Houston Amendments to the 2006 International Residential Code

Adopted by Ord. No. 2010-847

Passed 11/03/2010

Effective 12/31/2010

Part I — Administrative

CHAPTER 1
ADMINISTRATION

R101.1 Title. These provisions shall be known as the *City of Houston Residential Code for One- and Two-Family Dwellings* ~~of [NAME OF JURISDICTION]~~ and shall be cited as such and will be referred to herein as "this code."

The *City of Houston Construction Code* collectively includes this volume and certain other codes, pamphlets, specifications and documents that are adopted in or by reference through the adopting ordinance, which appears in the preamble of the *Building Code*.

R101.2 Scope. The provisions of the *International Residential Code for One- and Two-Family Dwellings* 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 in height with a separate means of egress and their accessory structures. Buildings that exceed three stories in height shall comply with the *Building Code*, *Electrical Code*, *Mechanical Code*, *Plumbing Code, and Energy Conservation Code*. One- and two-family dwellings and townhouses shall be classified as Group R Division 3 Occupancies and accessory structures shall be classified as Group U Occupancies.

R102.5 Appendices. Provisions in the appendices shall not apply unless specifically referenced in ~~the adopting ordinance~~ this section. Appendix A, Appendix B, Appendix C, Appendix H, Appendix L, Appendix M and Appendix V are hereby adopted and made part of this code.

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.

R102.8 Special piping and storage systems. Chapter 22 Special Piping and Storage Systems of this code is not adopted. See the *Fire Code* regarding flammable and combustible liquids.

R102.9 Electrical Code. Part VIII–Electrical (Chapters 33 - 42) of this code is not adopted. All electrical work and licensing shall comply with the *Electrical Code*. All references made to *ICC Electrical Code* are to be considered as made to the *Electrical Code*.

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

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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.

SECTION R103
~~DEPARTMENT OF BUILDING SAFETY~~
CODE ENFORCEMENT

R103.1 Creation of enforcement agency. The Code Enforcement Division ~~department of building safety~~ is hereby created within the jurisdiction's Department of Public Works and Engineering, and the official in charge thereof shall be known as the building official.

R104.8 Liability. ~~The building official, member of the board of appeals or employee charged with the enforcement of this code, while acting for the jurisdiction in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance, shall not thereby be rendered liable personally and is hereby relieved from personal liability for any damage accruing to persons or property as a result of any act or by reason of an act or omission in the discharge of official duties. Any suit instituted against an officer or employee because of an act performed by that officer or employee in the lawful discharge of duties and under the provisions of this code shall be defended by legal representative of the jurisdiction until the final termination of the proceedings. The building official or any subordinate shall not be liable for cost in any action, suit or proceeding that is instituted in pursuance of the provisions of this code.~~ Except as otherwise provided by law, the building official shall not personally be liable in damages for any act or omission arising out of any official action taken to implement and enforce the provisions of this code. Additionally, except as otherwise provided by law, the building official shall not personally be liable in damages for any action or omission taken in the course and scope of employment. Where and to the extent consistent with the provisions of Article X of Chapter 2 of the City Code, the jurisdiction shall provide legal representation and indemnification for any suit brought against the building official because of acts or omissions performed in the enforcement of this code.

This code shall not be construed to relieve from or lessen the responsibility of any person owning, operating or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be

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held as assuming any such liability by reason of the inspections authorized by this code or any permits or certificates issued under this code.

{**EDITOR'S NOTE: DELETE** SECTION R104.10.1 IN ITS ENTIRETY.}

R104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. ~~Compliance with the specific performance-based provisions of the *International Codes* in lieu of specific requirements of this code shall also be permitted as an alternate.~~

R104.12 Stop orders. The building official may order work stopped hereunder in the same manner provided in Section 114 of the *Building Code*.

R105.2 Work exempt from permit. Permits shall not be required for the following. Exemption from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

Building:

1. One-story detached accessory structures used as tool and storage sheds, playhouses and similar uses, provided the floor area does not exceed 120 square feet (11.15 m^2).
2. Fences not over ~~6~~ 8 feet (~~1829 mm~~ 2438 mm) high that are not constructed of masonry or concrete.
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~~ Uncovered wood decks, accessory to a one- or two-family dwelling, that are not more than 30 inches above grade.
6. Painting, papering, tiling, carpeting, cabinets, counter tops and similar finish work.
7. Prefabricated swimming pools accessory to a one- or two-family dwelling in which the pool walls are entirely above grade and the pool capacity does not exceed 5,000 gallons (18 927 L) ~~that are less than 24 inches (610 mm) deep~~.
8. Swings and other playground equipment.
9. Window awnings supported by an exterior wall which do not project more than 54 inches (1372 mm) from the exterior wall and do not require additional support.

Electrical:

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Repairs and maintenance: A permit shall not be required for ~~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.
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:

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.

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.

{**EDITOR'S NOTE: DELETE** SECTION R105.3.1.1 IN ITS ENTIRETY.}

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 if the work authorized by such permit is suspended or abandoned for a period of 180 days after the time the work is commenced. The building official is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each. The extension shall be requested in writing and justifiable cause demonstrated.~~ For purposes of this section, the determination whether work has commenced under a permit or whether work has been abandoned under a permit shall be based upon whether the permit holder requests an inspection of the work performed under the permit by the building official. If work is not commenced under a permit within 180 days of the date of issuance or is abandoned at any time for a period of 180 consecutive days, the permit

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shall lapse. An elapsed permit shall expire the 180th day following the date that the permit lapsed. The permit holder may obtain reactivation of the permit by:

1. Requesting reactivation of the permit by the building official; and
2. Requesting an inspection of work performed under the permit by the building official.

A permit may only be reactivated one time, and it shall expire if the work is again abandoned for a period of 180 consecutive days. In order to recommence work under an expired permit, the permit holder shall pay the full permit fee applicable and submit plans that comply with this code for the previously uninspected portion of the work.

Exception: The building official may upon request perform a final inspection of work for which the permit has expired or reactivate a permit for the purpose of issuing a certificate of compliance.

R105.6 Suspension or revocation. The building official is authorized to suspend or revoke a permit issued under the provisions of this code wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or regulation or any of the provisions of this code. Prior to taking such action the building official shall provide notice of a right to a hearing on the matter pursuant to Section 116 of the *Building Code*.

{**EDITOR'S NOTE: DELETE** R106.1.3 IN ITS ENTIRETY.}

R108.2 Schedule of permit fees. On buildings, structures, electrical, gas, mechanical, and plumbing systems or alterations requiring a permit, a fee for each permit shall be paid as required, in accordance with the schedule as established ~~by the applicable governing authority~~ in Section 117 of the *Building Code*.

R108.5 Refunds. The building official ~~is authorized to establish a refund policy~~ may authorize refunding of any fee paid hereunder that was erroneously paid or collected due to an error by one or more city employees. This provision shall not be applicable if the error occurred because of incorrect information provided by the applicant.

The building official may authorize the refunding of not more than 90 percent of the amount of the permit fee paid in excess of $25.00 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 may be authorized.

The building official shall not authorize refunding of any fee paid except on written application filed by the original permittee not later than 180 days after the date of fee payment.

R109.1.3 Floodplain inspections. For construction in areas prone to flooding inspections shall be in accordance with Chapter 19 of the City Code ~~as established by Table R301.2(1), upon placement of the lowest floor, including basement, and prior to further vertical construction, the building official shall require submission of documentation, prepared and sealed by a registered design professional, of the elevation of the lowest floor, including basement, required in Section R324~~.

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SECTION R110
CERTIFICATE OF ~~OCCUPANCY~~ COMPLIANCE

R110.1 Use and occupancy. When requested by the applicant, the building official is authorized to issue a certificate of compliance after all the final inspections have been approved ~~No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a certificate of occupancy therefor as provided herein. Issuance of a certificate of occupancy shall not be construed as an approval of a violation of the provisions of this code or of other ordinances of the jurisdiction. Certificates presuming to give authority to violate or cancel the provisions of this code or other ordinances of the jurisdiction shall not be valid~~.

~~**Exceptions:**~~

~~1. Certificates of occupancy are not required for work exempt from permits under Section R105.2.~~

~~2. Accessory buildings or structures.~~

R110.2 Change in use. Changes in the character or use of an existing structure shall not be made except as specified in Chapter 34 and Appendix M ~~3407~~ of the ~~*International*~~ *Building Code*.

{**EDITOR'S NOTE: DELETE** R110.3, R110.4 AND R110.5 IN THEIR ENTIRETY.}

R112.1 General. ~~In order to~~ Except as provided below for mechanical and plumbing issues, the General Appeals Board shall, in accordance with the provisions of the *Building Code*, hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of this code~~, there shall be and is hereby created a board of appeals. The building official shall be an ex officio member of said board but shall have no vote on any matter before the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the building official~~.

R112.2 Mechanical. The Mechanical Code Review Board shall, in accordance with the provisions of the *Mechanical Code*, hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of Part V of this code ~~**Limitations on authority.** An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or an equally good or better form of construction is proposed. The board shall have no authority to waive requirements of this code~~.

{**EDITOR'S NOTE: DELETE** SECTIONS R112.2.1 AND R112.2.2 IN THEIR ENTIRETY.}

R112.3 Plumbing. The *Plumbing Code* Review Board shall, in accordance with the provisions of the *Plumbing Code*, hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of Part VI and Part VII 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~~.

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R113.4.1 Penalty. Where no specific penalty is otherwise provided therein, the violation of any provision of this code or the modifications adopted by this jurisdiction shall constitute a misdemeanor punishable upon conviction by a fine of not less than $500.00 nor more than $2,000.00. Each day that any violation continues shall constitute and be punishable as a separate offense. Where any such conduct constitutes a violation of state penal law, then the offense shall be punishable as provided in the applicable state law. In prosecutions, the various provisions of this code or the jurisdiction's modifications that are designated as an 'exception' or '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.

SECTION 115
PRIVATE PLAN REVIEW AND INSPECTION SERVICES

R115.1. Applicability. The application of this section is limited to structures that are constructed under this code.

R115.2. Scope. This section applies to any permit required under this code, the *Electrical Code*, *Plumbing Code*, or the *Mechanical Code* for the construction, repair, or renovation of a structure to which this code applies.

R115.3. Program established. The building official may establish a private plan review and inspection program under which qualified persons who are not city employees may review plans, conduct certain building inspections, and provide related services for structures to which this section applies to assure compliance with all applicable construction codes. The program shall be conducted in accordance with the regulations and forms promulgated by the building official, which shall, without limitation, address the following:

1. Qualifications of the firms and individuals authorized to perform plan reviews, conduct inspections, and provide other related permit services. The qualifications shall include licensing in accordance with any applicable laws and regulations and certification in accordance with state or federally recognized standards.
2. Requirement of appropriate liability coverages in an amount of not less than $1,000,000, per occurrence, with indemnity agreements and coverage of the jurisdiction, as an additional insured, for the protection of the jurisdiction and other persons who may be affected by the performance of the any services under the program.
3. Provisions to ensure that the firms and individuals participating in the program will act independently of building owners, contractors, and others so as to avoid conflicts of interest.
4. Provisions for any non building code related review of plans and issuance of permits to applicants who utilize plan review, inspection, and other related services under the program.
5. Provisions regarding the keeping of records and filing of reports with the building official.
6. Administrative provisions for the acceptance, suspension, and revocation of the right of a firm or individual to participate in the program, which shall include elements of due process, including a right of appeal to a hearing officer designated by the director of public works and engineering, whose decision, notwithstanding any other provision of

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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 a report as set forth below:

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

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

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

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

        The report shall be filed with the building official not later than the last day of January and July in each calendar year and shall cover the preceding 6 month period ending on the last day of December and June, respectively, in each year.

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

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

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

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

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

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

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

(7) An assessment of program effectiveness as demonstrated by available data, including comments and complaints received by the jurisdiction regarding the program pertaining to work performed by a participating developer, builder or contractor, or any firm or individual, including subcontractors, providing private plan review or inspection services under the program.

The building official's report shall be filed with the Mayor and City Council not later than the last day of August and February in each calendar year and shall cover the preceding 6 month period ending on the last day of July and January, respectively, in each year and may include such additional information relating to the program as he may deem appropriate.

11. Provisions prohibiting any private plan reviewer or inspector from being related to building owners, contractors, and other similarly situated individuals or entities within the third degree of consanguinity or within the second degree of affinity.

R115.4. Oversight inspections. The provisions of this section do not affect the jurisdiction of the building official over any work or preclude oversight inspections by the building official of structures that are subject to the provision of services under the program. For purposes of quality assurance, the building official shall be authorized to recheck plans, perform inspections or reinspections, issue stop work orders, and take any and all actions that are authorized to be taken under this code, the *Electrical Code*, the *Plumbing Code*, or the *Mechanical Code*. No prior notice need be provided to any program firm or individual, contractor, or owner, unless otherwise required by law.

R115.5. Fees. To cover administrative costs, including registration of firms and individuals, management of the program, and oversight inspections, the building official shall assess fees equal to 25 percent of the amount otherwise payable under this code for any permit, but not less than the minimum fee as required in Section 117 of the *Building Code*. In addition to the reduced permit fees charged in connection with the program, an additional fee of $10 per payment voucher issued 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 same for a fee of $75. The administrative fee that is payable under Section 117.1.2 of the *Building Code* shall be collected in addition to the fees otherwise provided under this section.

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Part II — Definitions

CHAPTER 2
DEFINITIONS

SECTION R201
GENERAL

R201.3 Terms defined in other codes. Where terms are not defined in this code and are defined in the *Building Code, Fire Code*, *Electrical Code, Mechanical Code* or *Plumbing Code,* such terms shall have meanings ascribed to them as in those ~~other~~ codes ~~publications of the International Code Council~~**.**

SECTION R202
DEFINITIONS

BUILDING CODE. *The City of Houston Building Code*, as adopted by this jurisdiction.

BUILDING OFFICIAL. The ~~officer or other designated authority charged with the administration and enforcement of this code~~ jurisdiction's Director of the Department of Public Works and Engineering or the director's duly authorized representative or representatives, sometimes herein referred to as the Administrative Authority or the Code Official.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned spaces. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.

CITY CODE. The Code of Ordinances, Houston, Texas.

DECORATIVE COATING. A single coat of plaster, cementitious, or other approved material applied to a concrete or masonry surface for cosmetic purposes only.

FIRE CODE. *The City of Houston Fire Code*, as adopted by this jurisdiction. See Section 101.4.6 of the *Building Code*.

~~**GRADE FLOOR OPENING.** A window or other opening located such that the sill height of the opening is not more than 44 inches (1118 mm) above or below the finished ground level adjacent to the opening.~~

ICC ELECTRICAL CODE. *The National Electrical Code* promulgated by the National *Fire Protection Association*, as adopted by this jurisdiction, and the *City of Houston Electrical Code*. See Section 101.4.1 of the *Building Code*.

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INTERNATIONAL ENERGY CONSERVATION CODE. *The City of Houston Residential Energy Conservation Code* or the *City of Houston Commercial Energy Conservation Code,* both based the *International Energy Conservation Code,* as adopted by the State of Texas, or on an alternate code that has been determined to be more stringent than the *International Energy Conservation Code* by this jurisdiction. See Section 101.4.7 of the *Building Code.*

INTERNATIONAL FIRE CODE. *The City of Houston Fire Code*, as adopted by this jurisdiction. See Section 101.4.6 of the *Building Code*.

INTERNATIONAL FUEL GAS CODE. *The City of Houston Plumbing Code*, as adopted by this jurisdiction. See Section 101.4.2 of the *Building Code*.

INTERNATIONAL MECHANICAL CODE. *The City of Houston Mechanical Code*, as adopted by this jurisdiction. See Section 101.4.3 of the *Building Code*.

INTERNATIONAL PLUMBING CODE. *The City of Houston Plumbing Code*, as adopted by this jurisdiction. See Section 101.4.4 of the *Building Code*.

STAIRWAY. One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another. Stairs or ladders used only to attend equipment or to access an attic or window well are not considered a stairway.

