updates to reference standards.
	NAIMA North American Insulation Manufacturers Association ~~44~~11 Canal Center Plaza, Suite ~~3~~101 Alexandria, VA 22314 ~~Standard reference number~~ | ~~Title~~ | ~~Referenced in code section number~~ AH 116—09: Fibrous Glass Duct Construction Standards, Fifth Edition — M1601.1.1		Updates to reference standards.

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NEMA

National Electrical Manufacturers Association
1300 17th Street North No. 900
Arlington, VA 22209

OS 4—2016: Requirements for Air-Sealed Boxes for Electrical and Communication Applications
N1102.4.6

Updates to reference standards.

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Standard number	Referenced Reference Title	in code section number
70—2014	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

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

13D—19: Standard for the Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes
R313.1.1, R313.2.1, R324.6.2.1, P2904.1, P2904.6.1

13R—19: Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies
R325.5

31—20: Standard for the Installation of Oil-burning Equipment
M1701.1, M1801.3.1, M1805.3, M2201.2

58—20: Liquefied Petroleum Gas Code
G2412.2, G2414.5.2

70—20: National Electrical Code
R107.3, R324.3, R328.6, E3401.1, E3401.2, E4301.1, Table E4303.2, E4304.3, E4304.4

72—19: National Fire Alarm and Signaling Code
R314.1, R314.7.1

85—19: Boiler and Combustion Systems Hazards Code
G2452.1

211—19: Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
R1002.5, G2427.5.5.1

259—18: Standard for Test Method for Potential Heat of Building Materials
R316.5.7, R316.5.8

275—17: Standard Method of Fire Tests for the Evaluation of Thermal Barriers
R316.4

276—15: Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components
R906.1

286—19: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
R302.9.4, R316.6

501—17: Standard on Manufactured Housing
R202

720—15: Standard for the Installation of Carbon Monoxide (CO) Detectors and Warning Equipment
R315.7.1, R315.7.2

853—20: Standard on the Installation of Stationary Fuel Cell Power Systems
M1903.1

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

70—2023: National Electrical Code
R107.3, R324.3, R328.6, E3401.1, E4301.1, Table 4303.2, E4304.3, E4304.4

Updates to reference standards.

Houston amendment for NEC edition has been updated to the 2023 edition.

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	NFRC National Fenestration Rating Council, Inc. 6305 Ivy Lane, Suite 140 Greenbelt, MD 20770 100—2020: Procedure for Determining Fenestration Products *U*-Factors N1101.10.3 200—2020: Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence N1101.10.3 400—2020: Procedure for Determining Fenestration Product Air Leakage N1102.4.3		Updates to reference standards.
	NGWA National Ground Water Association 601 Dempsey Road Westerville, OH 43081 ANSI/NGWA 01—14: Water Well Construction Standard P2602.1		Updates to reference standards.

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	NSF NSF International 789 N. Dixboro Road Ann Arbor, MI 48105 14—2017: Plastics Piping System Components and Related Materials M1301.4, P2609.3, P2909.3 41—2016: Nonliquid Saturated Treatment Systems (Composting Toilets) P2725.1 42—2017: Drinking Water Treatment Units—Aesthetic Effects P2909.1, P2909.3 44—2017: Residential Cation Exchange Water Softeners P2909.1, P2909.3 50—2017: Equipment for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities P2911.8.1 53—2017: Drinking Water Treatment Units—Health Effects P2909.1, P2909.3 58—2017: Reverse Osmosis Drinking Water Treatment Systems P2909.2, P2909.3 61—2018: Drinking Water System Components—Health Effects P2609.5, P2722.1, P2903.9.4, P2906.4, P2906.5, P2906.6, P2909.3 62—2017: Drinking Water Distillation Systems P2909.1 350—2017a: Onsite Residential and Commercial Water Reuse Treatment Systems P2911.6.1 358-1—2017: Polyethylene Pipe and Fittings for Water-based Ground Source "Geothermal" Heat Pump Systems M2105.4, M2105.5 358-2—2017: Polypropylene Pipe and Fittings for Water-based Ground Source "Geothermal" Heat Pump Systems Table M2105.4, M2105.5 358-3—2016: Cross-linked Polyethylene (PEX) Pipe and Fittings for Water-based Ground-source (Geothermal) Heat Pump Systems Table M2105.4, Table M2105.5 358-4—2017: Polyethylene of Raised Temperature (PE-RT) Pipe and Fittings for Water-based Ground-source (Geothermal) Heat Pump Systems Table 2105.4, Table 2105.5 359—2011(R2016): Valves for Crosslinked Polyethylene (PEX) Water Distribution Tubing Systems Table P2903.9.4 372—2016: Drinking Water Systems Components—Lead Content P2906.2.1		Updates to reference standards.
	PCA Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 100—17: Prescriptive Design of Exterior Concrete Walls for One- and Two-family Dwellings (Pub. No. PCA 100.3) R301.2.2.5, R404.1.3, R404.1.3.2.1, R404.1.3.2.2, R404.1.3.4, R404.1.4.2, R608.1, R608.2, R608.5.1, R608.9.2, R608.9.3		Updates to reference standards.

