

An Ordinance adopting and establishing the 2014 National Electric Code and certain 2015 International Building Codes, with certain additions and deletions, which shall establish and repeal/replace predecessor Sections with the following Sections:

1. Section: 500.036 2014 National Electrical Code
2. Section: 500.010 2015 International Building Code
3. Section: 500.015 2015 International Plumbing Code
4. Section: 500.020 2015 International Mechanical Code
5. Section: 500.025 2015 International Energy Conservation Code
6. Section: 500.030 2015 International Fuel Gas Code
7. Section: 500.035 2015 International Residential Code
8. Section: 500.037 2015 International Swimming Pool and Spa Code

Whereas, the City of Troy Board of Aldermen recognizes the regulating and governing the conditions and maintenance of all property, buildings and structure; by providing the standards for supplied utilities and facilities and other physical things and conditions essential to ensure are safe, sanitary and fit for occupation and use; and the condemnation of buildings and structures in the City of Troy; providing for the issuance of permits and collection of fees.

Whereas, the Planning and Zoning Commission has reviewed the National Electric Code (2014) and the International Building Codes (2015) and has made a recommendation to the Board of Aldermen of the City of Troy, Missouri for passage of this Bill to become an Ordinance of the City of Troy, Missouri;

Whereas, members of the building community have reviewed the National Electric Code (2014) and the International Building Codes (2015) and have reviewed this Bill and recommend its passage to the Board of Aldermen of the City of Troy, Missouri;

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF ALDERMENT OF THE CITY OF TROY, MISSOURI, AS FOLLOWS:

1. SECTION 1: 500.036 Adoption of the National Electrical Code (2014)

The Board of Aldermen hereby amend Section 500.036 as follows:

- A. That a certain document, three (3) copies of which are on file in the office of the Building Official of City of Troy, being marked and designated as the 2014 National Electrical Code, Promulgated as a standard of the National Fire Protection Association, be and is hereby adopted as the electrical code of the City of Troy, in the State of Missouri.
- B. Ordinance No. 981 of the City of Troy entitled 2008 National Electrical Code and all other ordinances or parts of ordinances in conflict are hereby repealed.
- C. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- D. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

2. SECTION 2: 500.010 Adoption of the International Building Code (2015)

The Board of Aldermen hereby amend Section 500.010 as follows:

- A. That a certain document, three (3) copies of which are on file in the office of the BUILDING OFFICIAL of CITY OF TROY, being marked and designated as the *International Building Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Building Code of the CITY OF TROY, in the State of MISSOURI for regulating and governing the conditions and maintenance of all property, buildings and structures; by providing the standards for supplied utilities and facilities and other physical things and conditions essential to ensure that structures are safe, sanitary and fit for occupation and use; and the condemnation of buildings and structures unfit for human occupancy and use and the demolition of such structures as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Building Code on file in the office of the Building Official,

City of Troy are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.010.

B. The following sections of the International Building Code (2015) are hereby revised:

Section 101.1. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]

SECTION 423 STORM SHELTERS

423.1.1 Scope. This section applies to the construction of storm shelters constructed as separate detached buildings or constructed as ~~safe rooms, rooms or spaces~~ within buildings for the purpose of providing ~~safe refuge protection~~ from storms that produce high winds, such as tornados and hurricanes. Such structures shall be designated to be hurricane shelters, tornado shelters, or combined hurricane and tornado shelters.

423.4 Group E occupancies. In areas where the shelter design wind speed for tornados is 250 MPH in accordance with Figure 304.2(1) of ICC 500, all Group E occupancies with an aggregate occupant load of 50 or more shall have a storm shelter constructed in accordance with ICC 500. ~~The shelter shall be capable of housing the total occupant load of the Group E occupancy.~~

Exceptions:

1. Group E day care facilities.
2. Group E occupancies accessory to places of religious worship.
3. Buildings meeting the requirements for shelter design in ICC 500.