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CHAPTER 3
BUILDING PLANNING

R301.2.1.1 Design criteria. Construction in regions where the basic wind speeds from Figure R301.2(4) equal or exceed 100 miles per hour (45 m/s) in hurricane-prone regions, or 110 miles per hour (49 m/s) elsewhere, shall be designed in accordance with one of the following:

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual for One- and Two-Family Dwellings* (WFCM); or
2. ~~*Southern Building Code Congress International Standard for Hurricane Resistant Residential Construction* (SSTD 10)~~ *ICC 600 Standard for Residential Construction in High-Wind Regions*; or
3. *Minimum Design Loads for Buildings and Other Structures* (ASCE-7); or
4. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing-Prescriptive Method For One- and Two-Family Dwellings (COFS/PM) with Supplement to Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings*.
5. Concrete construction shall be designed in accordance with the provisions of this code.
6. Appendix L - Conventional light frame wood construction for high-wind areas.

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

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

{**EDITOR'S NOTE: DELETE** NOTES AND FOOTNOTES FOR TABLE R301.2(1) IN THEIR ENTIRETY.}

R302.1 Exterior walls. Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1. These provisions shall not apply to walls, projections, openings or penetrations in walls that are perpendicular to the line used to determine the fire separation distance. Projections shall not extend beyond a point one-third the distance to the property line ~~exterior wall shall not extend more than 12 inches (305 mm) into the areas where openings are prohibited~~.

Exceptions:

1. 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.

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2. 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).
3. Foundation vents installed in compliance with this code are permitted.
4. Roofs of open noncombustible carports may extend to a point two feet from the property line.

R302.2 Zero lot line separation. Where perpetual, platting, and recorded easements create a non-buildable minimum fire separation distance of at lease 6 feet between structures on adjacent properties, the one-hour fire-resistive ratings shall not apply.

TABLE R302.1
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	(Fire-resistance rated)	1 hour with exposure from both sides	0 feet
	(Not fire-resistance rated)	0 hours	~~5~~ 3 feet
Projections	(Fire-resistance rated)	1 hour on the face and underside	2 feet
	(Not fire-resistance rated)	0 hours	~~5~~ 3 feet
Openings	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 R317.3	< 5 feet
		None required	5 feet

R303.1 Habitable rooms. All 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, 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 minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

Exceptions:

1. The glazed areas need not be openable where the opening is not required by Section R310 and an approved mechanical ventilation system capable of producing 0.35 air change per hour in the room is installed or a whole-house mechanical ventilation system is ~~installed capable of~~ provided that will supply~~ing~~ outdoor ventilation air of 15 cubic feet per minute (cfm) (78 L/s) per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom.
2. The glazed areas need not be installed in rooms where Exception 1 above is satisfied and artificial light is provided 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. Use of sunroom additions 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.

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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 m^2), one-half of which must be openable.

Exception: The glazed areas shall not be required where artificial light and a mechanical ventilation system are provided. The minimum ventilation rates shall be 50 cubic feet per minute (24 L/s) ~~for intermittent ventilation or 20 cubic feet per minute (10 L/s) for continuous ventilation~~. Ventilation air from the space shall be exhausted directly to the outside.

R309.1 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 all of which shall be self-closing.

R309.1.1 Duct penetration. Ducts in the garage and ducts penetrating the walls or ceilings separating the dwelling from the garage shall be constructed of a minimum No. 26 gage (0.48 mm) sheet steel or other approved material and shall have no openings into the garage. All duct joints shall be seamed and sealed.

R309.2 Separation required. The garage shall be separated from the residence and its attic area by not less than 1/2-inch (12.7 mm) gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 5/8-inch (15.9 mm) Type X gypsum board or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall also be protected by not less than 1/2-inch (12.7 mm) gypsum board or equivalent. Garages located less than 3 feet (914 mm) from a dwelling unit on the same lot shall be protected with not less than 1/2-inch (12.7mm) gypsum board applied to the interior side of exterior walls that are within this area. Openings in these walls shall be regulated by Section R309.1. This provision does not apply to garage walls that are perpendicular to the adjacent dwelling unit wall. Attic disappearing stairs may be installed in the garage ceiling provided the exposed panel is not less than 3/8-inch thick fire retardant-treated plywood or covered with a minimum of 16 gage sheet metal.

R310.1.5 Yards and courts. Yards and courts shall not be less than 3 feet in width.

R311.4.4 Type of lock or latch. All egress doors shall be readily openable from the side from which egress is to be made without ~~the use of a key or~~ special knowledge or effort. Key locking hardware may be used.

R313.2.1 Alterations, repairs and additions. When alterations, repairs or additions requiring a permit occur, or when one or more sleeping rooms are added or created in existing dwellings, the individual dwelling unit shall be equipped with smoke alarms located as required for new dwellings.~~;~~ When the cost of the alteration, repair, or addition exceeds $5000.00, the smoke alarms shall be interconnected and hard wired.

Exceptions:

~~1.~~ Inter connection and hard-wiring of smoke alarms in existing areas shall not be required where the alterations or repairs do not result in the removal of interior wall

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

2. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section.
3. Permits involving only mechanical or plumbing work are exempt from the requirements of this section.

R317.2 Townhouses. Each townhouse shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302 for exterior walls.

Exception: A common 2-hour fire-resistance-rated wall is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of the common wall.~~ Electrical installations shall be installed in accordance with Chapters 33 through 42.~~ Penetrations of electrical outlet boxes shall be in accordance with Section R317.3.

R317.2.2 Parapets. Parapets constructed in accordance with Section R317.2.3 shall be constructed for townhouses as an extension of exterior walls 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 two cases above when the roof is covered with a minimum class B ~~C~~ roof covering, and there is no roof opening within 5 feet of the wall. A chimney that projects through the roof within 5 feet of the common wall is considered to be in compliance if the chimney is built of at least 1-hour rated construction and extends at least 5 feet above the roof decking.~~ 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 a minimum of nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a minimum distance of 4 feet (1220 mm) on each side of the wall or walls~~.

3. A parapet is not required where roof surfaces adjacent to the wall or walls are at different elevations and 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.

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SECTION R318
RESERVED
~~MOISTURE VAPOR RETARDERS~~

{**EDITOR'S NOTE: DELETE** REMAINDER OF SECTION R318.}

SECTION R320
RESERVED
~~PROTECTION AGAINST SUBTERRANEAN TERMITES~~

{**EDITOR'S NOTE: DELETE** REMAINDER OF SECTION R320.}

R321.1 Premises identification. Building numbering shall be provided in accordance with Article V of Chapter 10 of the *City Code* ~~Approved numbers or addresses shall be provided for all new buildings in such a position as to be plainly visible and legible from the street or road fronting the property~~.

[B] SECTION R322
RESERVED
~~ACCESSIBILITY~~

{**EDITOR'S NOTE: DELETE** REMAINDER OF SECTION R322.}

~~**R323.3 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.~~

R324.1 Flood-prone areas ~~**General**~~**.** See Chapter 19 of the City Code for requirements regarding construction in flood-prone areas ~~Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with the provisions contained in this section~~.

> ~~**Exception:** Buildings and structures located in whole or in part in identified floodways as established in Table R301.2(1) shall be designed and constructed as stipulated in the *International Building Code*.~~

{**EDITOR'S NOTE: DELETE** REMAINDER OF SECTION R324.}

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CHAPTER 4
FOUNDATIONS

R401.1 Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for all buildings. ~~In addition to the provisions of this chapter, the design and construction of foundations in areas prone to flooding as established by Table R301.2(1) shall meet the provisions of Section R324.~~ Wood foundations shall be designed and installed in accordance with AF&PA Report No.7.

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 more than two floors and a roof.
2. When interior basement and foundation walls are constructed at intervals not exceeding 50 feet (15 240 mm).

Wood foundations in Seismic Design Category D_0, D_1 or D_2 shall be designed in accordance with accepted engineering practice.

R401.3 Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection that does ~~so as to~~ not create a hazard. Lots shall be graded to drain surface water away from foundation walls. The grade shall fall a minimum of 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), ~~the final grade shall slope away from the foundation at a minimum slope of 5 percent and the water shall be directed to~~ drains or swales shall be constructed to ensure drainage away from the structure. ~~Swales shall be sloped a minimum of 2 percent when located within 10 feet of (3048 mm) of the building foundation.~~ Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

401.5 Foundation elevation. All new buildings constructed within this jurisdiction shall have the finished floor of the building not less than 12 inches above the nearest sanitary sewer manhole rim, or, where no sewer is available, the finished floor shall not be less than 4 inches above the crown of the street.

Exception: Buildings located in annexed subdivisions where the following conditions exist:

1. The subdivision was platted and recorded prior to annexation;
2. The sanitary sewer system for the subdivision was installed prior to annexation; and
3. The drainage piping 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*, then Chapter 19 shall govern.

401.5.1 Plans and applications. All construction plans and applications submitted for construction, sewer connections or septic systems shall reflect the elevations of the finished

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floor of the building and the elevation of the nearest manhole or crown of the street, whichever is applicable.

401.5.2 Damage risk. All permits for connection shall be issued on the condition that the owner take all the risk of damage that may result from water backing up into the premises from the sewer.

401.5.3 Existing structures. Existing structures required to be connected with a public or private sewer shall have the finished floor a minimum of 12 inches above the nearest manhole.

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

R403.1.9 Optional–Foundations for additions to conventional construction. A foundation for an addition to conventional construction of a Group R3 or U occupancy that meets the following conditions shall be considered to comply with the requirements of this code, and shall not require an engineer's seal nor a soils report:

1. Is classified as exempt by Section 20 of the Texas Engineering Practice Act; and
2. Meets or exceeds the specifications contained in Figure R403.1.9

FIGURE R403.1.9
FOUNDATIONS FOR ADDITIONS
(on next page)

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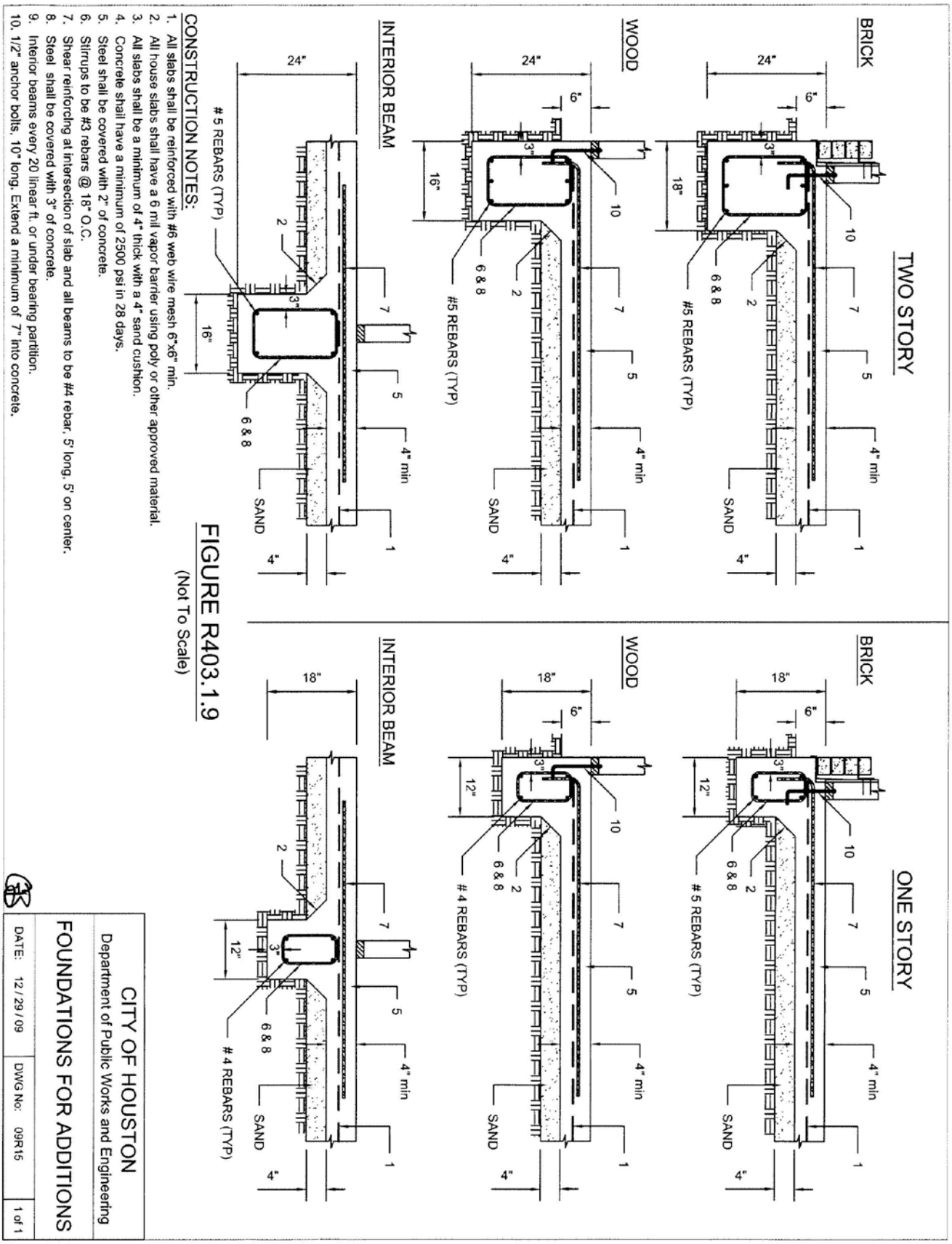

FIGURE R403.1.9
(Not To Scale)

CONSTRUCTION NOTES:

1. All slabs shall be reinforced with #6 web wire mesh 6"x6" min.
2. All house slabs shall have a 6 mil vapor barrier using poly or other approved material.
3. All slabs shall be a minimum of 4" thick with a 4" sand cushion.
4. Concrete shall have a minimum of 2500 psi in 28 days.
5. Steel shall be covered with 2" of concrete.
6. Stirrups to be #3 rebars @ 18" O.C.
7. Shear reinforcing at intersection of slab and all beams to be #4 rebar, 5' long, 5' on center.
8. Steel shall be covered with 3" of concrete.
9. Interior beams every 20 linear ft. or under bearing partition.
10. 1/2" anchor bolts, 10" long. Extend a minimum of 7" into concrete.

R405.1 Concrete or masonry foundations. Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drainage tiles, gravel or crushed stone drains~~,~~ with perforated pipe or other approved systems or materials shall be installed at or below the area to be protected and shall discharge by gravity or mechanical means into an approved drainage system. Gravel or crushed stone drains shall extend at least 1 foot (305 mm) beyond the outside edge of the footing and 6 inches (152 mm) above the top of the footing and be covered with an approved filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper, and the drainage tiles or perforated pipe shall be placed on a minimum of 2 inches (51 mm) of washed gravel or crushed rock at least one sieve size larger than the tile joint opening or perforation and covered with not less than 6 inches (152 mm) of the same material.

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

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CHAPTER 5
FLOORS

R502.3.3 Floor cantilevers. Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers constructed in accordance with Table R502.3.3(1) shall be permitted when supporting a light-frame bearing wall and roof only. The ratio of backspan to cantilever span shall be at least 3 to 1. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.3.3(2).

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CHAPTER 7
WALL COVERING

R703.6.2 Plaster. Plastering with portland cement plaster shall be not less than three coats when applied over metal lath or wire lath and shall be not less than two coats when applied over masonry, concrete, pressure-preservative treated wood or decay-resistant wood as specified in Section R319.1 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).

Exception: Decorative coatings applied to a concrete or masonry surface shall be installed in accordance with the manufacturer's installation instructions and are not required to comply with Table 702.1(1).

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CHAPTER 8
ROOF-CEILING CONSTRUCTION

R806.2 Minimum area. The total net free ventilating area shall not be less than 1/150 of the area of the space ventilated except that reduction of the total area to 1/300 is permitted, provided that at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet (914 mm) above the eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents. ~~As an alternative, the net free cross-ventilation area may be reduced to 1/300 when a vapor barrier having a transmission rate not exceeding 1 perm (5.7x10^{-11} kg/s•m^{2}•Pa) is installed on the warm-in-winter side of the ceiling.~~

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CHAPTER 9
ROOF ASSEMBLIES

R902.1 Roofing covering materials. Roofs, except for those on residential outbuildings, shall be covered with materials as set forth in Sections R904 and R905. Class A, B or C roofing shall be installed ~~in areas designated by law as requiring their use or when the edge of the roof is less than 3 feet (914 mm) from a property line~~. Classes A, B and C roofing required to be listed by this section shall be tested in accordance with UL 790 or ASTM E 108. Roof assemblies with coverings of brick, masonry, slate, clay or concrete roof tile, exposed concrete roof deck, ferrous or copper shingles or sheets, and metal sheets and shingles, shall be considered Class A roof coverings.