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<tr>
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SBCA
Structural Building Components Association
6300 Enterprise Lane
Madison, WI 53719

ANSI/FS100—12(R2018): Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies
R316.8

BCSI—2018: Building Component Safety Information Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses
R502.11.2, R802.10.3

CFS-BCSI—(updated June 2016): Cold-formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-formed Steel Trusses
R505.1.3, R804.3.6
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SMACNA
Sheet Metal & Air Conditioning Contractors National Assoc. Inc.
4021 Lafayette Center Road
Chantilly, VA 22021

SMACNA—10: Fibrous Glass Duct Construction Standards 7th edition
M1601.1.1, M1601.4.1

SMACNA/ANSI—2016: HVAC Duct Construction Standards—Metal and Flexible 4th Edition (ANSI)
M1601.4.1
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~~SRCC~~
~~Solar Rating & Certification Corporation~~
~~400 High Point Drive, Suite 400~~
~~Cocoa, FL 32926~~

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<tr><td>~~SRCC 100—13~~</td><td>~~Standard 100 for Solar Collectors~~</td><td>~~M2301.3.1~~</td></tr>
<tr><td>~~SRCC 300—13~~</td><td>~~Standard 300 for Solar Water Heating Systems~~</td><td>~~M2301.2.3, M2301.4, M2301.2.6, M2301.2.8~~</td></tr>
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TMS
The Masonry Society
105 South Sunset Street, Suite Q
Longmont, CO 80501

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<tr><td>402—201~~3~~6;</td><td>Building Code Requirements for Masonry Structures</td><td>R404.1.2, R606.1, R606.1.1, ~~R606.2.3.2,~~ R606.12.1, R606.12.2.3.1, R606.12.3.1, ~~Table R703.4,~~ R703.12</td></tr>
<tr><td>403—2013;</td><td>Direct Design Handbook for Masonry Structures</td><td>R606.1, R606.1.1, R606.12.1, R606.12.3.1</td></tr>
<tr><td>404—2016;</td><td>Standard for the Design of Architectural Cast Stone</td><td>R606.1</td></tr>
<tr><td>602—201~~3~~6;</td><td>Specification for Masonry Structures</td><td>~~R404.1.2, R606.2.9,~~ R606.2.12~~0~~, R606.~~12.3.1~~2.1.3, R703.12</td></tr>
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TPI
Truss Plate Institute
218 N. Lee Street, Suite 312
Alexandria, VA 22314

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<tr><th>~~Standard reference number~~</th><th>~~Title~~</th><th>~~Referenced in code section number~~</th></tr>
<tr><td>TPI 1—2014;</td><td>National Design Standard for Metal-plate-connected Wood Truss Construction</td><td>R502.11.1, R802.10.2</td></tr>
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	UL UL LLC 333 Pfingsten Road Northbrook, IL 60062 **17—2008: Vent or Chimney Connector Dampers for Oil-fired Appliances—with revisions through September 2013** **M1802.2.2** **55A—2004: Materials for Built-up Roof Coverings** **R905.9.2** **58—2018: Steel Underground Tanks for Flammable and Combustible Liquids** **M2201.1** **80—2007: Steel Tanks for Oil-burner Fuel—with revisions through January 2014** **M2201.1** **103—2010: Factory-built Chimneys for Residential Type and Building Heating Appliances—with revisions through March 2017** **R202, R1005.3, G2430.1** **127—2011: Factory-built Fireplaces—with revisions through July 2016** **R1001.11, R1004.1, R1004.4, R1004.5, R1005.4, N1102.4.2, G2445.7** **174—2004: Household Electric Storage Tank Water Heaters—with revisions through December 2016** **M2005.1** **180—2012: Liquid-level Indicating Gauges for Oil Burner Fuels and Other Combustible Liquids with revisions through May 2017** **M2201.5**	**UL** UL LLC 333 Pfingsten Road Northbrook, IL 60062 **UL/CSA/ANCE 60335-2-40—20122022: Standard for Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners, and Dehumidifiers ~~Motor-compressors~~** M1402.1, M1403.1, M1412.1, M1413.1, M2006.1	Updates to reference standards. New Houston amendment to update UL standard to 2022 edition.