Add new text as follows:

423.4.1 Required occupant capacity. The required occupant capacity of the storm shelter shall include all the buildings on the site, and shall be the greater of the following:

1. The total occupant load of the classrooms, vocational rooms and offices in the Group E occupancy.
2. The occupant load of any indoor assembly space that is associated with the Group E occupancy.

Exceptions:

1. Where a new building/addition is being added on an existing Group E site, and where the new building/addition is not of sufficient size to accommodate the required occupant capacity of the storm shelter for all the buildings/addition on the site, the storm shelter shall at a minimum accommodate the required occupant capacity for the new building/addition.

2. Where approved by the code official, the required occupant capacity of the shelter shall be permitted to be reduced by the occupant capacity of any existing storm shelters on the site.

423.4.2 Location. Storm shelters shall be located within the buildings they serve, or shall be located where the maximum distance of travel from at least one exterior door of each building to a door of the shelter serving that building does not exceed 1000 ft. (304.8 m)

Section 1612.3. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]

Section 1612.3. Insert: SEPTEMBER, 29TH, 2010 INTO [INSERT DATE OF ISSUANCE]

C. That Ordinance No 936A, 932A, 933A, 934A, 935A of CITY OF TROY entitled:

2009 International Building Code,
2009 International Plumbing Code,
2009 International Mechanical Code,
2009 International Energy Conservation Code,
2009 International Fuel Gas Code, and

all other ordinances, laws or parts of ordinances and laws in conflict herewith are hereby repealed.

D. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.

E. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

3. **SECTION 3. 500.015 International Plumbing Code (2015)**

A. That a certain document, three (3) copies of which are on file in the office of the BUILDING OFFICIAL of CITY OF TROY, being marked and designated as the *International Plumbing Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Plumbing Code of the CITY OF TROY in the State of MISSOURI regulating and governing the design, construction, quality of materials, erection, installation, alteration, repair, location, relocation, replacement, addition to, use or maintenance of plumbing systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Plumbing Code on file in the office of the BUILDING OFFICIAL are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.015.

B. The following sections of the International Plumbing Code (2015) are hereby revised:

Section 101.1. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]

Section 106.6.2. Insert: INSERT; PER THE BUILDING PERMIT FEE SCHEDULE (SEE TABLE I TO TITLE IV OF THE MUNICIPAL CODE OF THE CITY OF TROY INTO [JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

Section 106.6.3. paragraph 2 Insert: Zero into [SPECIFY PERCENTAGE]

Section 106.6.3 paragraph 3 Insert One Hundred into [SPECIFY PERCENTAGE]

Section 108.4. Insert: PROCEEDING WITH WORK WITHOUT THE REQUIRED INSPECTION INTO [SPECIFY OFFENSE]

Section 108.4. Insert: \$500.00 INTO [AMOUNT]

Section 108.4 Insert Zero into [NUMBER OF DAYS]

Section 305.4.1. Insert: 30 INTO 1ST [NUMBER]

Section 305.4.1. Insert: 30 INTO 2ND [NUMBER]

Section 903.1. Insert: 12 [NUMBER]

C. That Ordinance No. 932A of CITY OF TROY entitled Section: 500.015 Adoption of the International Plumbing Code and all other ordinances, laws or parts of ordinances and laws in conflict herewith are hereby repealed.

D. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.

E. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

4. **SECTION 4. 500.020 International Mechanical Code (2015)**

A. That a certain document, three (3) copies of which are on file in the office of the BUILDING OFFICIAL of CITY OF TROY, being marked and designated as the *International Mechanical Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Mechanical Code of the CITY OF TROY, in the State of MISSOURI regulating and governing the design, construction, quality of materials, erection, installation, alteration, repair, location, relocation, replacement, addition to, use or maintenance of mechanical systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Mechanical Code on file in the office of the Building Official of the CITY OF TROY are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.020.