R903.4.1 Overflow drains and scuppers. Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet flow line located 2 inches (51 mm) above the low point of the roof, or overflow scuppers having three times the size of the roof drains and having a minimum opening height of 4 inches (102 mm) shall be installed in the adjacent parapet walls with the inlet flow located 2 inches (51 mm) above the low point of the roof served. The installation and sizing of overflow drains, leaders and conductors shall comply with the ~~*International*~~ *Plumbing Code.*

Overflow drains shall discharge to an approved location and shall not be connected to roof drain lines.

{**EDITOR'S NOTE: DELETE** SECTION R903.5.2 IN ITS ENTIRETY.}

{**EDITOR'S NOTE: DELETE** SECTION R905.2.8.4 IN ITS ENTIRETY.}

R907.3 Re-covering versus replacement. New roof coverings shall not be installed without first removing existing roof coverings where any of the following conditions occur:

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

Exceptions:

1. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.

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2. Installation of metal panel, metal shingle, and concrete and clay tile roof coverings over existing wood shake roofs shall be permitted when the application is in accordance with Section R907.4.
3. The application of new protective coating over existing spray polyurethane foam roofing systems shall be permitted without tear-off of existing roof coverings.

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CHAPTER 10
CHIMNEYS AND FIREPLACES

R1006.2 Exterior air intake. The exterior air intake shall be capable of supplying all combustion air from the exterior of the dwelling or from spaces within the dwelling ventilated with outside air such as non-mechanically ventilated crawl or attic spaces. The exterior air intake shall not be located within the garage or basement of the dwelling ~~nor shall the air intake be located at an elevation higher than the firebox~~. The exterior air intake shall be covered with a corrosion-resistant screen of 1/4-inch (6 mm) mesh.

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CHAPTER 11
ENERGY EFFICIENCY

{**EDITOR'S NOTE: DELETE** CHAPTER 11 AND REPLACE WITH THE FOLLOWING.}

SECTION N1101
GENERAL

N1101.1 Scope. This chapter sets forth energy-efficiency related requirements for the design and construction of buildings regulated by this code.

Exceptions:

1. Portions of the building thermal envelope that do not enclose conditioned space.
2. Portions of the building that are designated by ordinance as a historical building when provisions of this code will affect the historical designation of the building.

N1101.2 Compliance. Compliance with this chapter shall be demonstrated by meeting either the requirements of the applicable sections and tables of this chapter or the *City of Houston Residential Energy Conservation Code*.

N1101.2.1 Climate Data. The City of Houston climate zone is 2A and is designated as a warm-humid climate.

N1101.2.2 Phased standards. Provisions requiring increased energy efficiency shall be phased in as provided by Section N1101.4.

N1101.3 Materials and equipment. Materials and equipment shall be identified in a manner that will allow a determination of their compliance with the provisions of this chapter. Materials and equipment used to conform to the applicable provisions of this chapter shall be installed in accordance with the manufacturer's installation instructions.

N1101.3.1 Insulation. The thermal resistance (*R*-value) shall be indicated on all insulation and the insulation installed such that the *R*-value can be verified during inspection, or a certification of the installed *R*-value shall be provided at the job site by the insulation installer. Where blown-in or sprayed insulation is applied in walls, the installer shall provide a certification of the installed density and *R*-value. Where blown-in or sprayed insulation is applied in the roof-ceiling assembly, the installer shall provide a certification of the initial installed thickness, settled thickness, coverage area, and number of bags of insulating material installed. Markers shall be provided for every 300 square feet (28 m^2) of attic area, attached to the trusses, rafters, or joists, and indicate in 1-inch-high (25.4 mm) numbers the installed thickness of the insulation. Insulation material used in layers, such as framing cavity insulation and insulation sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films.

N1101.3.2 Fenestration. The *U*-factor of fenestration shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. The solar heat gain coefficient (SHGC) of fenestration shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer.

N1101.3.2.1 Default fenestration performance. When a manufacturer has not determined a fenestration product's *U*-factor in accordance with NFRC100, compliance

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shall be determined by assigning such products a default *U*-factor from Tables 102.1.3(1) and 102.1.3(2) in the *City of Houston Residential Energy Conservation Code.* When a manufacturer has not determined a fenestration product's SHGC in accordance with NFRC 200, compliance shall be determined by assigning such products a default SHGC from Table 102.1.3(3) of the *City of Houston Residential Energy Conservation Code.*

N1101.3.2.2 Air leakage. The air leakage of prefabricated fenestration shall be determined in accordance with AAMA/WDMA 101/I.S.2 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Alternatively, the manufacturer shall certify that the fenestration is installed in accordance with Section 402.4.1 of the *City of Houston Residential Energy Conservation Code.*

N1101.3.3 Maintenance. Where mechanical or plumbing system components require preventive maintenance for efficient operation, regular maintenance requirements shall be clearly stated and affixed to the component, or the source for such information shall be shown on a label attached to the component.

N1101.3.4 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall be completed either by the builder or registered design professional. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawl space wall and/or floor) and ducts outside conditioned spaces, *U*-factors for fenestration, and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the type and efficiency of heating, cooling and service water heating equipment.

N1101.4 Phased standards.

N1101.4.1 General. For any permit application filed on or after October 1, 2009, compliance with additional performance objectives for new construction shall be required to achieve minimum fifteen percent improvement in efficiency above the minimum provisions of this code.

N1101.4.2 Energy use. New residences must use 15 percent less energy as shown by one of the methods indicated in Sections N1101.4.2.1 through N1101.4.2.3.

N1101.4.2.1 Above Code Programs. The United States Environmental Protection Agency's ENERGY STAR Program certification of energy code equivalency or other approved above code program; or

N1101.4.2.2 Software and Testing. Energy code compliance modeling through Texas A&M Energy Systems Laboratory approved software or other approved simulation software program, along with testing of the building thermal envelope for infiltration and the duct system for leakage; or

N1101.4.2.3 Option Packages. Prescriptive option packages approved by Texas A&M Energy Systems Laboratory and listed in Table N1101.4.2. Additional option packages that are issued by Texas A&M Energy Systems Laboratory shall be permitted.

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TABLE N1101.4.2
COMBINED ENERGY SAVINGS FOR ONE AND TWO FAMILY STRUCTURES WITH NATURAL GAS HEATING

Groups	Measures	Notes
Group 1	Solar Domestic Hot Water System 64 sq. ft. collector area	1
Group 2	Photovoltaic Array for 6kW	2
Group 3	Photovoltaic Array for Partial Demand at 4kW	3
Group 4	Mechanical Systems within Conditioned Spaces 50% Energy Star CFL Indoor Lamps	5 6
Group 5	Photovoltaic Array for Partial Demand at 2kW Decreased Duct Leakage (maximum 10%)	4 8
Group 6	50% Energy Star CFL Indoor Lamps Tankless water heater (minimum .748 Energy Factor) Decreased Infiltration (maximum .35 ACHn)	6 9 10
Group 7	50% Energy Star CFL Indoor Lamps Decreased Duct Leakage (maximum 10%) Improved SEER (minimum 15)	6 8 11
Group 8	Decreased Duct Leakage (maximum 10%) Improved SEER (minimum 15) Decreased SHGC (maximum .35) & U-Value (maximum .35) Decreased Infiltration (maximum .35 ACHn)	8 11 12 10
Group 9	Decreased Duct Leakage (maximum 6%) Decreased SHGC (maximum .35) & U-Value (maximum .35) Window Shading and Redistribution (minimum S=45%)	8 12 14
Group 10	Improved Furnace Efficiency (minimum .93 AFUE) Decreased Infiltration (maximum .35 ACHn) Decreased Duct Leakage (maximum 10%) Improved SEER (minimum 15)	15 10 8 11

Notes:

1. Solar Domestic Hot Water System: *Storage tank type DHW heater with 64 square feet collector area for single-family homes.*
2. Photovoltaic Array for 6kW: *Installed according to DC Standard Test Criteria standard and manufacturer's instructions.*
3. Photovoltaic Array for Partial Demand at 4kW per single family home: *Installed according to DC Standard Test Criteria standard and manufacturer's instructions.*
4. Photovoltaic Array for Partial Demand at 2kW per single family home: *Installed according to DC Standard Test Criteria standard and manufacturer's instructions.*
5. Mechanical Systems within Conditioned Spaces: *Ducts in ventilated attic moved to location within the thermal envelope of conditioned space including unventilated attic space.*
6. 50% Energy Star CFL Indoor Lamps: *Permanent Compact Florescent fixtures excluding closets*
7. RESERVED
8. Decreased Duct Leakage (maximum 10%), except Group 9 (maximum 6%): *Ducts tested with leakage to outside of building envelope.*
9. Tankless water heater (minimum .748 Energy Factor for Electric/Gas house) *Manufacturer's rating*
10. Decreased Infiltration (minimum .35 ACHn): *Base case formula for ACHn is Normalized Leakage 0.57 x Weather Factor 0.8*
11. Improved SEER (minimum 15 for Single Family homes): *Manufacturer's nominal rating*
12. Decreased SHGC (maximum .35) & U-factor (maximum .35): *NFRC 100 and 200*
13. RESERVED
14. Window Shading and Redistribution: *Maximum total window area of 18% window to floor ration. Window orientation with 1.5 ft. overhang (Projection Factor=.25) on all sides. A minimum of 45% of the total window area shall be on the south.*
15. Improved Furnace Efficiency (Minimum .93 AFUE): *Manufacturer's nominal rating*

N1101.4.3 Testing. When required by Section N1101.4.2.2 testing shall be performed according to Sections N1101.4.3.1 and N1101.4.3.2. Batch testing shall be permitted as approved by the Building Official.

N1101.4.3.1 Testing of the Building Thermal Envelope for Infiltration. Leakage of the building thermal envelope shall not exceed .35 Air Changes per Hour (ACHn) as measured by the blower door test. The testing procedure shall be based on ASTM E779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization, ASHRAE 119 Air Leakage Performance for Detached Single Family Residential Buildings or ANSI/ASHRAE 136, A Method of Determining Air Change Rates in Detached Dwellings.

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Testing shall be performed by an independent third-party technician approved by the building official. Documentation verifying thermal envelope air leakage equal to or less than .35 ACHn shall be submitted with the final mechanical code compliance package on the jobsite and include the following information:

a. Address of residence

b. Name and company of technician performing testing

c. Date of final test

d. Test results as percentage ACHn

N1101.4.3.2 Testing of Duct Systems for Leakage. Leakage of supply ducts and return plenum/ducts shall not exceed 10% of total design airflow. The testing procedure shall be based on ASTM E1554, Standard Test Methods for Determining External Air Leakage of Air Distribution Systems by Fan Pressurization, ASHRAE 111 Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems, ASHRAE 152, Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems, or a generally accepted equivalent method.

Testing shall be performed by an independent third-party technician approved by the building official. Documentation verifying duct leakage of less than 10% shall be submitted with the final mechanical code compliance package on the jobsite. Documentation shall include the following:

1. Address of residence
2. Date of final test
3. Name and company of technician performing duct testing
4. Type of test performed (duct pressurization method or blower door subtraction method)
5. Test results in percentage of airflow CFM

SECTION N1102
BUILDING ENVELOPE

N1102.1 Thermal performance criteria. The building thermal envelope shall meet the requirements of either Table N1102.1(1) when the total percentage of glazing is less than or equal to 18% of the conditioned floor area or Table N1102.1(2) for window to wall area ratios.

When compliance using Table N1102.1(1) is demonstrated with a ceiling R-value of R-30 or less, no more than 33% of the total projected ceiling area may be of cathedral type construction (ceiling joist/roof rafter assembly) and the required insulation R-value may be reduced to a minimum of R22 insulation when the remaining ceiling area insulation is increased to R-38.

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TABLE N1102.1(1)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT (BASED ON WINDOW TO SQUARE FOOTAGE RATIO)[a]

FENESTRATION U-FACTOR	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	MASS WALL R-VALUE	WOOD FRAME WALL R-VALUE	FLOOR R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
0.75	0.75	0.40	30	4	13	13	0	0

a. R-values are minimums. U –factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 x 6 cavity.
b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
c. The first R-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
d. R-5 shall be added to the required slab edge r-values for heated slabs.

TABLE N1102.1.(2)
INSULATION AND FENESTRATION REQUIRMENTS BY COMPONENT(BASED ON WINDOW TO WALL RATIO)[a]

Maximum Window to Wall Area Ratio	Fenestration U-Factor	Skylight U-Factor[b]	Glazed Fenestration SHGC	Ceiling R-Value[c]	Wood Frame Wall R-Value	Floor R-Value	Slab R-Value & Depth[d]	Crawl Space Wall R-Value
15	0.65	0.65	0.40	30	13	11	0	6
20	0.55	0.55	0.40	30	13	11	0	6
25	0.51	0.51	0.35	30	13	19	0	10
30	0.46	0.46	0.35	38	16	19	0	10

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 x 6 cavity.
b. The fenestration U-factor column excludes skylights. The SHGC column applies glazed fenestration.
c. If a roof radiant barrier with an emittance of 0.05 or less as tested in accordance with ASTM C-1371 or ASTM E-408 is used, then the roof/ceiling minimum insulation value shall be R-19.
d. R-5 shall be added to the required slab edge R-values for heated slabs.

N1102.1.1 Exterior walls. The minimum required *R*-value in Table N1102.1(1) or N1102.1(2) shall be met by the sum of the *R*-values of the insulation materials installed in framing cavities and/or insulating sheathing applied, and not by framing, drywall, structural sheathing, or exterior siding materials. Insulation separated from the conditioned space by a vented space shall not be counted towards the required *R*-value.

N1102.1.1.1 Specific insulation requirements. (Prescriptive)

▲ **N1102.1.1.1.1 Ceilings with attic spaces.** When Section N1102.1 would require R-38 in the ceiling, R-30 shall be deemed to satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Similarly R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.

N1102.1.1.1.2 Ceilings without attic spaces. Where Section N1102.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section N1102.1.1 shall be limited to 500 square feet (46 m^2) of ceiling area.

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N1102.1.1.1.3 Mass walls. Mass walls for the purposes of this chapter shall be considered walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs. The provisions of Section N1102.1.1 for mass walls shall be applicable when at least 50 percent of the required insulation *R*-value is on the exterior of, or integral to, the wall. Walls that do not meet this criterion for insulation placement shall meet the wood frame wall insulation requirements of Section N1102.1.1.

Exception: For walls that do not meet the criterion for insulation placement, the minimum added insulation *R*-value shall be permitted to be an R-value of 6.

N1102.1.1.1.4 Steel-frame ceilings, walls and floors. Steel frame ceilings, walls and floors shall meet the insulation requirements of Table N1102.1.1.1.4. The calculation of the *U*-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

TABLE N1102.1.1.1.4
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (R-VALUE)

WOOD FRAME *R*-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT *R*-VALUE[a]
Steel Truss Ceilings[b]	
R-30	R - 38 or R - 30 + 3 or R - 26 + 5
R-38	R - 49 or R - 38 + 3
R-49	R-38+5
Steel Joist Ceilings[b]	
R-30	R - 38 in 2×4 or 2×6 or 2×8 R - 49 in any framing
R-38	R - 49 in 2×4 or 2×6 or 2×8 or 2×10
Steel Framed Wall	
R-13	R - 13 + 5 or R - 15 + 4 or R - 21 + 3
R-19	R - 13 + 9 or R - 19 + 8 or R - 25 + 7
R-21	R - 13 + 10 or R – 19 + 9 or R - 25 + 8
Steel Joist Floor	
R-13	R - 19 in 2×6 R - 19 + 6 in 2×8 or 2×10
R-19	R - 19 + 6 in 2×6 R - 19 + 12 in 2×8 or 2×10

a. Cavity insulation *R*-value is listed first, followed by continuous insulation *R*-value.
b. Insulation exceeding the height of the framing shall cover the framing.

N1102.1.2 Reserved.