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181—2005: Factory-made Air Ducts and Air Connectors—with revisions through April 2017
M1601.1.1, M1601.4.1

181A—2013: Closure Systems for Use with Rigid Air Ducts and Air Connectors—with revisions through March 2017
M1601.2, M1601.4.1

181B—2013: Closure Systems for Use with Flexible Air Ducts and Air Connectors—with revisions through March 2017
M1601.4.1

217—2015: Smoke Alarms—with revisions through November 2016
R314.1.1, R315.1.1

263—2011: Fire Test of Building Construction and Materials—with revisions through March 2018
Table R302.1(2), R302.2, R302.2.1, R302.2.2, R302.4.1, R302.11.1, R606.2.2

268—2016: Smoke Detectors for Fire Alarm Systems—with revisions through July 2016
R314.7.1, R314.7.4, R315.7.4

325—2017: Door, Drapery, Gate, Louver and Window Operations and Systems
R309.4

343—2017: Pumps for Oil-burning Appliances
M2204.1

378—06: Draft Equipment—with revisions through September 2013
M1804.2.6, G2427.3.3

441—16: Gas Vents—with revisions through July 2016
G2426.1, G2427.6.1

467—13: Grounding and Bonding Equipment
G2411.2.5

507—2017: Electric Fans—with revisions through August 2018
M1503.2

508—2018: Industrial Control Equipment
M1411.3.1

515—11: Electrical Resistance Heat Tracing for Commercial and Industrial Applications Including Revisions through July 2015
N1103.5.1.2

536—2014: Flexible Metallic Hose
M2202.3

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580—2006: Test for Uplift Resistance of Roof Assemblies—with Revisions through October 2013
R905.4.4.1

641—2010: Type L, Low-temperature Venting Systems—with revisions through April 2018
R202, R1003.11.5, M1804.2.4, G2426.1, G2427.6.1

651—2011: Schedule 40, Type EB and A Rigid PVC Conduit and Fittings—with revisions through June 2016
G2414.5.3

705—2017: Power Ventilators—with revisions through October 2018
M1502.4.4

723—2018: Standard for Test 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, R507.2.2.2, R703.14.3, R802.1.5, M1601.3, M1601.5.2, P2801.6

726—95: Oil-fired Boiler Assemblies—with revisions through October 2013
M2001.1.1, M2006.1

727—2018: Oil-fired Central Furnaces
M1402.1

729—2003: Oil-fired Floor Furnaces
M1408.1

730—03: Oil-fired Wall Furnaces—with revisions through November 2016
M1409.1

732—2018: Oil-fired Storage Tank Water Heaters—with revisions through August 2018
M2005.1

737—2011: Fireplaces Stoves
M1414.1, M1901.2

790—04: Standard Test Methods for Fire Tests of Roof Coverings—with revisions through October 2018
R302.2.4, R902.1

795—2016: Commercial-industrial Gas Heating Equipment
G2442.1, G2452.1

834—2004: Heating, Water Supply and Power Boilers—Electric—with revisions through September 2018
M2001.1.1

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842—2015: Valves for Flammable Fluids—with revisions through May 2015
M2204.2

858—2014: Household Electric Ranges—with revisions through June 2018
M1503.2, M1901.2

875—09: Electric Dry-bath Heaters—with revisions through September 2017
M1902.2

896—1993: Oil-burning Stoves—with revisions through November 2016
M1410.1

907—94: Fireplace Accessories—with revisions through November 2014
R1001.13

923—2013: Microwave Cooking Appliances—with revisions through July 2017
M1503.2, M1504.1, M1901.2

959—2010: Medium Heat Appliance Factory-built Chimneys—with revisions through June 2014
R1005.6

1026—2012: Electric Household Cooking and Food Serving Appliances—with revisions through July 2018
M1901.2

1040—1996: Fire Test of Insulated Wall Construction—with revisions through April 2017
R316.6

1042—2009: Electric Baseboard Heating Equipment—with revisions through December 2016
M1405.1

1256—02: Fire Test of Roof Deck Construction—with revisions through August 2018
R906.1

1261—2016: Electric Water Heaters for Pools and Tubs—with revisions through September 2017
M2006.1

1479—2015: Fire Tests of Through-Penetration Firestops
R302.4.1.2

1482—2011: Solid-Fuel-type Room Heaters—with revisions through August 2015
R1002.2, R1002.5, M1410.1