B. The following sections of the International Mechanical Code (2015) are hereby revised:

Section 101.1. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]

Section 106.5.2. Insert: PER THE BUILDING PERMIT FEE SCHEDULE (SEE TABLE I TO TITLE IV OF THE MUNICIPAL CODE OF THE CITY OF TROY INTO [JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

Section 106.5.3. Insert: Zero into paragraph 2. [SPECIFY PERCENTAGE]

Section 106.5.3. Insert: One Hundred into paragraph 3. [SPECIFY PERCENTAGE]

Section 108.4. Insert: PROCEEDING WITH WORK WITHOUT THE REQUIRED INSPECTION INTO [SPECIFY OFFENSE]

Section 108.4. Insert: \$500.00 into [AMOUNT]

Section 108.4. Insert Zero into [NUMBER OF DAYS]

Section 108.5. Insert: ZERO INTO 1ST [AMOUNT]

Section 108.5. Insert: FIVE HUNDRED INTO 2ND [AMOUNT]

- C. That Ordinance No. 933A of CITY OF TROY entitled 2009 International Mechanical Code and all other ordinances, laws or parts of ordinances or laws in conflict herewith are hereby repealed.
- D. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- E. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

5. Section 5. 500.025 International Energy Conservation Code (2015)

- A. That a certain document, three (3) copies of which are on file in the office of the Building Official of CITY OF TROY, being marked and designated as the *International Energy Conservation Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Energy Conservation Code of the CITY OF TROY, in the State of MISSOURI for regulating and governing energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Energy Conservation Code on file in the office of the BUILDING OFFICIAL are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.025.
- B. The following sections of the International Energy Conservation Code (2015) are hereby revised:
 - Sections: C101.1 Insert: CITY OF TROY into [NAME OF JURISDICTION]
 - Sections: R101.1 Insert: City of Troy into [NAME OF JURISDICTION]
- C. That Ordinance No. 934A of CITY OF TROY entitled 2009 International Energy Conservation Code and all other ordinances, laws or parts of ordinances or laws in conflict herewith are hereby repealed.
- D. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- E. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

6. Section 6. 500.030 International Fuel Gas Code (2015)

- A. That a certain document, three (3) copies of which are on file in the office of the BUILDING OFFICIAL of CITY OF TROY, being marked and designated as the *International Fuel Gas Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Fuel Gas Code of the CITY OF TROY, in the State of MISSOURI for regulating and governing fuel gas systems and gas-fired appliances as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Fuel Gas Code on file in the office of the BUILDING OFFICIAL are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.030.
- B. The following sections of the International Fuel Gas Code (2015) are hereby revised:
 - Section 101.1. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]
 - Section 106.6.2. Insert: PER THE BUILDING PERMIT FEE SCHEDULE (SEE TABLE I TO TITLE IV OF THE MUNICIPAL CODE OF THE CITY OF TROY INTO [JURISDICTION TO INSERT APPROPRIATE SCHEDULE])
 - Section 106.6.3. Insert: Zero into paragraph 2 [SPECIFY PERCENTAGE]
 - Section 106.6.3. Insert: One Hundred into paragraph 3 [SPECIFY PERCENTAGE]
 - Section 108.4. Insert: PROCEEDING WITH WORK WITHOUT THE REQUIRED INSPECTION INTO [SPECIFY OFFENSE]
 - Section 108.4. Insert: \$500.00 into [AMOUNT]
 - Section 108.4. Insert: Zero into [NUMBER OF DAYS]
 - Section 108.5. Insert: ZERO INTO 1ST [AMOUNT]
 - Section 108.5. Insert: FIVE HUNDRED INTO 2ND [AMOUNT]

- C. That ORDINANCE No 935A of CITY OF TROY entitled 2009 International Fuel Gas Code and all other ordinances or parts of laws in conflict herewith are hereby repealed.
- D. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- E. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