N1102.1.3 Opaque doors. Opaque doors separating conditioned and unconditioned space shall have a maximum *U*-factor of 0.75. One opaque door shall be permitted to be exempt from this *U*-factor requirement.

N1102.1.4 Floors. The required *R*-value in Table N1102.1 shall apply to all floors, except any individual floor assembly with over 25 percent of its conditioned floor area exposed directly to outside air shall meet the *R*-value requirement in Section N1102.1 for "Ceilings." Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

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N1102.1.5 Basement walls. When the basement is a conditioned space, the basement walls shall be insulated in accordance with Section N1102.1. When the basement is not a conditioned space, either the basement walls or the ceilings separating the basement from conditioned space shall be insulated in accordance with Section N1102.1. When insulating basement walls, the required *R*-value shall be applied from the top of the basement wall to a depth of 10 feet (3048 mm) below grade or to the top of the basement floor, whichever is less.

N1102.1.6 Reserved.

N1102.1.7 Crawl space walls. Where the floor above the crawl space is uninsulated, insulation shall be installed on crawl space walls when the crawl space is not vented to outside air. The required *R*-value in Table N1102.1 shall be applied inside of the crawl space wall, downward from the sill plate to the exterior finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). The exposed earth in all crawl space foundations shall be covered with a continuous vapor retarder having a maximum permeance rating of 1.0 perm [(57 mg)/(s • m^2 • Pa)], when tested in accordance with ASTM E 96. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

N1102.1.8 Masonry veneer. For exterior foundation insulation, that horizontal portion of the foundation that supports a masonry veneer shall not be required to be insulated.

N1102.1.9 Protection. Exposed insulating materials applied to the exterior of foundation walls shall be protected. The protection shall extend at least 6 inches (152 mm) below finished grade level.

N1102.1.10 Air leakage. The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material:

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Other sources of infiltration

N1102.2 Maximum solar heat gain coefficient for fenestration products. The area-weighted-average solar heat gain coefficient (SHGC) for glazed fenestration installed shall not exceed 0.40.

N1102.3 Fenestration exemption. Up to 15 square feet (1.4 m^2) of glazed fenestration per dwelling unit shall be exempt from U-factor and the SHGC requirements.

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N1102.4 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the new fenestration shall meet the applicable U-factor and SHGC requirements in Section N1102.1.

SECTION N1103
MECHANICAL SYSTEMS

N1103.1 Heating and air conditioning appliance and equipment performance. Performance of equipment listed in Table N1103.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1103.1 shall meet the minimum efficiency requirements of the *City of Houston Commercial Energy Conservation Code*.

N1103.2 Controls. At least one thermostat shall be provided for each separate heating, cooling, or combination heating and cooling system. Heat pumps shall have controls that prevent supplementary electric resistance heater operation when the heating load can be met by the heat pump alone. Supplementary heater operation shall be permitted during outdoor coil defrost cycles not exceeding 15 minutes.

N1103.3 Duct insulation. All portions of the air distribution system shall be installed in accordance with Section M1601 and be insulated in accordance with Table N1103.3.

> **Exceptions:** Exhaust air ducts and portions of the air distribution system within appliances or equipment.

N1103.4 Duct sealing. All ducts shall be sealed in accordance with Section M1601.3.1.

N1103.5 Piping insulation. All mechanical system piping shall be insulated in accordance with Table N1103.5.

> **Exceptions:** Piping installed within appliances and equipment or piping serving fluids between 55°F (13°C) and 120°F (49°C).

TABLE N1103.1
MINIMUM EQUIPMENT PERFORMANCE

EQUIPMENT CATEGORY	SUB-CATEGORY[e]	REFERENCED STANDARD	MINIMUM PERFORMANCE
Air-cooled heat pumps heating mode < 65,000 Btu/h cooling capacity	Split systems Single Package	ARI210-240	6.8 HSPI[a,b] 6.8 HSPI[a,b]
Gas-fired or oil-fired furnace < 25,000 Btu/h	-	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78%[b] *E*t 80%[c]
Gas-fired or oil-fired steam and hot-water boilers < 300,000 Btu/h	-	DOE 10 CFR Part 430, Subpart B, Appendix N	AFUE 78%[b,d]
Air-cooled air conditioners and heat pumps cooling mode < 65,000 Btu/h cooling capacity	Split systems Single package	ARI 210-240	10.0 SEER[b] 9.7 SEER[b]

For SI: 1 Btu/h = 0.2931 W.

a. For multicapacity equipment, the minimum performance shall apply to each capacity step provided. Multicapacity refers to manufacturer-published ratings for more than one capacity mode allowed by the product's controls.
b. This is used to be consistent with the National Appliance Energy Conservation Act (NAECA) of 1987 (Public Law 100-12).
c. These requirements apply to combination units not covered by NAECA (three-phase power or cooling capacity 65,000 Btu/h).
d. Except for gas-fired steam boilers, for which the minimum AFUE shall be 75 percent.
e. Seasonal rating.

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TABLE N1103.3
INSULATION OF DUCTS

Duct Location	Insulation Types Mechanically Cooled and Outside Air	Insulation Types Heating Only
1. On roof or exterior of building	R-8, V, W	R-8,W
2. Inside the building thermal envelope)	R-5,V	R-5
3. Outside the building thermal envelope)	R-8,V	R-8

NOTES:
V. Vapor retarders: Material with a perm rating not exceeding 0.5 perm (29 ng/Pa·s· m^2). Vapor retarders shall be installed on cooling supply ducts in spaces vented to the outside in geographic areas where the summer dew point temperature exceeds 60°F (16°C) at the 2 ½ percent summer design dry-bulb with mean coincident wet-bulb temperature. All joints to be sealed.
W. Approved weatherproof barrier.

TABLE N1103.5
MINIMUM PIPE INSULATION (thickness in inches)

PIPING SYSTEM TYPES	FLUID TEMPERATURE RANGE, °F	Pipe Sizes [a, b]					
		Runouts up to 2" [b]	1" and less	1.25" to 2"	2.5" to 4"	5" to 6"	8" and larger
HEATING SYSTEMS							
Steam and hot water:							
High pressure/temperature	306-450	1 ½	2 ½	2 ½	3	3 ½	3 ½
Medium pressure/temperature	251-305	1 ½	2	2 ½	2 ½	3	3
Low pressure/temperature	201-250	1	1 ½	1 ½	2	2	2
Low temperature	106-200	½	1	1	1 ½	1 ½	1 ½
Steam condensate (for feed water)	Any	1	1	1 ½	2	2	2
COOLING SYSTEMS							
Chilled water, refrigerant and brine:	40-55	3/4	3/4	¾	1	1	1
	Below 40	1	1	1 ½	1 ½	1 ½	1 1/2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, °C = [(°F)-32]/1.8.

a. Inside pipe diameter.
b. Run outs not exceeding 12 feet in length to individual terminal units.

SECTION N1104
SERVICE WATER HEATING

N1104.1 Water heating appliance and equipment performance. Performance of equipment listed in Table N1104.1 is covered by preemptive Federal law. Appliances and equipment not listed in Table N1104.1 shall meet the minimum efficiency requirements of the *City of Houston Commercial Energy Conservation Code.*

N1104.2 Circulating hot water systems. All circulating service hot water piping shall be insulated in accordance with Table N1104.2. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.

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TABLE N1104.1
REQUIRED PERFORMANCE OF DOMESTIC HOT WATER HEATING EQUIPMENT SUBJECT TO MINIUM FEDERAL STANDARDS

CATEGORY	MAXIMUM INPUT RATING	MINIMUM EFFICIENCY
Electric; storage or instantaneous	12kW	0.93-0.00132 x V^a
Gas; storage	75, 000 Btu/h	0.62-0.0019 x V^a
Gas; instantaneous	200,000 Btu/h	0.62–0.0019 x V^a
Oil; Storage	105, 000 Btu/h	0.59-0.0019 x V^a
Oil; instantaneous	210,000 Btu/h	0.59-0.0019 x V^a

For SI: 1 Btu/h = 0.2931 W, 1 gallon=3.785 L.

a. V is the rated storage volume in gallons as specified by the manufacturer.

TABLE N1104.2
HOT WATER PIPING INSULATION

SERVICE WATER-HEATING TEMPERATURES (°F)	PIPE SIZES[a]			
	Non-circulating runouts	Circulating mains and runouts		
	Up to 1"	Up to 1.25"	1.5" to 2"	Over 2"
170-180	0.5	1	1.5	2
140-169	0.5	0.5	1	1.5
100-139	0.5	0.5	0.5	1

For SI: 1 inch = 25.4 mm, °C = [(°F) - 32] / 1/8
1 Btu/h/inch * ft^2 * °F = 0.144 W/(m * K)

a. Nominal iron pipe size and insulation thickness. Conductivity, k ≅ 0.27

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CHAPTER 12
MECHANICAL ADMINISTRATION

M1201.1 Scope. The provisions of Chapters 12 through 24 shall regulate the design, installation, maintenance, alteration and inspection of mechanical systems that are permanently installed and used to control environmental conditions within buildings. These chapters shall also regulate those mechanical systems, system components, equipment and appliances specifically addressed in this code. The administrative provisions of the *Mechanical Code* shall govern Chapters 12 through 23 as well as the mechanical provisions of Chapter 24.

{**EDITOR'S NOTE: DELETE** M1202 IN ITS ENTIRETY.}

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CHAPTER 13

GENERAL MECHANICAL SYSTEM REQUIREMENTS

M1301.1 Scope. The provisions of this chapter shall govern the installation of mechanical systems not specifically covered in other chapters applicable to mechanical systems. Installations of mechanical appliances, equipment and systems not addressed by this code shall comply with the applicable provisions of the ~~*International*~~ *Mechanical Code* and the ~~*International Fuel Gas*~~ *Plumbing Code.*

M1305.1.3 Appliances in attics. Attics containing appliances requiring access shall be provided with a pull down stairway with a clear opening not less than 22 inches in width and 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 (6096 mm) long when measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring in accordance with Chapter 5 not less than 24 inches (610 mm) wide. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present along all sides of the appliance where access is required. ~~The clear access opening dimensions shall be a minimum of 20 inches by 30 inches (508 mm) by 762 mm), where such dimensions are large enough to allow removal of the largest appliance.~~

Exceptions:

1. The passageway and level service space are not required where the appliance can be serviced and removed through the required opening.
2. Where the passageway is unobstructed and not less than 6 feet (1829 mm) high and 22 inches (559 mm) wide for its entire length, the passageway shall be not more than 50 feet (15 250 mm) long.

~~**M1305.1.3.1 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 Chapter 38.~~

M1305.1.4 Appliances under floors. Underfloor spaces containing appliances requiring access shall have an unobstructed passageway large enough to remove the largest appliance, but not less than 30 inches (762 mm) high and ~~22~~ 30 inches (~~559~~ 762 mm) wide, nor more than 20 feet (6096 mm) long when measured along the centerline of the passageway from the opening to the appliance. A level service space at least 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the appliance. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4 inches (102 mm) above the adjoining grade in accordance with Chapter 4. The rough-framed access opening dimensions shall be a minimum of ~~22~~ 30 inches by 30 inches (~~559~~ 762 mm by 762 mm), where the dimensions are large enough to remove the largest appliance.

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Exceptions:

1. The passageway is not required where the level service space is present when the access is open, and the appliance can be serviced and removed through the required opening.
2. Where the passageway is unobstructed and not less than 6 feet high (1929 mm) and 22 inches (559 mm) wide for its entire length, the passageway shall not be limited in length.

M1305.1.4.1 Ground clearance. Appliances supported from the ground shall be level and firmly supported on a concrete slab or other approved material extending not less than 3 inches (76 mm) above the adjoining ground. Appliances suspended from the floor shall have a clearance of not less than 6 inches (152 mm) from the ground.

M1307.3.1 Protection from impact. Appliances located in a garage or carport or within 24 inches (608 mm) adjacent to a driveway shall be protected from impact by automobiles.

M1307.4.1.2 Louvers and grilles. In calculating free area required by Section M1307.4.1, the required size of openings shall be based on the net free area of each opening. If the free area through a design of louver or grille is known, it shall be used in calculating the size opening required to provide the free area specified. If the design and free area are not known, it shall be assumed that wood louvers will have a ~~25~~ 50-percent free area and metal louvers and grilles will have a ~~75~~ 50-percent free area. Louvers and grilles shall be fixed in the open position.

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CHAPTER 14
HEATING AND COOLING EQUIPMENT

M1401.2 Access. Heating and cooling equipment shall be located with respect to building construction and other equipment 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.

{**EDITOR'S NOTE: DELETE** M1401.3 AND **RESERVE**.}

M1405.1 General. Electric baseboard convectors shall be installed in accordance with the manufacturer's installation instructions and ~~Chapters 33 through 42 of this code~~ the *Electrical Code*.

M1406.1 General. Electric radiant heating systems shall be installed in accordance with the manufacturer's installation instructions and ~~Chapters 33 through 42 of this code~~ the *Electrical Code*.

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 and ~~Chapters 33 through 42 of this code~~ the *Electrical Code*.

M1407.1 General. Electric duct heaters shall be installed in accordance with the manufacturer's installation instructions and ~~Chapters 33 through 42 of this code~~ the *Electrical Code*. Electric furnaces shall be tested in accordance with UL 1995.

{**EDITOR'S NOTE: DELETE** M1407.3 AND **RESERVE**.}

M1407.5 Fan interlock. The fan circuit shall be provided with ~~an interlock~~ safety device to prevent heater operation when the fan is not operating.

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 the furnace will operate within the temperature rise specified for the furnace.

M1411.3 Condensate disposal. Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet to an approved plumbing fixture or disposal area ~~place of disposal~~. Condensate shall not discharge into a street, alley or other areas where it would cause a nuisance.

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M1411.3.1 ~~**Auxiliary and secondary drain systems.** In addition to the requirements of Section M1411.3, a secondary drain or auxiliary drain pan shall be required for each cooling or evaporator coil where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than 1/8 unit vertical in 12 units horizontal (1-percent slope). Drain piping shall be a minimum of 3/4-inch (19 mm) nominal pipe size. One of the following methods shall be used:~~

1. ~~An auxiliary drain pan with a separate drain shall be installed under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 1.5 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch (0.7 mm) galvanized sheet metal. Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).~~

2. ~~A separate overflow drain line shall be connected to the drain pan provided with the equipment. This overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.~~

3. ~~An auxiliary drain pan without a separate drain line shall be installed under the coils on which condensate will occur. This pan shall be equipped with a water level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.~~

4. ~~A water level detection device conforming to UL 508 shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line or the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.~~

Condensate wastes. When a cooling coil or cooling unit is located in an attic or furred space where damage may result from condensate overflow, an additional watertight pan of corrosion-resistant metal shall be installed beneath the cooling coil or unit top to catch the overflow condensate caused by a clogged primary condensate drain, or one pan with a standing overflow and a separate secondary drain may be provided with a drain pipe, minimum 3/4-inch (19 mm) nominal pipe size, discharging at a point that can be readily observed.

Exception: The additional watertight pan may be of corrosion resistant material other than metal when approved by the building official.

M1411.3.1.2 Condensate Waste Sizing. Condensate waste pipe from air-cooling coils shall be sized in accordance with equipment capacity as set forth in Table M1411.3.1.2.

The size of condensate waste pipes may be for one unit or a combination of units, or as recommended by the manufacturer. The capacity of waste pipes assumes a 1/8 inch per foot (10.5 mm/m) or one percent slope, with pipe running three-quarters full:

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Condensate drain sizing for other slopes or other conditions shall be approved by the building official.

TABLE M1411.3.1.2
CONDENSATE WASTE SIZING

EQUIPMENT CAPACITY	MINIMUM CONDENSATE PIPE DIAMETER
Up to 10 tons (70.3kW) of refrigeration	3/4 inch (19 mm)
Over 10 (70.3kW) to 40 tons (141 kW) of refrigeration	1 inch (25 mm)
Over 40 (141 kW) to 90 tons (317 kW) of refrigeration	1 1/4 inch (32 mm)
Over 90 (317 kW) to 125 tons (440 kW) of refrigeration	1 1/2 inch (38 mm)
Over 125 (440 kW) to 250 tons (879 kW) of refrigeration	2 inch (51 mm)

M1411.3.2 Drain pipe materials and sizes. Components of the condensate disposal system shall be cast iron, galvanized steel, copper, ~~polybutylene,~~ polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Condensate waste and drain line size shall be not less than 3/4-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method. All horizontal sections of drain piping shall be installed in uniform alignment at a uniform slope.