1563—2009: Electric Spas, Equipment Assemblies, and Associated Equipment—with revisions through October 2017
M2006.1

1618—2015: Wall Protectors, Floor Protectors, and Hearth Extensions—with revisions through January 2018
R1004.2, M1410.2

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1693—2010: Electric Radiant Heating Panels and Heating Panel Sets—with revisions through October 2011
M1406.1

1703—2002: Flat-plate Photovoltaic Modules and Panels—with revisions through September 2018
R324.3.1, R902.4, R905.16.4

1715—97: Fire Test of Interior Finish Material—with revisions through April 2017
R316.6

1738—2010: Venting Systems for Gas-burning Appliances, Categories II, III and IV
G2426.1, G2427.4.1, G2427.4.1.1, G2427.4.2

1741—2010: Inverters, Converters, Controllers and Interconnection System Equipment with Distributed Energy Resources—with revisions through February 2018
R324.3.1, R328.6

1777—07: Chimney Liners—with revisions through April 2014
R1003.11.1, R1003.18, M1801.3.4, G2425.12, G2425.15.4, G2427.5.1, G2427.5.2

1897—2015: Uplift Tests for Roof Covering Systems
R905.4.4.1

1995—2015: Heating and Cooling Equipment—with revisions through August 2018
M1402.1, M1403.1, M1407.1, M1412.1, M1413.1, M2006.1

1996—2009: Electric Duct Heaters—with revisions through July 2016
M1402.1, M1407.1

2034—2017: Standard for Single- and Multiple-station Carbon Monoxide Alarms—with revisions through September 2018
R314.1.1, R315.1.1

2075—2013: Gas and Vapor Detectors and Sensors—with revisions through December 2017
R314.7.4, R315.7.1, R315.7.4

2158A—2013: Outline of Investigation for Clothes Dryer Transition Duct—with revisions through April 2017
M1502.4.3, G2439.7.3

2200—2012: Stationary Engine Generator Assemblies—with revisions through October 2015
R329.1

2523—2009: Standard for Solid Fuel-fired Hydronic Heating Appliances, Water Heaters and Boilers—with revisions through March 2018
M2001.1.1, M2005.1

2703—2014: Mounting Systems, Mounting Devices, Clamping/Retention Devices and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels—with revisions through December 2019
R902.4

7103—19: Ouline of Investigation for Building-Integrated Photovoltaic Roof Covering
R902.3, R905.16.4, Table 905.16.6, R905.17.5

9540—2016: Standard for Energy Storage Systems and Equipment
R328.2, R328.6

61730-1—2017: Photovoltaic (PV) Module Safety Qualification—Part 1: Requirments for Construction
R324.3.1, R905.16.4, 905.17.5

61730-2—2017: Photovoltaic (PV) Module Safety Qualification—Part 2: Requirements for Testing
R324.3.1, R905.16.4, R905.17.5

UL/CSA/ANCE 60335-2-40—2012: Standard for Household and Similar Electrical Appliances, Part 2: Particular Requirements for Motor-compressors
M1402.1, M1403.1, M1412.1, M1413.1, M2006.1

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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	ULC ULC 13775 Commerce Parkway Richmond, BC V6V 2V4 CAN/ULC S 102.2—2018: Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies R302.10.1, R302.10.2		Updates to reference standards.
	US-FTC United States-Federal Trade Commission 600 Pennsylvania Avenue NW Washington, DC 20580 CFR Title 16(2015): R-value Rule N1101.10.4		Updates to reference standards.
	WDMA Window and Door Manufacturers Association 2025 M Street NW, Suite 800 Washington, DC 20036-3309 AAMA/WDMA/CSA 101/I.S.2/A440—17: North American Fenestration Standard/Specifications for Windows, Doors and Skylights R308.6.9, R609.3, N1102.4.3 I.S. 11—16: Industry Standard Analytical Method for Design Pressure (DP) Ratings of Fenestration Products R308.6.9.1, R609.3.1		Updates to reference standards.
	WMA World Millwork Alliance (formerly Association of Millwork Distributors Standards AMD) 10047 Robert Trent Parkway New Port Richey, FL 34655-4649 ANSI WMA 100—2018: Standard Method of Determining Structural Performance Ratings of Side-Hinged Exterior Door Systems and Procedures for Component Substitution R609.3		Updates to reference standards.