7. Section 7. 500.035 International Residential Code (2015)

- A. That a certain document, three (3) copies of which are on file in the office of the Building Official of CITY OF TROY, being marked and designated as the *International Residential Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Residential Code of the CITY OF TROY, in the State of MISSOURI for regulating and governing the construction, alteration, movement, enlargement, replacement, repair, equipment, location, removal and demolition of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with separate means of egress as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Residential Code on file in the office of the BUILDING OFFICIAL are hereby referred to, adopted, and made a part hereof, as if fully set out in this ordinance, with the additions, insertions, deletions and changes, if any, prescribed in subsection B of Section 500.035
- B. The following sections of the International Residential Code (2015) are hereby revised:
 Section R101.1. Insert: CITY OF TROY INTO [NAME OF JURISDICTION]
 Section R103 Department of Building Safety is deleted in its entirety
- C. The following sections of the International Residential Code (2015) are hereby revised to insert the following sections in their place. Any stricken through text shall be deleted in the International Residential Code (2015) utilized by the City of Troy and, if applicable, underlined text is inserted in the sections. The sections are amended to read as follows:

R106.3.1 Approval of construction documents. Where the *Building Official* issues a *permit*, the *construction documents* shall be *approved* in writing or by a stamp that states "REVIEWED FOR CODE COMPLIANCE." One set of *construction documents* so reviewed shall be retained by the *Building Official*. The other set shall ~~shall~~ may be kept at the site of work or made available at the time of inspection and shall be open to inspection by the *Building Official* or a duly authorized representative.

R108.6 Work commencing before permit issuance. Any person who commences work requiring a *permit* on a building, structure, electrical, gas, mechanical or plumbing system before obtaining the necessary permits shall be subject to a fee established by the applicable governing authority that shall be in addition to the required *permit fees*.

Exceptions:

1. Earthwork
2. Stakeouts and other necessary planning procedures

Definition (WHAT SECTION IS THIS AMENDING???)

Revise as follows:

PAN FLASHING. Corrosion-resistant flashing at the base of an opening that is integrated into the building exterior wall to direct water to the exterior ~~and is premanufactured, fabricated, formed or applied at the job site.~~

Table R301.2(1) Insert: Climatic and Geographic Design Criteria, the following values shall be entered into the table and footnotes B and H to the table are amended as follows:

Ultimate Wind Speed:	115 (51)
Ground Snow Load:	20
WIND DESIGN SPEED:	90
WIND TOPOGRAPHIC EFFECTS:	NO
SPECIAL WIND REGION:	NO
WIND-BORNE DEBRIS ZONE:	NO
Seismic Design Category:	B
Weathering:	Severe
Frost Line Depth:	30 inches
Termite:	Moderate to Heavy
Winter Design Temp:	6
Ice Barrier Underlayment Required:	NO
Flood Hazards:	09-29-2010
Air Freezing Index:	1000
Mean Annual Temp:	56.3

Foot Notes B and H are amended to read as follows:

B. The frost line depth may require deeper footings than indicated in figure R403.1 (1). The Jurisdiction shall fill in the frost line depth column with 30", the minimum depth of footing below finish grade.

H. The jurisdiction shall fill in this part of the table with "No"

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls of dwellings* and accessory buildings shall comply with Table R302.1 (1) as amended; or *dwellings* equipped throughout with an *automatic sprinkler system* installed in accordance with Section P2904 shall comply with Table R302.1 (2).

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the *fire separation distance*.
2. Walls of *dwelling*s and *accessory structures* located on the same *lot*.
3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the *lot*. Projections beyond the *exterior wall* shall not extend over the *lot line*.
4. Detached garages accessory to a *dwelling* located within 2 feet (610 mm) of a *lot line* are permitted to have roof eave projections not exceeding 4 inches (102 mm).
5. Foundation vents installed in compliance with this code are permitted.
6. Cantilevered manufactured fireplaces.
7. Roof eave overhangs.
8. Uncovered decks.

Table R302.1(1)

Exterior Walls

Exterior Wall Element		Minimum Fire-Resistance Rating	Minimum Fire Separation Distance
Walls	Fire-resistance rated	1 hour – tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	<5 Feet <u>0 Feet to ≤ 3 Feet</u>
	Not fire-resistance rated	0 hours	≥ 5 Feet <u>> 3 Feet</u>
Projections	Not allowed	N/A	<2 Feet
	Fire-resistance rated	1 hour on the underside ^{a, b}	≥ 2 Feet to < 5 Feet <u>2 Feet</u>
	Not fire-resistance rated	0 hours	≥ 5 Feet <u>3 Feet</u>
Openings in walls	Not allowed	N/A	< 3 Feet
	25% maximum of wall area	0 hours	3 Feet
	Unlimited	0 hours	5 Feet <u>3 Feet</u>
Penetrations	All	Comply with Section R302.4	< 3 Feet
		None required	3 Feet

For SI: 1 foot = 304.8 mm

N/A = Not Applicable.