M1411.3.3 Condensate. Condensate from air-cooling coils shall be collected and drained to an approved location. 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.

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CHAPTER 15
EXHAUST SYSTEMS

M1502.6 Duct length. The maximum length of a clothes dryer exhaust duct shall not exceed a total combined horizontal and vertical length, including two (2) 90 degree (1.57 rad.) elbows, of 25 feet (7620 mm) for 4 inch diameter duct, and 40 feet for 5-inch diameter duct from the dryer location to the outside of the building at the wall or roof termination. The maximum length of the duct shall be reduced 2.5 feet (762 mm) for each additional 45-degree (0.8 rad) bend and 5 feet (1524 mm) for each additional 90-degree (1.6 rad) bend in excess of two. For duct lengths in excess of 40 feet, a system designed by a registered professional engineer licensed to practice as such in the State of Texas is required. The maximum length of the exhaust duct does not include the transition duct.

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

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

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

SECTION M1508
MAKE UP AIR

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

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CHAPTER 16
DUCT SYSTEMS

M1601.3 Installation. Duct installation shall comply with Sections M1601.3.1 through M1601.3.6.

M1601.3.1 Joints and seams. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gasketing or other approved closure systems. Closure systems used with rigid fibrous glass ducts shall comply 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. Closure systems used with flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure-sensitive tape or "181B-M" for mastic. Duct connections to flanges of air distribution system equipment or sheet metal fittings shall be 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 metal ducts shall have a contact lap of at least 1 1/2 inches (38 mm) and shall be mechanically fastened by means of at least three sheet-metal screws or rivets equally spaced around the joint. Sealing shall comply with SMACNA, Method "A".

M1601.3.2 Support. Metal ducts shall be supported by ~~1/2-~~ 1 inch (26 ~~13~~ mm) wide ~~18-~~24-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet (3048 mm) or other approved means. Nonmetallic ducts shall be supported in accordance with the manufacturer's installation instructions.

M1601.4 Furnaces. ~~**Under-floor plenums.** An under-floor space used as a supply plenum shall conform to the requirements of this section. Fuel gas lines and plumbing waste cleanouts shall not be located within the space.~~

~~**M1601.4.1 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 4 mils (0.1 mm).~~

~~**M1601.4.2 Materials.** The under-floor space, including the sidewall insulation, shall be formed by materials having flame-spread ratings not greater than 200 when tested in accordance with ASTM E 84.~~

~~**M1601.4.3**~~ **Furnace connections.** A duct shall extend from the furnace supply outlet to not less than 6 inches (152 mm) below the combustible framing. This duct shall comply with the provisions of Section M1601.1. A noncombustible receptacle shall be installed below any floor opening into the plenum in accordance with the following requirements:

1. The receptacle shall be securely suspended from the floor members and shall not be more than 18 inches (457 mm) below the floor opening.
2. The area of the receptacle shall extend 3 inches (76 mm) beyond the opening on all sides.
3. The perimeter of the receptacle shall have a vertical lip at least 1 inch (25 mm) high at the open sides.

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~~**M1601.4.4 Access.** Access to an under-floor plenum shall be provided through an opening in the floor with minimum dimensions of 18 inches by 24 inches (457 mm by 610 mm).~~

~~**M1601.4.5**~~ **M1601.4.2 Furnace controls.** The furnace shall be equipped with an automatic control that will start the air-circulating fan when the air in the furnace bonnet reaches a temperature not higher than 150°F (66°C). The furnace shall additionally be equipped with an approved automatic control that limits the outlet air temperature to ~~200~~ 250°F (~~93~~ 156.67°C).

M1602.2 Prohibited sources. Outdoor and return air for a forced-air heating or cooling system shall not be taken from the following locations:

1. Closer than 10 feet (3048 mm) to an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet.
2. Where flammable vapors are present; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley or driveway.
3. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with Sections 1602.4 and 1603.1 ~~ACCA Manual D~~, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of such rooms or spaces.

   Exception: The minimum volume requirement shah 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.
4. A closet, bathroom, toilet room, kitchen, garage, mechanical room, furnace room or other dwelling unit.
5. A room or space containing a fuel-burning appliance where such room or space serves as the sole source of return air.

   Exceptions:

   1. The fuel-burning appliance is a direct-vent appliance or an appliance not requiring a vent in accordance with Section M 1801.1 or Chapter 24.
   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 (9.6 L/W) of combined input rating of all fuel-burning appliances therein.
      - 2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.
      - 2.3. Return-air inlets shall not be located within 10 feet (3048 mm) of any appliance firebox or draft hood 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.

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M1602.4 Required area. The total unobstructed area of return ducts or openings to a warm-air furnace shall be in accordance with the manufacturer's installation instructions, but not less than 2 square inches (1290 mm^2) for each 1,000 Btu/h (293 W) output rating of the furnace. The minimum unobstructed total area of the return air ducts or openings to a central air conditioning unit and/or heat pump shall be in accordance with the manufacturer's installation instructions, but shall not be less than 6 square inches (3870 mm^2) for each 1,000 Btu/h (293 W) nominal cooling output rating.

SECTION M1603
SUPPLY AIR

M1603.1 General. The minimum unobstructed total area of supply ducts from a warm-air furnace shall be in accordance with the manufacturer's installation instructions, but shall not be less than 2 square inches (1290 mm^2) for each 1,000 Btu/h (293 W) output rating of the furnace. The minimum unobstructed total area of the supply air ducts from a central air-conditioning unit and/or heat pump shall be in accordance with the manufacturer's installation instructions, but shall not be less than 6 square inches (3870 mm^2) for each 1,000 Btu/h (293 W) nominal cooling output rating. Dampers, grilles or registers installed for the purpose of controlling the supply airflow shall not be considered as obstructions.

SECTION M1604
CENTRAL VACUUM SYSTEMS

M1604 Central vacuum systems. Ducts used in central vacuum-cleaning systems within a dwelling unit shall be permitted to be of PVC pipe. Penetrations of fire walls, rated floor-ceiling or rated roof-ceiling assemblies shall comply with this code. Copper or ferrous pipes or conduits shall be used to extend through the wall assembly separation between a garage and a dwelling unit for a central vacuum unit.

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CHAPTER 21
HYDRONIC PIPING

TABLE M2101.1
HYDRONIC PIPING MATERIALS

{**EDITOR'S NOTE: DELETE** ROW OF TABLE M2101.1 BEGINNING WITH "POLYBUTYLENE (PB) PIPE AND TUBING.}

M2103.1 Piping materials. Piping for embedment in concrete or gypsum materials shall be standard-weight steel pipe, copper tubing, cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe, chlorinated polyvinyl chloride (CPVC), ~~polybutylene,~~ cross-linked polyethylene (PEX) tubing or polypropylene (PP) with a minimum rating of 100 psi at 180°F (690 kPa at 82°C).

M2103.2 Piping joints. 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 with brazing material having a melting point exceeding 1,000°F (538°C).
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~~4. Polypropylene pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings.

~~6~~5. Cross-linked polyethylene (PEX) tubing shall be joined using cold expansion, insert or compression fittings.

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CHAPTER 22
SPECIAL PIPING AND STORAGE SYSTEMS

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 34 of the *Fire Code*.

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CHAPTER 24
FUEL GAS

G2401.1 (101.2) Application. This chapter covers those fuel gas piping systems, fuel-gas utilization equipment 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.

Coverage of piping systems shall extend from the point of delivery to the outlet of the equipment shutoff valves (see "Point of delivery"). Piping systems requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance. Requirements for gas utilization equipment 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 Code*~~ *Plumbing Code* shall not be construed as prohibiting the use of such material or method of installation. Fuel-gas piping systems, fuel-gas utilization equipment and related accessories, venting systems and combustion air configurations not specifically covered in these chapters shall comply with the applicable provisions of the ~~*International Fuel Gas*~~ *Construction Code.*

Gaseous hydrogen systems shall be regulated by ~~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 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 34 of the *Fire Code*.

{**EDITOR'S NOTE: DELETE** SECTION G2404.9 (301.14) AND **RESERVE**.}

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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.

{**EDITOR'S NOTE: DELETE** G2407.2 (304.2) AND **RESERVE**.}

G2407.3 (304.3) Draft hood/regulator location. ~~Where used,~~ For equipment with atmospheric burners, a draft hood or a barometric draft regulator shall be installed in the same room or enclosure as the appliance served so as to prevent any difference in pressure between the hood or regulator and the combustion air supply.

G2407.10 (304.10) Louvers and grilles. The required size of openings for combustion, ventilation and dilution air shall be based on the net free area of each opening. Where the free area through a design of louver, grille or screen is known, it shall be used in calculating the size opening required to provide the free area specified. Where the design and free area of louvers and grilles are not known, it shall be assumed that wood louvers will have ~~25~~ 50-percent free area and metal louvers and grilles will have ~~75~~ 50-percent free area. Screens shall have a mesh size not smaller than 1/4 inch (6.4 mm). Nonmotorized louvers and grilles shall be fixed in the open position. Motorized louvers shall be interlocked with the appliance so that they are proven to be in the full open position prior to main burner ignition and during main burner operation. Means shall be provided to prevent the main burner from igniting if the louvers fail to open during burner start-up and to shut down the main burner if the louvers close during operation.

G2407.11 (304.11) Combustion air ducts. Combustion air ducts shall comply with all of the following:

1. Ducts shall be constructed of galvanized steel complying with Chapter 16 or of a material having equivalent corrosion resistance, strength and rigidity.

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Exception: Within dwellings units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one required fireblock is removed.

2. Ducts shall terminate in an unobstructed space allowing free movement of combustion air to the appliances.
3. Ducts shall serve a single enclosure.
4. Ducts shall not serve both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.
5. Ducts shall not be screened where terminating in an attic space.
6. Horizontal upper combustion air ducts shall ~~not~~ slope downward toward the source of combustion air. See Chapter 17.
7. The remaining space surrounding a chimney liner, gas vent, special gas vent or plastic piping installed within a masonry, metal or factory-built chimney shall not be used to supply combustion air.

   Exception: Direct-vent gas-fired appliances designed for installation in a solid fuel-burning fireplace where installed in accordance with the manufacturer's instructions.

8. Combustion air intake openings located on the exterior of a building shall have the lowest side of such openings located not less than 12 inches (305 mm) vertically from the adjoining grade level.

{**EDITOR'S NOTE: DELETE** SECTION G2409.3.4 AND G2409.3.5 IN THEIR ENTIRETY.}

{**EDITOR'S NOTE: DELETE** SECTION G2409.4.4 AND G2409.4.5 AND **RESERVE**.}

{**EDITOR'S NOTE: DELETE** SECTION G2410.2 IN ITS ENTIRETY.}

G2411.1 (310.1) Gas pipe bonding. Each above-ground portion of a gas piping system that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. CSST ~~G~~gas piping systems shall be ~~considered to be~~ bonded ~~where it is connected to appliances that are connected~~ to the electrical service ~~equipment~~ grounding ~~conductor of the circuit supplying that appliance~~ electrode system at the point where the gas service enters the building. The bonding jumper shall be not smaller than 6 AWG copper wire. [NFPA 54-09:7.13.2]

G2411.1.1 (310.1) Corrugated stainless steel (CSST) gas piping systems shall be bonded per the manufacturers installation instructions.

G2412.1 (401.1) Scope. This section shall govern the design, installation, modification and maintenance of gas piping systems. The applicability of this code to gas piping systems extends from the point of delivery to the connections with the equipment and includes the design, materials, components, fabrication, assembly, installation, testing, inspection, operation and maintenance of such gas piping systems.

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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~~ *Fire Code* and applicable State laws that are administered by the Texas Railroad Commission**.**

SECTION G2413 (402)
GAS PIPE SIZING

G2413.3 (402.3) Sizing. ~~Gas piping shall be sized in accordance with one of the following:~~ Gas piping shall be sized in accordance with tables G2412.3(1) through G2412.3(6). CSST piping shall be sized according to manufacturer's recommendations and the *Plumbing Code*.

~~1. Pipe sizing tables or sizing equations in accordance with Section G2413.4.~~

~~2. The sizing tables included in a listed piping system's manufacturer's installation instructions.~~

~~3. Other approved engineering methods.~~

{**EDITOR'S NOTE: DELETE** SECTION G2413.6 IN ITS ENTIRETY.}

~~**G2413.6.1 (402.6.1) Liquefied petroleum gas systems**. The operating pressure for undiluted LP-Gas systems shall not exceed 20 psig (140 kPa gauge). Buildings having systems designed to operate below -5°F (21°C) or with butane or a propane-butane mix shall be designed to either accommodate liquid LP-gas or prevent LP-gas vapor from condensing into a liquid.~~

G2414.5 (403.5) Metallic tubing. ~~Seamless copper,~~ Aluminum alloy or steel tubing shall be permitted to be used with gases not corrosive to such material.

G2414.5.2 (403.5.2) Copper tubing. ~~Copper tubing shall comply with standard Type K or L of ASTM B 88 or ASTM B 280.~~

~~Copper and brass tubing shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic feet of gas (0.7 milligrams per 100 liters).~~ Copper pipe or tubing shall not be used for gas piping systems.

G2414.6.1 (403.6.1) Anodeless risers. Anodeless risers shall comply with the following:

1. Factory-assembled anodeless risers shall be recommended by the manufacturer for the gas used and shall be leak-tested by the manufacturer in accordance with written procedures.
2. Service head adapters and field-assembled anodeless risers incorporating service head adapters shall be recommended by the manufacturer for the gas used by the manufacturer and shall be designed certified to meet the requirements of Category I of ASTM D 2513, and U.S. Department of Transportation, Code of Federal Regulations, Title 49, Part 192.281(e). The manufacturer shall provide the user

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qualified installation instructions as prescribed by the U.S. Department of Transportation, Code of Federal Regulations, Title 49, Part 192.283(b).

3. Where compression risers are used, a properly sized anode shall be installed.
4. Risers that are not anodeless must have a properly sized anode installed when the riser is installed.

{**EDITOR'S NOTE: DELETE** SECTION G2414.6.2 (403.6.2) AND **RESERVE**.}

G2414.10.4 (403.10.4) Metallic fittings. Metallic fittings, including valves, strainers and filters shall comply with the following:

1. Fittings used with steel or wrought-iron pipe shall be steel, brass, bronze, malleable iron, ductile iron or cast iron.
2. Fittings used with ~~copper or~~ brass pipe shall be ~~copper,~~ brass or bronze.
3. Brass or bronze fittings, if exposed to soil, shall have a minimum 80-percent copper content.

~~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; installed or braced to prevent separation of the joint by gas pressure or external physical damage; and shall be approved.

G2415.1 (404.1) Prohibited locations. Piping shall not be installed in or through a circulating air duct, clothes chute, chimney or gas vent, ventilating duct, dumbwaiter or elevator shaft. ~~Piping installed downstream of the point of delivery shall not extend through any townhouse unit other than the unit served by such piping.~~

G2415.4 (404.4) Piping through foundation wall. Underground piping, where installed below grade through the outer foundation or basement wall of a building, shall be encased in a protective pipe sleeve. The annular space between the gas piping and the sleeve shall be sealed at the point where it enters the building, and the sleeve shall be vented to the outside of the building.

G2415.8 (404.8) 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. Ferrous metal exposed in exterior locations shall be protected from corrosion in a manner satisfactory to the code official. Where dissimilar metals are joined ~~underground~~, an insulating coupling or fitting shall be used. Piping shall not be laid in contact with cinders.

G2415.8.1 (404.8.1) 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~~.

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G2415.9.1 (404.9.1) Individual outside appliances. Individual lines to outside lights, grills or other appliances shall be installed a minimum of ~~8~~ 12 inches (~~203~~ 304.56 mm) below finished grade, provided that such installation is approved and is installed in locations not susceptible to physical damage.

G2415.14.1 (404.14.1) Limitations. Plastic pipe shall be installed outside 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 that 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.