2015 Houston IRC Amendments – Appendix A – Sizing and Capacities of Gas Piping	2021 IRC	2021 Houston IRC Amendments – Appendix AA – Sizing and Capacities of Gas Piping	Code Change Summary
(~~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*.)		~~*This appendix is an excerpt from the 2021* International Fuel Gas Code® *informative Appendix A. Table references in the text, other than AA tables, are as numbered in the* International Fuel Gas Code *(IFGC). For related table references in this code, you can find the IFGC table number in brackets adjacent to the table number in Chapter 24 of this code. For example, Table 402.4(2) in the IFGC is related to Table G2413.4(1) [402.4(2)] in this code.~~ **User note:** ***About this appendix:*** *Appendix AA provides ~~commentary, guidance and examples~~ requirements for sizing of gas piping systems. The provisions contained in this appendix are mandatory.*	No change to Houston amendment to adopt appendix as mandatory.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments – Appendix B – Sizing of Venting Systems Serving Appliances...	2021 IRC	2021 Houston IRC Amendments – Appendix AB – Sizing of Venting Systems Serving Appliances...	Code Change Summary
(~~**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*~~.**)		~~*This appendix is an excerpt from the 2021* International Fuel Gas Code® *informative Appendix B. Section and table references in the text, other than AB tables, are as numbered in the* International Fuel Gas Code *(IFGC). For related table references in this code, you can find the IFGC table number in brackets adjacent to the table number in Chapter 24 of this code. For example, Table 504.2(2) in the IFGC is related to Table G2428.2(2) [504.2(2)] in this code.~~ **User note:** ***About this appendix:*** *Appendix AB provides ~~commentary, guidance and examples~~ requirements for the design of venting systems for the types of appliances that vent by natural draft and have draft hoods or are listed as Category I or are listed for use with Type B vents. The provisions contained in this appendix are mandatory.*	No change to Houston amendment to adopt appendix as mandatory.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments – Appendix C – Exit Terminals of Mechanical Draft and Direct-Vent Venting Systems	2021 IRC	2021 Houston IRC Amendments – Appendix AC – Exit Terminals of Mechanical Draft and Direct-Vent Venting Systems	Code Change Summary
(~~**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*~~.**)		*This appendix is mandatory ~~informative and is not part of the code. This appendix is an excerpt from the~~ 2018 International Fuel Gas Code®, ~~coordinated with the section numbering of the~~ International Residential ~~Code.~~*	No change to Houston amendment to adopt appendix as mandatory.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments – Appendix H – Patio Covers	2021 IRC	2021 Houston IRC Amendments – Appendix AH – Patio Covers	Code Change Summary
(***The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance~~.)***		*This provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*	No change to Houston amendment to adopt appendix as mandatory.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments – Appendix K – Sound Transmission	2021 IRC	2021 Houston IRC Amendments – Appendix AK – Sound Transmission	Code Change Summary
(***The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance~~.)***		*This provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*	No change to Houston amendment to adopt appendix as mandatory.
AK101.1 General. Wall and floor-ceiling assemblies separating *dwelling units* in multi-family residential structures, including those separating adjacent *townhouse* units, shall provide airborne sound insulation for walls, and both air-borne and impact sound insulation for floor-ceiling assemblies.		**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.	No change to Houston amendment.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments – Appendix L	2021 IRC	2021 Houston IRC Amendments – Appendix AL	Code Change Summary
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 AL** **~~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**	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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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.		**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.	No change to Houston amendment.
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.	No change to Houston amendment.
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 (178 mm) minimum embedment into the foundation and spaced not more than 4 feet (1,219 mm) on center.		**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 (178 mm) minimum embedment into the foundation and spaced not more than 4 feet (1,219 mm) on center.	No change to Houston amendment.
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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
AL103.6 Wall sheathing. All exterior walls and required interior main cross-stud partitions shall be sheathed in accordance with Chapter 6.		**AL103.6 Wall sheathing.** All exterior walls and required interior main cross-stud partitions shall be sheathed in accordance with Chapter 6.	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary
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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.	No change to Houston amendment.
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.	No change to Houston amendment.
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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
SECTION AL104 **ROOFS** **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.		**SECTION AL104** **ROOFS** **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.	No change to Houston amendment.
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. **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.		**AL104.2 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.	No change to Houston amendment.
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. **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.	No change to Houston amendment.
SECTION AL105 **ELEVATED FOUNDATION** **AL105.1 General.** When approved, elevated foundations supporting not more than one *story* and meeting the provisions of		**SECTION AL105** **ELEVATED FOUNDATION** **AL105.1 General.** When approved, elevated foundations supporting not more than one *story* and meeting the provisions of	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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this section may be used. A foundation investigation may be required by the *building official.*		this section may be used. A foundation investigation may be required by the *building official.*	
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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.	No change to Houston amendment.
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) 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.	No change to Houston amendment.