- a. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
- b. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.

R302.2 Townhouses. Common walls separating *townhouses* shall be assigned a fire-resistance rating in accordance with Section R302.2, Item 1 or 2. The common wall shared by two *townhouses* shall be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

1. Where a fire sprinkler system in accordance with Section P2904 is provided, the common wall shall be not less than a 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263.
2. Where a fire sprinkler system in accordance with Section P2904 is not provided, the common wall shall be not less than a 2-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263 or the common wall may be two independent 1-hour fire-resistance-rated wall assemblies.

R302.5.1 Opening protection. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors, ~~equipped with a self-closing device.~~

R302.5.2 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~~ 28 gage (0.48 mm) sheet steel or other *approved* material and shall not have openings into the garage.

R302.13 Fire protection of floors. Floor assemblies that are not required elsewhere in this code to be fire-resistance rated, shall be provided with 1/2-inch (12.7 mm) gypsum wallboard membrane, 5/8-inch (16 mm) wood structural panel membrane, or equivalent on the underside of the floor framing member. Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted. Fire blocking, draft stopping, and/or additional framing is not required.

Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA 13D, or other approved equivalent sprinkler system.
2. Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances.
3. Portions of floor assemblies shall be permitted to be unprotected where complying with the following:
 - 3.1 The aggregate area of the unprotected ~~portions~~ floor assembly does not exceed ~~80 (7.4 m²)~~ per story 100 square feet per HVAC zone.

3.2 Fireblocking in accordance with Section 302.11.1 is installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.

Areas of the floor assembly covered by HVAC metal plenum, trunk lines, and steel structural beams shall be considered protected. Gypsum wallboard membrane shall be within 1 inches of all previously listed items.

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

R303.3 Bathrooms. Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m²), one-half of which must be openable.

Exception:

The glazed areas shall not be required where artificial light and a local exhaust system are provided. The minimum local exhaust rates shall be determined in accordance with Section M1507. Exhaust air from the space shall be exhausted directly to the outdoors, to a ventilated soffit, or a gabled end vent.

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

R303.5.2 Exhaust openings. Exhaust air shall not be directed below 6 feet and 8 inches onto public walkways.

R303.8 Exterior stairway illumination. Exterior stairways shall be provided with an artificial light source ~~located at the top landing of the stairway.~~ Exterior stairways providing access to a *basement* from the outdoor *grade* level shall be provided with an artificial light source located at the bottom landing of the stairway.

R309.5 Fire sprinklers. Private garages shall be protected by fire sprinklers where the garage wall has been designed based on Table 302.1(2), Footnote a, and the homeowner has opted to purchase a fire sprinkler system for their residence, as per Missouri Revised Statutes 67.281. Sprinklers in garages shall be connected to an automatic sprinkler system that complies with Section P2904. Garage sprinklers shall be residential sprinklers or quick-response sprinklers, designed to provide a density of 0.05 gpm/ft². Garage doors shall not be considered obstructions with respect to sprinkler placement.

R311.3 Floors and landings at exterior doors. There shall be a landing or floor ~~on each side of~~ at each required egress exterior door. The width of each landing shall not be less than the door served. Every landing shall have a dimension of not less than 36 inches (914 mm) measured in the direction of travel. The slope at exterior landings shall not to exceed 1/4 unit vertical in 12 units horizontal (2 percent).

Exception: Exterior balconies less than 60 square feet (5.6 m²) and only accessible from a door are permitted to have a landing less than 36 inches (914 mm) measured in the direction of travel.

R311.3.2 Floor elevations for other exterior doors. Doors other than the required egress door shall be provided with landings or floors not more than 7 3/4 inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of ~~not more than two~~ four or fewer risers is located on the exterior side of the door, provided that door does not swing over the stairway.