G2417.1.1 (406.1.1) Inspections. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly ~~or~~ and pressure tests as appropriate. The building official shall make the following inspections and either approve the portion of the work as completed or notify the permit holder that the same fails to comply with this code:

1. Rough Piping Inspection. This inspection shall be made after all gas piping authorized by the permit has been installed and before any such piping has been covered or concealed, or any fixture or appliance has been attached thereto. This inspection shall include a determination that the gas piping size, material, and installation meet the requirements of this code. This inspection shall also include a pressure test. The gas piping shall pass an air pressure test of 25 psi for a period of 15 minutes with no perceptible drop in pressure.

   Exception: For metal welded piping and for piping carrying gas at pressure in excess of 14 inches (355.6 mm) water column pressure, the test pressure shall not be less that 100 psi (689 kPa) for 30 minutes. These tests shall be made using air, CO, or nitrogen pressure only and shall be made in the presence of the inspector. All necessary apparatus for conducting tests shall be furnished by the permit holder.

2. Final Piping Inspection. This inspection shall be made after all piping authorized by the permit has been installed and after all portions thereof which are to be covered or concealed are so concealed and after all fixtures, appliances, or shutoff valves have been attached thereto, and after the completed system is ready to be put in service. This inspection shall include an air, CO, or nitrogen pressure test at a pressure of at least 6 inches (152.4 mm) of mercury, measured with a manometer or slope gauge for a period of not less than fifteen (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

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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.

G2417.1.2 (406.1.2) Repairs and additions. ~~In the event repairs or additions are made after the pressure test, the affected piping shall be tested.~~

~~Minor repairs and additions are not required to be pressure tested provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other approved leak-detecting methods.~~

In cases where the work authorized by the permit consists of a minor installation of additional piping already connected to a gas meter, the foregoing inspections may be waived at the discretion of the building official. In this event, the building official shall make such inspection as deemed advisable in order to be assured the work has been performed in accordance with the intent of this code.

Small sections of piping may be soap tested in the presence of the building official when the building official determines that a complete test is not required to preserve life safety.

{**EDITOR'S NOTE: DELETE** SECTION G2417.2 AND **RESERVE**.}

G2417.4 (406.4) Test pressure measurement. Test pressure shall be measured with a manometer or with ~~a~~ 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. The following alternative pressure measuring devices are approved:

1. Low Pressure Systems–A low pressure diaphragm gauge with a minimum dial size of 3 ½ inches with a set hand and a pressure range not to exceed 6 psi with 1/10 pound incrementation. 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 3 ½ inches with a set hand and a pressure range not to exceed 20 psi with 2/10 pound incrementation. The minimum test pressure shall not be less than 10 psi, and the maximum test pressure shall not exceed 12 psi.
3. High Pressure Systems–Gauges for high pressure test shall be as follows:

   A. Required pressure tests that exceed 10 pounds (69 kPa) but do not exceed 100 pounds (689 kPa) shall be performed with gauges that have 1 pound (6.9 kPa) incrementation or less.

   B. Required pressure tests that exceed 100 pounds (689 kPa) shall be performed with gauges incremented for 2 percent or less of the required test pressure.

   C. Test gauges shall have a pressure range not greater than twice the test pressure applied.

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{**EDITOR'S NOTE: DELETE** SECTION G2417.4.1 AND G2417.4.2.}

G2417.7 (406.7) Purging. The ~~P~~purging of piping shall ~~comply~~ be in accordance with Sections G2417.7.1 through G2417.7.~~4~~3.

G2417.7.1 (406.7.1) Piping systems required to be purged outdoors. The purging of piping systems shall be in accordance with the provisions of Sections G2417.7.1.1 through G2417.7.1.4 where the piping system meets either of the following:

1. The design operating gas pressure is greater than 2 psig.
2. The piping being purged contains one or more sections of pipe or tubing greater than 2 inches in nominal size and exceeding the lengths in Table G2417.7.1.1.

G2417.7.1.1 (406.7.1.1) Removal from service. ~~When~~ Where existing gas piping is ~~to be~~ opened ~~for servicing, addition or modification~~, the section that is opened ~~to be worked on~~ shall be ~~turned off~~ isolated from the gas supply ~~at the nearest convenient point,~~ and the line pressure vented ~~to the outdoors, or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures~~ in accordance with Section G2417.7.1.3. Where gas piping meeting the criteria of Table G2417.7.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

TABLE G2417.7.1.1 (406.7.1.1)

Nominal Pipe Size (inches)	Length of Piping (feet)
2 ½	> 50
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units: 1 inch = 25.4mm; 1ft = 304.8 mm

G2417.7.1.2 (406.7.1.2) Placing in operation. ~~When piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas. The air can be safely displaced with fuel gas provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow should be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed.~~ Where gas piping containing air and meeting the criteria of Table G2417.7.1.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with Section G2417.7.1.3.

G2417.7.1.3 (406.7.1.3) Outdoor d~~D~~ischarge of purged gases. The open end of a piping system~~s~~ being pressure vented or purged shall ~~not~~ discharge directly to an outdoor location ~~into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control or purging rate, and elimination of all hazardous conditions~~. Purging operations shall comply with all of the following requirements:

1. The point of discharge shall be controlled with a shutoff valve.

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2. The point of discharge shall be located at least 10 feet from sources of ignition, at least 10 feet from building openings and at least 25 feet from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with Section G2417.7.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90% fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 ft of the point of discharge.

G2417.7.1.4 (406.7.1.4) Combustible gas indicator. The combustible gas indicator used during purging operations shall be listed and shall be calibrated in accordance with the manufacturer's instructions and recommended schedule. The combustible gas indicator used for pipe discharge monitoring shall numerically display a volume scale from 0% to 100% with a resolution of not greater than 1% increments.

G2417.7.2 (406.7.2) Piping systems allowed to be purged indoors or outdoors. The purging of piping systems shall be in accordance with the provisions of Section G2417.7.2.1 where the piping system meets both of the following:

1. The design operating gas pressure is 2 psig or less.
2. The piping being purged is constructed entirely from pipe or tubing of 2 inch nominal size or smaller, or larger size pipe or tubing with lengths shorter than specified in Table G2417.7.1.1.

G2417.7.2.1 (406.7.2.1) Purging procedure. The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.
4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with G2417.7.2.2. Purging shall be stopped when fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures.

G2417.7.2.2 (406.7.2.2) Combustible gas detector. The combustible gas detector used during purging operations shall be listed and shall be calibrated or tested in accordance with the manufacturer's instructions and recommended schedule. The combustible gas detector used for pipe discharge monitoring shall indicate the presence of fuel gas.

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G2417.7.4~~2~~3 (406.7.4~~2~~3) ~~Placing~~ Purging appliances and equipment~~ in operation~~. After the piping system has been placed in operation, ~~all~~ appliances and equipment shall be purged ~~and then~~ before being placed into operation~~, as necessary~~.

G2418.2 (407.2) Design and installation. Piping shall be supported with pipe hooks, metal pipe straps, bands, brackets or hangers suitable for the size of piping, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. Piping shall be anchored to prevent undue strains on connected equipment 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 they will not be disengaged by movement of the supported piping.

{**EDITOR'S NOTE: DELETE** SECTIONS G2419.4 IN ITS ENTIRETY.}

G2423.1 (413.1) General. Motor fuel-dispensing facilities for CNG fuel shall be in accordance with this section and the *Fire Code*~~ 413 of the *International Fuel Gas Code*~~. The operation of CNG motor fuel-dispensing facilities shall be regulated by the *Fire Code*.

{**EDITOR'S NOTE: DELETE** SECTION G2425.7 AND **RESERVE.**}

{**EDITOR'S NOTE: DELETE** SECTIONS G2425.7.1, G2425.7.2 AND G2425.7.3 IN THEIR ENTIRETY.}

G2425.8 (501.8) Equipment 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 Chapter 15 and Section G2439.
5. Refrigerators.
6. Counter appliances.
7. ~~Room heaters listed for unvented use.~~

~~Where the appliances and equipment listed in Items 5 through 7 above are installed so that the aggregate input rating exceeds 20 Btu per hour per cubic foot (207 watts per m^3) of volume of the room or space in which such appliances and equipment 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 and equipment does not exceed the 20 Btu per hour per cubic foot (207 watts per m^3) figure. Where the room or space in which the equipment 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.~~

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G2425.10 (501.10) Connections to exhauster. Appliance connections to a chimney or vent equipped with a power exhauster shall be made on the inlet side of the exhauster. Joints on the positive pressure side of the exhauster shall be sealed to prevent flue-gas leakage as specified by the manufacturer's installation instructions for the exhauster. The sealant shall have the appropriate temperature rating**.**

G2427.6.7 (503.6.8) Exterior wall penetrations. A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in ~~Sections G2427.2.1 and G2427.3.3~~ the manufacturer's instructions**.**

G2439.5.1 (614.6.1) Maximum length. See Section M1502.6. ~~The maximum length of a clothes dryer exhaust duct shall not exceed 25 feet (7620 mm) from the dryer location to the outlet terminal. The maximum length of the duct shall be reduced 2 1/2 feet (762 mm) for each 45 degree (0.79 rad) bend and 5 feet (1524 mm) for each 90 degree (1.6 rad) bend.~~

~~**Exception:** Where the make and model of the clothes dryer to be installed is known and the manufacturer's installation instructions for such dryer are provided to the code official, the maximum length of the exhaust duct, including any transition duct, shall be permitted to be in accordance with the dryer manufacturer's installation instructions.~~

SECTION G2445 (621)
RESERVED
~~UNVENTED ROOM HEATERS~~

{**EDITOR'S NOTE: DELETE** REMAINDER OF SECTION G2445}

G2447.2 ~~(623.2) Prohibited location.~~ ~~Cooking appliances designed, tested, listed and labeled for use in commercial occupancies shall not be installed within dwelling units or within any area where domestic cooking operations occur~~ **(622.5) Electronic ignition.** Gas fired cooking appliances with electronic ignition shall not be connected to a ground fault circuit interrupter (GFCI).

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Part VII — Plumbing

CHAPTER 25
PLUMBING ADMINISTRATION

P2502.1 Existing building sewers and drains. Existing building sewers and drains shall be permitted to be used in connection with new systems when found by examination and/or test to conform to the requirements prescribed by this document.

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CHAPTER 27
PLUMBING FIXTURES

P2701.1 Quality of fixtures. Plumbing fixtures, faucets and fixture fittings shall be constructed of approved materials, shall have smooth impervious surfaces, shall be free from defects and concealed fouling surfaces, ~~and~~ shall conform to the standards cited in this code, and shall be listed or approved by a nationally recognized testing agency. Plumbing fixtures shall be provided with an adequate supply of potable water to flush and keep the fixtures in a clean and sanitary condition without danger of backflow or cross connection.

P2705.1 General. The installation of fixtures shall conform to the following:

1. Floor-outlet or floor-mounted fixtures shall be secured to the drainage connection and to the floor, where so designed, by screws, bolts, washers, nuts and similar fasteners of copper, brass or other corrosion-resistant material.
2. Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
3. Where fixtures come in contact with walls ~~and~~ or floors, the contact area shall be water tight.
4. Plumbing fixtures shall be usable.
5. The centerline of water closets or bidets shall not be less than 15 inches (381 mm) from adjacent walls or partitions or not less than 15 inches (381 mm) from the centerline of a bidet to the outermost rim of an adjacent water closet. There shall be at least 21 inches (533 mm) clearance in front of the water closet, bidet or lavatory to any wall, fixture or door.
6. The location of piping, fixtures or equipment shall not interfere with the operation of windows or doors.
7. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R323.1.5.
8. Integral fixture-fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on site, shall meet the design requirements of ASME A112.19.2 or ASME A112.19.3.

P2708.1 General. ~~Shower compartments shall have at least 900 square inches (0.6 m^2) of interior cross-sectional area. Shower compartments shall be not less than 30 inches (762 mm) in minimum dimension measured from the finished interior dimension of the shower compartment, exclusive of fixture valves, shower heads, soap dishes, and safety grab bars or rails. The minimum required area and dimension shall be measured from the finished interior dimension at a height equal to the top of the threshold and at a point tangent to its centerline and shall be continued to a height of not less than 70 inches (1778 mm) above the shower drain outlet. Hinged shower doors shall open outward. The wall area above built-in tubs having installed shower heads and in shower compartments shall be constructed in accordance with~~

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~~Section R702.4. Such walls shall form a water-tight joint with each other and with either the tub, receptor or shower floor.~~ Shower receptors are plumbing fixtures and shall conform to the general requirements contained in Section 401.0 of the *Plumbing Code*. Each such shower receptor shall be constructed of vitrified china or earthenware, ceramic tile, porcelain-enameled metal or such other material acceptable to the building official. No shower receptor shall be installed unless it conforms to acceptable standards as referenced in Table 14-1 of the *Plumbing Code* or until a specification or a proto-type or both of such receptor has first been submitted to and approval obtained from the building official.

Shower compartments, regardless of shape, shall have a minimum finished interior of 1024 square inches (0.66 m^2) and shall also be capable of encompassing a 30 inch (750 mm) circle. The minimum required area and dimensions shall be measured at a height equal to the top of the threshold and at a point tangent to its centerline. The area and dimensions shall be maintained to a point of not less than 70 inches (1,778 mm) above the shower drain outlet with no protrusions other than the fixture valve or valves, shower head, soap dishes, shelves, and safety grab bars or rails. Fold-down seats in accessible shower stalls shall be permitted to protrude into the 30 inch (750 mm) circle.

Exceptions:

1. ~~Fold-down seats shall be permitted in the shower, provided the required 900-square-inch (0.6 m^2) dimension is maintained when the seat is in the folded-up position.~~ Showers that are designed to comply with ICC A117.1.
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 minimum of 1,300 square inches (0.838 m^2) of cross-sectional area.~~ The minimum required area and dimension shall not apply for a shower receptor having overall dimensions of not less than 30 inches (750 mm) in width and 60 inches (1,500 mm) in length.

P2708.1.1 Access. ~~The shower compartment access and egress opening shall have a minimum clear and unobstructed finished width of 22 inches (559 mm).~~ Each shower receptor shall be an approved type and be so constructed as to have a finished dam, curb, or threshold that is not less than 1 inch (25.4 mm) lower than the sides and back of such receptor. In no case shall any dam or threshold be less than 2 inches (51 mm) nor more than 9 inches (229 mm) in depth when measured from the top of the dam or threshold to the top of the drain. Each such receptor shall be provided with an integral nailing flange to be located where the receptor meets the vertical surface of the finished interior of the shower compartment. The flange shall be water-tight and extend vertically not less than 1 inch (25.4 mm) above the top of the sides of the receptor. The finished floor of the receptor shall slope uniformly from the sides toward the drain not less than 1/4 inch per foot (20.8 mm/m), nor more than 1/2 inch per foot (41.8 mm/m). Thresholds shall be of sufficient width to accommodate a minimum 22 inch (559 mm) door. Shower doors shall open so as to maintain an unobstructed opening for egress of not less than 22 inches (559 mm).

Exception:

1. Showers that are designed to comply with the accessibility standards listed in Table 14-1 of the *Plumbing Code*.
2. Special use shower compartments for wheelchair use may eliminate the curb or threshold. The required slope and depth shall be maintained from the door entry to the drain opening.

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P2708.4 Hand showers. Hand-held showers shall conform to ASME A112.18.1 or CSA B125.1. Hand-held showers shall ~~be~~ provide backflow protection in accordance with ASME A112.18.1 or CSA B125.1 or shall be protected against backflow by a device complying with ASME A112.18.3.

P2709.1 Construction. ~~Shower receptors shall have a finished curb threshold not less than 1 inch (25 mm) below the sides and back of the receptor. The curb shall be not less than 2 inches (51 mm) and not more than 9 inches (229 mm) deep when measured from the top of the curb to the top of the drain. The finished floor shall slope uniformly toward the drain not less than ¼ unit vertical in 12 units horizontal (2-percent slope) nor more than 1/2 inch (13 mm), and floor drains shall be flanged to provide a water-tight joint in the floor~~ Shower receptors are plumbing fixtures and shall conform to the general requirements contained in Section 401.0 of the *Plumbing Code*. Each such shower receptor shall be constructed of vitrified china or earthenware, ceramic tile, porcelain-enameled metal, or of such other material acceptable to the building official ~~Having Jurisdiction~~. No shower receptor shall be installed unless it conforms to acceptable standards as referenced in Table 14-1 of the *Plumbing Code* or until a specification or a prototype or both of such receptor has first been submitted to and approval obtained from the building official.