2015 Houston IRC Amendments – Appendix M – Home Day Care—R3 Occupancy	2021 IRC	2021 Houston IRC Amendments – Appendix AM – Home Day Care—R3 Occupancies	Code Change Summary
(***The provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~***)		*This provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*	No change to Houston amendment.
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.		**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.	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.}		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.

2015 Houston IRC Amendments – Appendix Q – Airport Sound Attenuation Requirements	2021 IRC	2021 Houston IRC Amendments – Appendix AQ – Tiny Houses	Code Change Summary
User Note: Appendix Q in the 2015 Houston IRC contained requirements for Airport Sound Attenuation – These requirements have been relocated to Appendix AU in the 2021 edition of the Houston IRC. Appendix T in the 2015 Houston IRC contained requirements for Tiny Homes – These requirements are now part of base code in Appendix AQ.			
		APPENDIX AQ **TINY HOUSES** *This provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*	New Houston amendment for adoption of base code Appendix AQ providing Tiny Home requirements.
		[**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	New Houston amendment for adoption of base code Appendix AQ providing Tiny Home requirements.
APPENDIX Q **~~RESERVED~~** **AIRPORT SOUND ATTENUATION REQUIREMENTS**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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SECTION AQ201 **DEFINITIONS** **AQ201.1 Definitions.** For the purposes of these provisions, the following words have the meaning shown herein. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
SOUND TRANSMISSION CLASS (STC). An integer rating relating to the quality of sound attenuation for building partitions such as walls, ceilings, doors, and windows. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
AQ301.4 Other assemblies and materials. All other exterior wall assemblies or materials shall have a tested or *listed* minimum STC rating of 40. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
SECTION AQ401 **WINDOWS** **AQ401.1 Windows.** All windows shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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.			Airport sound requirements are now located in Appendix AU.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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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. **Moved to Appendix AU**			
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.
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. **Moved to Appendix AU**			Airport sound requirements are now located in Appendix AU.

2015 Houston IRC Amendments – Appendix T – Tiny Houses	2021 IRC	2021 Houston IRC Amendments – Appendix AT – Solar-Ready Provisions—Detached One- and Two-Family Dwellings, Multiple Single-Family Dwellings (Townhouses)	Code Change Summary
User Note: Appendix T in the 2015 Houston IRC contained requirements for Tiny Homes – These requirements are now part of base code in Appendix AQ. The base code appendix for Appendix AT now provides Solar-Ready requirements.			
		APPENDIX AT **SOLAR-READY PROVISIONS—DETACHED ONE- AND TWO-FAMILY DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS (TOWNHOUSES)** *This provisions contained in this appendix are ~~not~~ mandatory ~~unless specifically referenced in the adopting ordinance.~~*	Solar-ready appendix has been relocated. No changes to Houston amendment adopting appendix as mandatory.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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		AT103.6 (RB103.6) Capped roof penetration sleeve. A capped roof penetration sleeve shall be ~~provided~~ indicated on the construction documents adjacent to a solar-ready zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8-percent slope). The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit, but shall have an inside diameter of not less than 1¼ inches (32 mm).	New Houston amendment accepted during public comment to clarify intent of capped roof penetration requirements.
		[EDITORIAL NOTE: ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2021 IRC.]	No change to Houston amendment.
APPENDIX T **~~RECOMMENDED PROCEDURE FOR WORST CASE TESTING OF ATMOSPHERIC VENTING SYSTEMS UNDER N1102.4 OR N1105 CONDITIONS ≤5 ACH$_{50}$~~** {**EDITORIAL NOTE:** DELETE ENTIRE APPENDIX AND REPLACE WITH THE FOLLOWING.} **TINY HOUSES**			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.*			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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LANDING PLATFORM. A landing provided as the top step of a stairway accessing a *loft*.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
TINY HOUSE. A *dwelling* that is 400 square feet (37 m²) or less in floor area excluding *lofts*.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.1.1 Minimum area. *A loft* shall have a floor area of not less than 35 square feet (3.25 m²).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.1.2 Minimum dimensions. *A loft* shall be not less than 5 feet (1,524 mm) in any horizontal dimension.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.