R311.7.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 Risers. The riser height shall be not more than 7 3/4 inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted provided that the openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below do not permit the passage of a 4-inch-diameter (102 mm) sphere.

Exceptions:

1. The opening between adjacent treads is not limited on spiral stairways.
2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 3/8 inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and do not have to be within 3/8 inch (9.5 mm) of the rectangular tread depth.

Exception: The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

Exceptions:

1. For remodeling projects in existing homes, homes in urban, infill or high-density developments, or historical buildings or dwellings, riser height of not more than 8 1/4 inches (210 mm) and tread depth of not more than 9 inches (229 mm) will be allowed.
2. For remodeling projects in existing homes, stair tread and riser will be allowed to mimic previous or existing conditions.

R311.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. Landings of shapes other than square or rectangular shall be permitted provided the depth at the walk line and the total area is not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall not be less than 36 inches (914 mm).

Exception: A floor or landing is not required at the top of an interior or exterior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R312.1.1 Where required. *Guards* shall be located along open-sided walking surfaces, including stairs, ramps and landings that are located more than 30 inches (762 mm) measured vertically at the edge of the walking surface to the floor or *grade* below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a *guard*.

~~**R312.2 Window fall protection.** Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.~~

~~**R312.2.1 Window sills.** In dwelling units, where the top of the sill of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished *grade* or other surface below on the exterior of the building, the operable window shall comply with one of the following:~~

- ~~1. Operable windows with openings that will not allow a 4-inch diameter (102 mm) sphere to pass through the opening where the opening is in its largest open position.~~
- ~~2. Operable windows that are provided with window fall prevention devices that comply with ASTM F 2090.~~
- ~~3. Operable windows that are provided with window opening control devices that comply with Section R312.2.2.~~

~~**R312.2.2 Window opening control devices.** Window opening control devices shall comply with ASTM F 2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the new clear opening area of the window unit to less than the area required by Section R310.2.1.~~

R313.1 Townhouse automatic fire sprinkler systems. An automatic residential fire sprinkler system shall be installed in *townhouses*, in accordance with §67.281 of the Missouri Revised Statutes.

Exception: An automatic residential fire sprinkler system shall not be required where *additions* or *alterations* are made to existing *townhouses* that do not have an automatic residential fire sprinkler system installed.

R313.1.1 Design and installation. Automatic residential fire sprinkler systems for *townhouses* shall be designed and installed in accordance with Section P2904 or NFPA 13D.

R313.2 One- and two-family dwellings automatic fire systems. An automatic residential fire sprinkler system shall be installed in one- and two-family dwellings. A builder of a single-family dwelling or residence or multi-unit dwellings of four or fewer units shall offer to any purchaser on or before the time of entering into the purchase contract the option, at the purchaser's cost, to install or equip fire sprinklers in the dwelling, residence, or unit. Notwithstanding any other provision of law to the contrary, no purchaser of such a single-family dwelling, residence, or multi-unit dwelling shall be denied the right to choose or decline to install a fire sprinkler system in such dwelling or residence being purchased by any code, ordinance, rule, regulation, order, or resolution by any county or other political subdivision. Any county or other political subdivision shall provide in any such code, ordinance, rule, regulation, order, or resolution the mandatory option for purchasers to have the right to choose and the requirement that builders offer to purchasers the option to purchase fire sprinklers in connection with the purchase of any single-family dwelling, residence, or multi-unit dwelling of four or fewer units.

Exception: An automatic residential fire sprinkler system shall not be required for *additions* or *alterations* to existing buildings that are not already provided with an automatic residential sprinkler system.

R313.2.1 Design and installation. Automatic residential fire sprinkler systems shall be designed and installed in accordance with Section P2904 or NFPA 13D.

R323.1 General. This section applies to storm shelters where constructed as separate detached buildings or where constructed as safe rooms within buildings for the purpose of providing refuge from storms that produce high winds, such as tornadoes and hurricanes. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC/NSSA-500, except when located below grade or if basement walls are fully constructed with concrete.