When the construction of on-site built-up shower receptors is permitted by the building official, receptors built directly on the ground shall be water-tight and shall be constructed from approved-type dense, nonabsorbent and noncorrosive materials. Each such receptor shall be adequately reinforced, shall be provided with an approved flanged floor drain designed to make a water-tight joint in the floor, and shall have smooth, impervious, and durable surfaces.

P2709.2 Lining required. ~~The adjoining walls and floor framing enclosing on-site built-up shower receptors shall be lined with sheet lead, copper or a plastic liner material that complies with ASTM D 4068 or ASTM D 4551. The lining material shall extend not less than 3 inches (76 mm) beyond or around the rough jambs and not less than 3 inches (76 mm) above finished thresholds. Hot mopping shall be permitted in accordance with Section P2709.2.3~~ Shower receptors shall have the subfloor and rough side of walls to a height of not less than three (3) inches (76 mm) above the top of the finished dam or threshold shall be first lined with sheet plastic,* lead,* or copper,* or other durable and water-tight materials.

Showers that are provided with a built-in-place, permanent seat or seating area that is located within the shower enclosure, shall be first lined with sheet plastic,* lead,* copper,* or

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* Note: Lead and copper subpans or linings shall be insulated from all conducting substances other than their connecting drain by 15 pound (6.8 kg) asphalt felt or its equivalent. No lead pan or liner shall be constructed of material weighing less than four (4) pounds per square foot (19.5 kg/m^2). Copper pans or liners shall be not less than No. 24 B & S Gauge (0.02 inches) (0.5 mm). Joints in lead pans or liners shall be burned. Joints in copper pans or liners shall be soldered or brazed. Plastic pans shall not be coated with asphalt-based materials.

* Note: Lead and copper subpans or linings shall be insulated from all conducting substances other than their connecting drain by 15 pound (6.8 kg) asphalt felt or its equivalent. No lead pan or liner shall be constructed of material weighing less than 4 pounds per square foot (19.5 kg/m^2). Copper pans or liners shall be not less than No. 24 B & S Gauge (0.02 inches) (0.5 mm). Joints in lead pans or liners shall be burned. Joints in copper pans or liners shall be soldered or brazed. Plastic pans shall not be coated with asphalt-based materials.

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other durable and water-tight materials that extend not less than 3 inches (76 mm) above horizontal surfaces of the seat or the seating area.

P2709.2.1 ~~PVC sheets~~ Nonmetallic shower subpans. ~~Plasticized polyvinyl chloride (PVC) sheets shall be a minimum of 0.040 inch (1 mm) thick, and shall meet the requirements of ASTM D 4551. Sheets shall be joined by solvent welding in accordance with the manufacturer's installation instructions~~ Nonmetallic shower subpans or linings shall be permitted to consist of multilayers of other approved equivalent materials suitably reinforced and carefully fitted in place on the job site as elsewhere required in this section.

P2709.2.2 ~~Chlorinated polyethylene (CPE) sheets.~~ ~~Nonplasticized chlorinated polyethylene sheet shall be a minimum of 0.040 inch (1 mm) thick, and shall meet the requirements of ASTM D 4068. The liner shall be joined in accordance with the manufacturer's installation instructions.~~

~~P2709.2.3~~ Hot-mopping. ~~Shower receptors lined by hot mopping shall be built-up with not less than three layers of standard grade Type 15 asphalt-impregnated roofing felt. The bottom layer shall be fitted to the formed subbase and each succeeding layer thoroughly hot-mopped to that below. All comers shall be carefully fitted and shall be made strong and water tight by folding or lapping, and each corner shall be reinforced with suitable webbing hot-mopped in place. All folds, laps and reinforcing webbing shall extend at least 4 inches (102 mm) in all directions from the corner and all webbing shall be of approved type and mesh, producing a tensile strength of not less than 50 pounds per inch (893 kg/m) in either direction.~~ Nonmetallic shower subpans or linings shall be permitted to be built up on the job site of not less than three layers of standard, grade 15 pound (6.8 kg) asphalt-impregnated roofing felt. The bottom layer shall be fitted to the formed subbase and each succeeding layer thoroughly hot-mopped to that below. Corners shall be carefully fitted and shall be made strong and water-tight by folding or lapping, and each corner shall be reinforced with suitable webbing hot-mopped in place. Folds, laps, and reinforcing webbing shall extend not less than four (4) inches (102 mm) in all directions from the corner and webbing shall be of approved type and mesh, producing a tensile strength of not less than 50 psi (344.5 kPa) in either direction.

P2709.3 Installation. ~~Lining materials shall be pitched one-fourth unit vertical in 12 units horizontal (2-percent slope) to weep holes in the subdrain by means of a smooth, solidly formed subbase, shall be properly recessed and fastened to approved backing so as not to occupy the space required for the wall covering, and shall not be nailed or perforated at any point less than 1 inch (25.4 mm) above the finished threshold.~~ Lining materials shall be pitched one-quarter (1/4) inch per foot (20.8 mm/m) to weep holes in the subdrain of a smooth and solidly formed subbase. Such lining materials shall extend upward on the rough jambs of the shower opening to a point not less than 3 inches (76 mm) above the horizontal surfaces of the seat or the seating area, the top of the finished dam or threshold and shall extend outward over the top of the permanent seat, permanent seating area, or rough threshold and be turned over and fastened on the outside face of both the permanent seat, permanent seating area, or rough threshold and the jambs.

Linings shall be properly recessed and fastened to approved backing so as not to occupy the space required for the wall covering and shall not be nailed or perforated at any point that is less than 1 inch (25.4 mm) above the finished dam or threshold.

P2709.3.1 Materials. ~~Lead and copper linings shall be insulated from conducting substances other than the connecting drain by 15-pound (6.80 kg) asphalt felt or its~~

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~~equivalent. Sheet lead liners shall weigh not less than 4 pounds per square foot (19.5 kglm^2). Sheet copper liners shall weigh not less than 12 ounces per square foot (3.7 kg/m^2). Joints in lead and copper pans or liners shall be burned or silver brazed, respectively. Joints in plastic liner materials shall be jointed per the manufacturer's recommendations.~~

P2709.4 Receptor drains. ~~An approved flanged drain shall be installed with shower subpans or linings. The flange shall be placed flush with the subbase and be equipped with a clamping ring or other device to make a water-tight connection between the lining and the drain. The flange shall have weep holes into the drain~~ An approved-type subdrain shall be installed with every shower subpan or lining. Each such sub-drain shall be of the type that sets flush with the subbase and shall be equipped with a clamping ring or other device to make a tight connection between the lining and the drain. The subdrain shall have weep holes into the waste line. The weep holes located in the subdrain clamping ring shall be protected from clogging. Shower lining materials shall conform to approved standards acceptable to the building official**.**

P2709.5 Test for shower receptors. Shower receptors shall be tested for water-tightness by filling with water to the level of the rough threshold. The test plug shall be so placed that both upper and under sides of the sub-pan shall be subjected to the test at the point where it is clamped to the drain.

P2710.1 Bathtub and shower spaces. Shower walls shall be finished ~~in accordance with Section R307.2~~ with materials impervious to water.

P2717.3 Sink, dishwasher and food grinder. The combined discharge from a sink, dishwasher, and waste grinder is permitted to discharge through a single 1½ inch (38 mm) trap. The discharge pipe from the dishwasher shall be increased to a minimum of 3/4 inch (19 mm) in diameter and shall connect ~~with a wye fitting between the discharge of the food-waste grinder and the trap inlet or~~ to the head of the food grinder. The dishwasher waste line shall rise and be securely fastened to the underside of the counter before connecting to the sink tail piece or the food grinder.

P2720.1 Access to pump. Access shall be provided to circulation pumps in accordance with the fixture manufacturer's installation instructions. Where the manufacturer's instructions do not specify the location and minimum size of field fabricated access openings, a 12-inch by 12-inch (304 mm by 304 mm) minimum size opening shall be installed to provide access to the circulation pump. Where pumps are located more than 2 feet (609 mm) from the access opening, an 18-inch by 18-inch (457 mm by 457 mm) minimum size opening shall be installed. A door or panel of finished materials shall be permitted to close the opening. In all cases, the access opening shall be unobstructed and be of the size necessary to permit the removal and replacement of the circulation pump.

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CHAPTER 28
WATER HEATERS

P2801.6 Water heaters installed in garages. Water heaters having an ignition source shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the garage floor unless listed as flammable vapor ignition resistant.

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CHAPTER 29
WATER SUPPLY AND DISTRIBUTION

{**EDITOR'S NOTE: DELETE** SECTION P2902.3 AND **RESERVE.**}

P2902.5.1 Connections to boilers. The potable supply to the boiler shall be equipped with a reduced pressure principle backflow preventer ~~with an intermediate atmospheric vent complying with ASSE 1012 or CSA B64.3. Where conditioning chemicals are introduced into the system, the potable water connection shall be protected by an air gap or a reduced pressure principle backflow preventer~~ complying with ASSE 1013, CSA B64.3 or AWWA C511.

P2902.5.2 Heat exchangers. Heat exchangers using an essentially toxic transfer fluid shall be separated from the potable water by double-wall construction. An air gap open to the atmosphere shall be provided between the two walls. ~~Heat exchangers utilizing an essentially nontoxic transfer fluid shall be permitted to be of single-wall construction.~~

P2902.5.5 Solar systems. The potable water supply to a solar system shall be equipped with a backflow preventer ~~with intermediate atmospheric vent complying with ASSE 1012 or a reduced pressure principle backflow preventer complying with ASSE 1013~~. Where chemicals are used, the potable water supply shall be protected by a reduced pressure principle backflow preventer.

Exception: Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the ~~*International*~~ *Plumbing Code,* and all components of the piping system are listed for potable water use, cross-connection protection measures shall not be required.

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 used. Water-hammer arrestors shall be installed in accordance with manufacturers' specifications. Water-hammer arrestors shall conform to ASSE 1010~~**.**

P2904.5.1 Under concrete slabs. Inaccessible water distribution piping under slabs shall be copper water tube minimum Type M, brass, ductile iron pressure pipe, cross-linked polyethylene/aluminum/cross-linked polyethylene (PEXAL-PEX) pressure pipe, polyethylene/aluminum/polyethylene (PE-AL-PE) pressure pipe, chlorinated polyvinyl chloride (CPVC), ~~polybutylene (PB),~~ cross-linked polyethylene (PEX) plastic pipe or tubing or polypropylene (PP) pipe or tubing, all to be installed with approved fittings or bends. The minimum pressure rating for plastic pipe or tubing installed under slabs shall be 100 pounds per square inch at 180°F (689 kPa at 82°C).

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{**EDITOR'S NOTE: DELETE** THE NOTED ROWS IN THE FOLLOWING TABLES. ALL OTHER PORTIONS OF THE TABLES REMAIN UNCHANGED.}

TABLE P2904.4
WATER SERVICE PIPE

MATERIAL	STANDARD
~~Polybutylene (PB) plastic pipe and tubing~~	~~ASTM D 2662; ASTM D 2666; ASTM D 3309; CSA B137.8M~~

TABLE P2904.5
WATER DISTRIBUTION PIPE

MATERIAL	STANDARD
~~Polybutylene (PB) plastic pipe and tubing~~	~~ASTM D 3309; CSA CAN3-B137.8~~

TABLE P2904.6
PIPE FITTINGS

MATERIAL	STANDARD
Butt Heat Fusion P.E. fittings for plastic pipe	ASTM D 3261
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; ASME B 16.32
Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 (PEX) Tubing	ASTM F 1807
~~Polybutylene (PB) plastic~~	~~CSA B137.8~~
Polyvinyl chloride (PVC) plastic	ASTM D 2464; ASTM D 2466; ASTM D 2467; CSA CAN/CSA-B137.2
Socket Bell for PVC Plastic Pipe	ASTM D 2672

P2904.15 Underground joints. Joints in ~~polybutylene (PB)~~ plastic pipe or tubing underground ~~or under a concrete floor slab~~ shall be installed using heat fusion, in accordance with the manufacturer's installation instructions. Joints in copper pipe or tube installed in a concrete floor slab ~~under a concrete floor slab~~ ~~on grade~~ shall be installed using wrought-copper fittings and brazed joints. No joints shall be permitted under slabs.

P2904.16 Above-ground joints. Joints within the building between copper pipe, ~~polybutylene~~ tubing or CPVC tubing, in any combination with compatible outside diameters, are permitted to be made with the use of approved push-in mechanical fittings of a pressure-lock design.

P2904.17.2 Plastic pipe or tubing to other piping material. Joints between different grades of plastic pipe or 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

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made by a caulked joint or a mechanical compression joint. Plastic adapter fittings shall be male only.

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CHAPTER 30
SANITARY DRAINAGE

{**EDITOR'S NOTE: DELETE** SECTION P3001.2 AND **RESERVE.**}

P3001.3 Flood-resistant installation. In areas prone to flooding 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.

P3002.3.1 Drainage. Drainage fittings shall have a smooth interior waterway of the same diameter as the piping served. All fittings shall conform to the type of pipe used. Drainage fittings shall have no ledges, shoulders or reductions which can retard or obstruct drainage flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type, ~~black~~ cast iron or galvanized. Drainage fittings shall be designed to maintain one-fourth unit vertical in 12 units horizontal (2-percent slope) grade.

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TABLE P3005.1
FITTINGS FOR CHANGE IN DIRECTION

TYPE OF FITTING PATTERN	CHANGE IN DIRECTION		
	Horizontal to vertical[c]	Vertical to horizontal	Horizontal to horizontal
Sixteenth bend	X	X	X
Eighth bend	X	X	X
Sixth bend	X	X	X
Quarter bend	X	~~X~~[a]	~~X~~[a]
Short Sweep	X	X[a,b]	X[a]
Long sweep	X	X	X
Sanitary tee	X[c]	—	—
Wye	X	X	X
Combination wye and eighth bend	X	X	X

For SI: 1 inch = 25.4 mm.

a. The fittings shall only be permitted for a 2-inch or smaller fixture drain
b. Three inches and larger.
c. For a limitation on multiple connection fittings, see Section P3005.1.1.

P3005.4.1 Fixture branch and stack sizing.

1. Branches and stacks shall be sized according to Table P3005.4.1. Below grade drain pipes shall not be less than ~~1½ inches (38 mm)~~ 2 inches (50.66 mm) in diameter.
2. Minimum stack size. Drain stacks shall not be 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 into a 3-inch (76 mm) stack tee shall be acceptable (see Section P3005.1.4).

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CHAPTER 31
VENTS

P3103.1 Roof extension. Open vent pipes that extend through a roof shall be terminated at least 6 inches (152 mm) above the roof~~ or 6 inches (152 mm) above the anticipated snow accumulation, whichever is greater, except that where a roof is to be used for any purpose other than weather protection, the vent extension shall be run at least 7 feet (2134 mm) above the roof~~.

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.

P3114.4 Location. ~~Individual and branch~~ The air admittance valve~~s~~ shall be located ~~a minimum of 4 inches (102 mm) above the horizontal branch drain or fixture drain being vented. Stack-type air admittance valves shall be located a minimum of~~ 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 a minimum of 6 inches (152 mm) above insulation materials where installed in attics.~~

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CHAPTER 32
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)	~~1½~~ 2
Bidet	1¼
Clothes washer standpipe	2
Dishwasher (on a separate trap)	1½
Floor drain	2
Kitchen sink (one or two traps, with or without dishwasher and garbage grinder)	1½
Laundry tub (one or more compartments)	1½
Lavatory	1¼
Shower (based on the total flow rate through showerheads and bodysprays) Flow rate: 5.7 gpm and less More than 5.7 gpm up to 12.3 gpm More than 12.3 gpm up to 25.8 gpm More than 25.8 gpm up to 55.6 gpm	 1½ 2 3 4
Water Closet	~~Note a~~ 3

For SI: 1 inch = 25.4 mm

~~a. Consult fixture standards for trap dimensions of specific bowls~~.