vertical in 12 units horizontal (50 percent slope) shall not be considered as contributing to the minimum required area for the *loft.*			
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.2.1 Stairways. Stairways accessing *lofts* shall comply with this code or with Sections AT104.2.1.1 through AT104.2.1.5.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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: The tread depth shall be 20 inches (508 mm) minus 4/3rds of the riser height. The riser height shall be 15 inches (381 mm) minus three-fourths of the tread depth.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.2.1.5 Handrails. Handrails shall comply with Section R311.7.8.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.2.1.6 Stairway guards. Guards at open sides of stairways shall comply with Section R312.1.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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AT104.2.2 Ladders. Ladders accessing *lofts* shall comply with Sections AT104.2.2.1 and AT104.2.2.2.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
AT104.2.2.2 Incline. Ladders shall be installed at 70 to 80 degrees from horizontal.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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).			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.
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.			Houston amendment for Tiny Houses appendix has been removed as it's now base code Appendix AQ.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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2015 Houston IRC Amendments – Appendix U – Solar-Ready Provisions	2021 IRC	2021 Houston IRC Amendments – Appendix AU – Airport Sound Attenuation Requirements	Code Change Summary
User Note: The Solar-Ready appendix was relocated from Appendix U to Appendix AT in the 2021 IRC. Appendix AU now includes the Houston amendment for Airport Sound Attenuation that were previously found in Appendix Q.			
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~~.)* **Moved to Appendix AT**			Houston amendment has been relocated to Appendix AT.
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.			Previous Houston amendment for conduit to be installed has been removed.
{**EDITORIAL NOTE:** ALL OTHER PROVISIONS OF THIS APPENDIX REMAIN AS SET FORTH IN 2015 IRC.} **Moved to Appendix AT**			Houston amendment has been relocated to Appendix AT.
		APPENDIX AU **~~COB CONSTRUCTION (MONOLITHIC ADOBE)~~** [**EDITORIAL NOTE:** DELETE ENTIRE APPENDIX AND REPLACE WITH THE FOLLOWING.] **AIRPORT SOUND ATTENUATION REQUIREMENTS**	Airport Sound Attenuation requirements have been relocated from Appendix Q in the 2015 Houston IRC to Appendix AU in the 2021 Houston IRC.
		SECTION AU101 **GENERAL** **AU101.1 Purpose.** The purpose of this appendix is to set forth sound attenuation specifications for buildings when such sound	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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		attenuation is required by Chapter 9, Article VI, of the *City Code* to achieve an interior sound level of 45 dBa or less.	
		AU101.2 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.	No change to Houston amendment.
		SECTION AU201 **DEFINITIONS** **AU201.1 Definitions.** For the purposes of these provisions, the following words have the meaning shown herein.	No change to Houston amendment.
		SOUND TRANSMISSION CLASS (STC). An integer rating relating to the quality of sound attenuation for building partitions such as walls, ceilings, doors, and windows.	No change to Houston amendment.
		SECTION AU301 **WALLS** **AU301.1 General.** The specific exterior wall assemblies set forth in Sections AU301.2 and AU 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 AU301.2 and AU301.3.	No change to Houston amendment.
		AU301.2 Brick veneer. When exterior walls are constructed using brick veneer, a minimum of ½ inch gypsum drywall shall be applied as the interior finish.	No change to Houston amendment.
		AU301.3 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.	No change to Houston amendment.
		AU301.4 Other assemblies and materials. All other exterior wall assemblies or materials shall have a tested or *listed* minimum STC rating of 40.	No change to Houston amendment.
		SECTION AU401 **WINDOWS** **AU401.1 Windows.** All windows shall have a minimum STC rating of 40 when tested in accordance with ASTM E90, or have a	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

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		Normalized Noise Isolation Class (NNIC) rating of not less than 45 if field tested in accordance with ASTM E336 for airborne noise. Windows shall be *labeled* to indicate STC rating.	
		AU401.2 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.	No change to Houston amendment.
		SECTION AU501 **DOORS** **AU501.1 Doors.** All exterior doors shall have a minimum STC rating of 40 when tested in accordance with ASTM E90, or have a Normalized Noise Isolation Class (NNIC) rating of not less than 45 if field tested in accordance with ASTM E336 for airborne noise. Doors shall be *labeled* to indicate STC rating. **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.	No change to Houston amendment.
		SECTION AU601 **ROOF/CEILING ASSEMBLIES** **AU601.1 General.** Roof/ceiling assemblies shall be constructed in accordance with the requirements of AU601.2 or AU601.3. **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 AU601.2 or AU601.3.	No change to Houston amendment.
		AU601.2 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.	No change to Houston amendment.
		AU601.3 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.	No change to Houston amendment.

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2015 Houston IRC – Appendix V – Visitability	2021 IRC	2021 Houston IRC – Appendix AV - Visitability	Code Analysis
APPENDIX V **VISITABILITY**		**APPENDIX V** **VISITABILITY**	No change to Houston amendment.
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.		**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: 4. 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. 5. Doors to kitchens, family rooms, living rooms, dining rooms and hallways on the ground level that are wide enough for wheelchair use. 6. 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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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).		**AV102.2 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).	No change to Houston amendment.
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:		**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).	No change to Houston amendment.

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A slope between 1:10 and 1:12 is allowed for a maximum rise of 6 inches (152.4 mm). 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.		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.	
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, 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.		**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, 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.	No change to Houston amendment.
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.		**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.	No change to Houston amendment.
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).		**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).	No change to Houston amendment.
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.		**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.	No change to Houston amendment.

2015 Houston IRC Amendments	2021 International Residential Code	2021 Houston IRC Amendments	Code Change Summary

COLOR CODE INDEX: Text = NEW or Modified Text by ICC in 2021 | **Text Underlined** = COH Amendment added (NEW) | Grey Text = Previous COH Amendment Brought Forward to 2021
~~Yellow Strikethrough~~ = Text Deleted from the Code by COH | Green Text = NEW or Modified Text by COH in 2021 | Magenta = New or modified Text by ICC in 2018

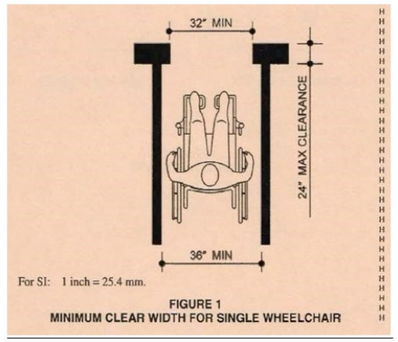


FIGURE 1
MINIMUM CLEAR WIDTH FOR SINGLE WHEELCHAIR

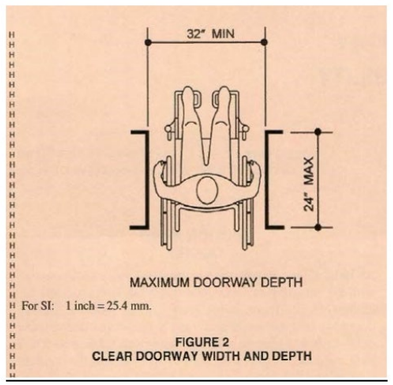


FIGURE 2
CLEAR DOORWAY WIDTH AND DEPTH

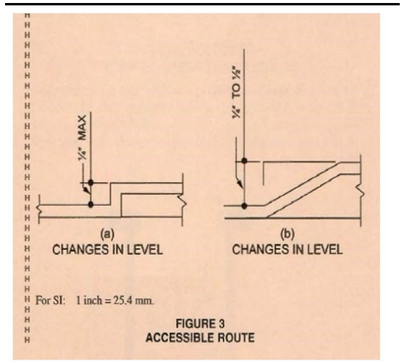
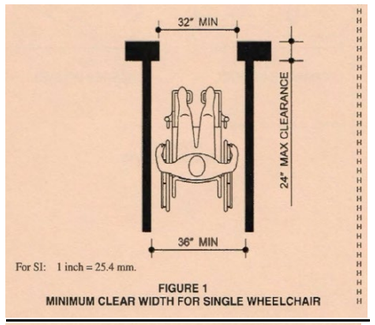


FIGURE 3
ACCESSIBLE ROUTE



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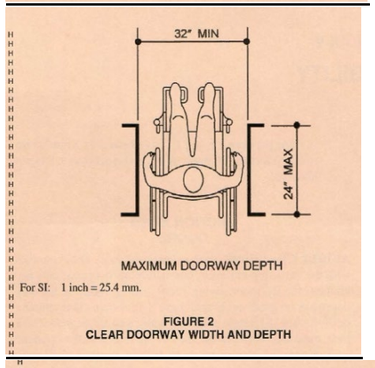

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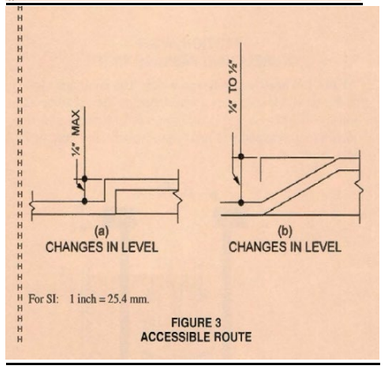

FIGURE 3
ACCESSIBLE ROUTE

No change to Houston amendment.