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Part IX-Referenced Standards

CHAPTER 43
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standard shall be as specified in Section R102.4.

{**EDITOR'S NOTE:** CHANGE THE TABLES AS SHOWN BELOW. ALL OTHER STANDARDS REMAIN AS SET FORTH IN 2006 IRC.}

ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428	
Standard reference number	**Title**	**Referenced in code section number**
~~D 2662-96a~~	~~Specification for Polybutylene (PB) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter~~	~~Table P2904.4~~
~~D 2666-96a(2003)~~	~~Specification for Polybutylene (PB) Plastic Tubing……..~~	~~Table P2904.4~~
~~D 3309-96a(2002)~~	~~Specification for Polybutylene (PB) Plastic Hot- and Cold-water Distribution Systems ……..~~	~~Table M2101.1, Table P2904.4, Table P2904.5~~

CSA	Canadian Standards Association 5060 Spectrum Way, Suite 100 Mississauga, Ontario Cananda L4W 5N6	
Standard reference number	**Title**	**Referenced in code section number**
~~B137.8-02~~	~~Polybutylene (PB) Piping for Pressure Applications ……..~~	~~Table 2904.4, Table P2904.5, Table 2904.6~~

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ICC	International Code Council 5203 Leesburg Pike, Suite 600 Falls Church, VA 22041	
Standard reference number	**Title**	**Referenced in code section number**
ICC 600-08	Standard for Residential Construction in High-Wind Regions ……	R301.2.1.1

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APPENDIX A (IFGS)

SIZING AND CAPACITIES OF GAS PIPING

~~This Appendix is informative and is not part of the Code.~~ This appendix is an excerpt from the 2006 *International Fuel Gas Code,* coordinated with the section numbering of the *International Residential Code.*

{**EDITOR'S NOTE:** ALL OTHER PROVISIONS REMAIN AS SET FORTH IN 2006 IRC.}

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APPENDIX B (IFGS)

SIZING OF VENTING SYSTEMS SERVING APPLIANCES EQUIPPED WITH DRAFT HOODS, CATEGORY I APPLIANCES, AND APPLIANCES LISTED FOR USE WITH TYPE B VENTS

~~This Appendix is informative and is not part of the Code.~~ This appendix is an excerpt from the *2006 International Fuel Gas Code,* coordinated with the section numbering of the *International Residential Code.*

{**EDITOR'S NOTE:** ALL OTHER PROVISIONS REMAIN AS SET FORTH IN 2006 IRC.}

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APPENDIX C (IFGS)

EXIT TERMINALS OF MECHANICAL DRAFT AND DIRECT-VENT VENTING SYSTEMS

~~This Appendix is informative and is not part of the Code.~~ This appendix is an excerpt from the *2006 International Fuel Gas Code,* coordinated with the section numbering of the *International Residential Code.*

{**EDITOR'S NOTE:** ALL OTHER PROVISIONS REMAIN AS SET FORTH IN 2006 IRC.}

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APPENDIX L

~~PERMIT FEES~~

~~**TOTAL VALUATION FEE**~~

~~$1 to $ 500 $24~~

~~$501 to $2,000 $24 for the first $500; plus $3 for each additional $ 100 or fraction thereof, to and including $2,000~~

~~$2,001 to $40,000 $69 for the first $2,000; plus $11 for each additional $1,000 or fraction thereof, to and including $40,000~~

~~$40,001 to $100,000 $487 for the first $40,000; plus $9 for each additional $1,000 or fraction thereof, to and including $100,000~~

~~$100,001 to $500,000 $1,027 for the first $100,000; plus $7 for each additional $1 000 or fraction thereof, to and including $500,000 '~~

~~$500,001 to $1,000,000 $3,827 for the first $500,000; plus $5 for each additional $1 000 or fraction thereof, to and including $1,000,000 '~~

~~$1,000,001 to $5,000,000 $6,327 ~or the first $1,000,000; plus $3 for each additional $1,000 or fraction thereof, to and including $5,000,000~~

~~$5,000,001 and over $18,327 for the first $ 5,000,000; plus $1 for each additional $1 000 or fraction thereof~~

CONVENTIONAL LIGHT-FRAME WOOD CONSTRUCTION FOR HIGH-WIND AREAS

SECTION AL101
GENERAL

AL101.1 Scope. This chapter applies to regular-shaped 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 m^2) and accessory to Group R, Division 3 Occupancies need only comply with the roof-member-to-wall-tie requirements of Section AL103.8.

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SECTION AL102
DEFINITION

CORROSION RESISTANT or NONCORROSIVE is material having a corrosion resistance equal to or greater than a hot-dipped galvanized coating of 1.5 ounces of zinc per square foot 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 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 gage) sheet steel and shall be corrosion resistant as herein specified. All metal connectors and fasteners used in exposed locations or in areas otherwise subject to corrosion shall be of corrosion-resistant or noncorrosive material.

The number of common nails specified is the total required and shall be equally divided on each side of the connection. Nails shall be spaced to avoid splitting of the wood.

EXCEPTION: Pre-manufactured connectors that provide equal or greater tie-down capacity may be used provided that they comply with all the manufacturer's specifications.

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.

AL103.3 Sills and foundation tie. Foundation plates resting on concrete or masonry foundations shall be bolted to the foundation with not less than 1/2-inch-diameter (13mm) anchor bolts with 7-inch-minimum (178 mm) embedment into the foundation and spaced not more than 6 feet (1829 mm) on center.

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 48 inches (1219 mm) on center. Tie straps shall be nailed with a minimum of 4 ten penny nails.

AL103.5 Wall framing details. The spacing of studs in exterior walls shall be in accordance with Chapter 6.

Mechanical fasteners complying with this chapter shall be installed at a maximum of 48 inches (1219 mm) on center as required to connect studs to the sole plates, foundation sill plate and top plates of the wall. The fasteners shall be nailed with a minimum of 8 eight penny nails.

Where openings exceed 4 feet (1219 mm) in width, the required tie straps shall be at each edge of the opening and connected to a doubled full-height wall stud. When openings exceed 12 feet (3658 mm) in width, two ties at each connection or a manufactured fastener designed to prevent uplift shall be provided.

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AL103.6 Wall sheathing. All exterior walls and required interior main cross-stud partitions shall be sheathed in accordance with Chapter 7.

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 48 inches (1219) on center and connected with a minimum of 6 eight penny nails per strap.

AL103.8 Roof-members-to-wall tie. Tie straps shall be provided from the side of the roof-framing member to the supporting member~~s~~ below the roof. Tie straps shall be placed no further apart than every other roof-framing member and connected with a minimum of 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 4 feet (1219 mm) on center and connected with 8 eight penny nails.

AL103.10 Gable-end walls. Gable-end wall studs shall be continuous between points of lateral support which are perpendicular to the plane of the wall. Gable-end wall studs shall be attached with approved mechanical fasteners at the top and bottom. Eight 8 penny nails shall be required for each fastener. Fasteners shall be spaced a maximum of 48 inches (1219 mm) on center.

SECTION AL104
ROOFS

AL104.1 Roof sheathing. Solid roof sheathing shall be applied and shall consist of a minimum 1-inch-thick (25.4 mm) nominal lumber applied diagonally or a minimum 15/32-inch-thick (11.9 mm) wood structural panel or particle board (OSB) or other approved sheathing applied with the long dimension perpendicular to supporting rafters. Sheathing shall be nailed to roof framing in an approved manner. The end joints of wood structural panels or particle board shall be staggered and shall occur over blocking, rafters or other supports.

AL104.2 Roof covering. Roof coverings shall be approved and shall be installed and fastened in accordance with Chapter 9 and with the manufacturer's instructions.

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.

SECTION AL105
ELEVATED FOUNDATION

AL105.1 General. When approved, elevated foundations supporting not more than one story and meeting the provisions of this section may be used. A foundation investigation may be required by the building official.

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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.

AL105.3 Wood piles. The spacing of wood piles shall not exceed 8 feet (2438 mm) on center. Square piles shall not be less than 10 inches (254 mm) and tapered piles shall have a tip of not less than 8 inches (203 mm). Eight-inch-square (51613 mm^2) piles shall have a minimum embedment length of 5 feet (1524 mm) and shall project not more than 8 feet (2438 mm) above undisturbed ground surface. Eight-inch (203 mm) taper piles shall have a minimum embedment length of 6 feet (1828 mm) and shall project not more than 7 feet (2134 mm) above undisturbed ground surface.

AL105.4 Girders. Floor girders shall be 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.

AL105.5 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 1/4-inch (6.4 mm) corrosion-resistant or noncorrosive steel plates and 3/4-inch-diameter (19 mm) bolts shall be provided. Each end of the girder shall be connected to the piles using a minimum of two 3/4-inch-diameter (19 mm) bolts.

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{**EDITOR'S NOTE: REPLACE** APPENDIX M WITH THE FOLLOWING.}

APPENDIX M

AIRPORT SOUND ATTENUATION REQUIREMENTS

SECTION AM101
GENERAL

AM101.1 Purpose. The purpose of this appendix to set forth sound attenuation specifications for buildings when such sound attenuation is required by Article VI, Chapter 9 of the City Code to achieve an interior sound level of 45dBA.

AM101.2 Applicability. These provisions shall apply under circumstances where an airport land use permit is required under Section 9-381 a (2) or (3) of the City Code, and are in addition to other applicable building standards set forth elsewhere in this code.

AM101.3 Alternate compliance. Alternative means or methods which equal or exceed the standards set forth in these provisions may be used when approved by the building official in accordance with section R104.9 of this code.

SECTION AM201
DEFINITIONS

AM201.1 Definitions. For purposes of these provisions, the following words shall have the meaning shown herein.

SOUND TRANSMISSION CLASS (STC). An integer rating relating to the quality of sound attenuation for building partitions such as walls, ceilings, doors, and windows.

SECTION AM301
WALLS

AM301.1 General. The specific exterior wall assemblies set forth in AM 301.2 and AM301.3 shall include the interior finishes set forth therein.

Exception: Exterior wall assemblies or materials that have been tested or listed with a minimum STC rating of 40.

AM301.2 Brick veneer. When exterior walls are constructed using brick veneer, a minimum of ½ inch gypsum drywall shall be applied as the interior finish.

AM301.3 Vinyl or cement sidings. When exterior walls are constructed using vinyl or cement sidings, a minimum of 5/8 inch gypsum drywall shall be applied as the interior finish.

AM301.4 Other assemblies and materials. All other exterior wall assemblies or materials shall have a tested or listed minimum STC rating of 40.

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SECTION AM401
WINDOWS

AM401.1 Windows. All windows shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90.

AM401.2 Insulation at windows. The cavity between the wood framing and the window frame shall be insulated with fiberglass insulation or foam insulation to the depth of the window frame.

SECTION AM501
DOORS

AM501.1 Doors. All exterior doors shall have a minimum STC rating of 40 when tested in accordance with ASTM E 90.

> **Exception:** An exterior door may have a tested or listed STC rating of less than 40 when installed with a storm door which when combined, achieve a minimum tested or listed STC rating of 40.

SECTION AM601
ROOF/CEILING ASSEMBLIES

AM601.1 General. Roof/ceiling assemblies shall be constructed in accordance with the requirements of AM601.2 or AM601.3

> **Exception:** Roof/ceiling assemblies or materials that have been tested or listed with a minimum STC rating of 40.

AM601.2 Ceilings with unconditioned attic space above. Ceilings with unconditioned attic space shall be insulated with a minimum of ½ inch gypsum drywall on the interior ceiling side covered with a minimum of 12 inches of blown in fiberglass insulation.

AM601.3 Ceilings without attic space above. Ceilings without attic space above shall be insulated with a minimum of 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.

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APPENDIX V
VISITABILITY

SECTION AV101
SCOPE

AV101.1 Purpose. This set of standards is intended to provide minimum residential features to allow a mobility-impaired person to visit and use a home by providing:

1. One zero-step entrance at grade-level from the street, a driveway, garage, or an alley connecting to a 36 inch wide door.
2. Doors to kitchens, family rooms, living rooms, dining rooms and hallways on the ground level that are wide enough for wheelchair use.
3. At least one bathroom or half bath on ground level with sufficient room to allow a wheelchair to enter into the bathroom.

Exception: Where the grade-level floor plan does not include habitable rooms.[1]

AV101.2 Application. Unless compliance is required by another law or regulation outside this code, compliance with this chapter is voluntary. Any owner who desires to comply with this chapter shall so advise the building official when the plans for the residence are filed, so that conformity with this chapter may be considered in the plan review and inspection process.

SECTION AV102
ZERO STEP ENTRANCE

AV102.1 Route. A 36 inch wide accessible route to the residence shall be provided by a smooth uninterrupted surface with slope not to exceed 1:12.

AV102.2 Ramp slope and rise. The least possible slope shall be used for any ramp. The maximum slope of a ramp in new construction shall be 1:12. The maximum rise for any run shall be 30 inches (760mm).

AV102.3 Special technical provisions for ramps. Curb ramps and interior or exterior ramps to be constructed on sites where space limitations prohibit the use of a 1:12 slope or less may have slopes and rises as follows:

1. A slope between 1:10 and 1:12 is allowed for a maximum rise of 6 inches.
2. A slope between 1:8 and 1:10 is allowed for a maximum rise of 3 inches. A slope steeper than 1:8 is not allowed.

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1. Habitable room – A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

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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 in (815 mm) with the door open 90 degrees, measured between the face of the door and the opposite stop. Where the door opens more than 90 degrees the clear opening shall be measured between the stops on both sides.

AV103.2 Thresholds at doorways. Thresholds at doorways shall not exceed 3/4 in (19 mm) in height for exterior sliding doors or 1/2 in (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.

SECTION V104
WHEELCHAIR PASSAGE WIDTH

AV104.1 Wheelchair passage width. The minimum clear width for single grade-level wheelchair passage shall be 32 in (815 mm) at a point not to exceed 24 inches and 36 in (915 mm) continuously (see Fig. 1 and 2).

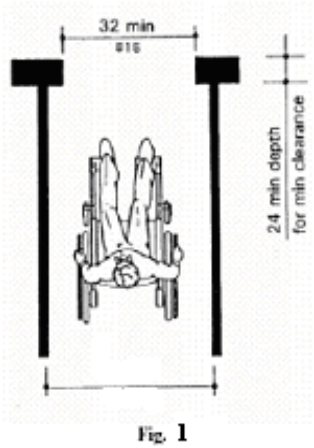
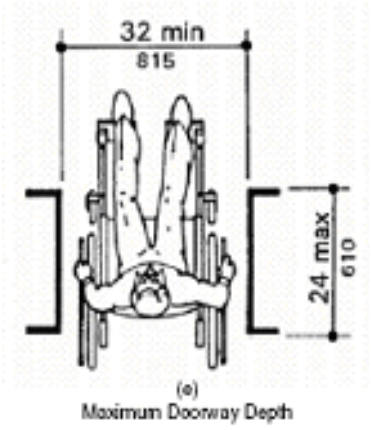


Fig. 1
Minumum Clear Width for Single Wheelchair



(e)
Maximum Doorway Depth

Fig 2
Clear Doorway Width and Depth

AV104.2 Changes in level. Changes in level up to 1/4 in (6 mm) may be vertical and without edge treatment (see Fig. 3(a)). Changes in level between 1/4 in and 1/2 in (6 mm and 13 mm) shall be beveled with a slope no greater than 1:2 (see Fig. 3(b)). Changes in level greater than 1/2 in (13 mm) shall be accomplished by means of a ramp that complies with Section AV102.

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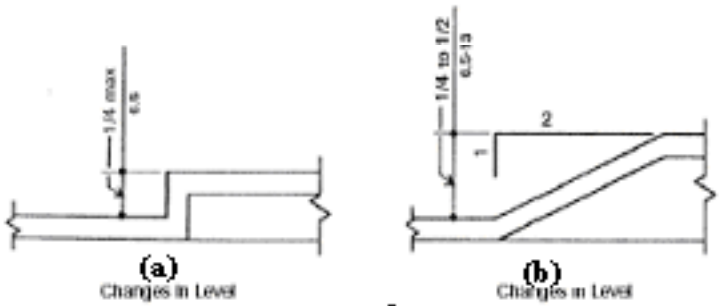

Fig 3
Accessible Route

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