R403.1.7 Footings on or adjacent to slopes. The placement of buildings and structures on or adjacent to slopes steeper than one unit vertical in three units horizontal (33.3-percent slope) shall conform to Sections R403.1.7.1 through R403.1.7.4 or plans as signed and sealed by a registered engineer.

Table R404.1.2(10) Concrete Foundation Walls

<u>Maximum Wall Height</u>	<u>Maximum Depth of Unbalanced Backfill</u>	<u>Minimum Nominal Wall Thickness</u>
<u>7'-0"</u>	<u>6'-0" or less</u>	<u>8"</u>
	<u>7'-0"</u>	<u>10" (Note a)</u>
<u>8'-0"</u>	<u>6'-0 or less</u>	<u>8" (Note a)</u>
	<u>7'-0"</u>	<u>8" (Note a)</u>
	<u>8'-0"</u>	<u>8" (Note a)</u>

<u>9'-0"</u>	<u>6'-0" or less</u>	<u>10" (Note b)</u>
	<u>7'-0"</u>	<u>10" (Note b)</u>
	<u>8'-0"</u>	<u>10" (Note b)</u>
	<u>9'-0"</u>	<u>10" (Note b)</u>

Note a: Concrete foundation walls may be constructed a minimum of nominal 8 inches thick where the wall height from the top of the footing to the top of the wall does not exceed 8 feet. A minimum of two #4 reinforcing bars shall be placed horizontally in the top and bottom of the foundation wall. A minimum of two #5 reinforcing bars shall be provided around all window and door openings in concrete foundation and basement walls; bars shall extend a minimum of 24 inches beyond the corners of the openings.

Note b: Concrete foundation walls may be constructed a minimum of nominal 10 inches thick. A minimum of two #5 reinforcing bars shall be placed horizontally in the top, middle, and bottom of the foundation wall. A minimum of two #5 reinforcing bars shall be provided around all window and door openings in concrete foundation and basement walls; bars shall extend a minimum of 24 inches beyond the corners of the openings.

The concrete minimum nominal wall thickness shall be 8 inches for foundation walls in soil classes SC, MH, ML-MC and inorganic CL when the maximum wall height is 8 feet.

The concrete minimum wall thickness shall be 10 inches for foundation walls in soil classes SC, MH, ML-CL and inorganic CL when the maximum wall height is 9 feet.

The concrete minimum wall thickness shall be 12 inches for foundation walls in soil classes SC, MH, ML-CL and inorganic CL when the maximum wall height is 10 feet.

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

Exceptions:

1. A drainage system is not required where the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I soils, as detailed in Table R405.1.
2. Drains provided as detailed in Section R405.1.2 are approved as an alternative method to meet the requirements of this section.

R405.1.2 Soil evaluations. An evaluation of the soil for the presence or absence of groundwater is required. The evaluation report shall be based on either a subsurface soil investigation or satisfactory data from adjacent areas together with an inspection of the excavation prior to pouring concrete.

R405.1.2.1 Groundwater present. Provide drain tile, perforated pipe or other approved foundation drainage systems (such as water channel system) around perimeter of the outside of the foundation and inside the foundation. Drain discharge shall be by gravity to daylight or be connected to a basement floor sump.

R405.1.2.2 No groundwater present. Provide drain tile, perforated pipe or other approved foundation drainage systems (such as water channel system) around perimeter of the outside of the foundation or inside the foundation. Drain discharge shall be by gravity to daylight or be connected to a basement floor sump.

R405.1.2.3 Filter membranes. An approved filter membrane shall be placed over the top of the joints/pipe perforations. The tile/pipe shall be placed on 2 inches minimum of gravel or crushed stone and have 6 inches of minimum cover.

R405.1.2.4 Drainage system. A drainage system shall discharge by gravity to daylight or be connected to an approved sump (15 inches in diameter x 18 inches deep with fitted cover). A sump pump shall be provided if the basement is finished or partially finished with pump discharge by an approved method.

R507.2.4 Deck lateral load connection. ~~The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3(1) or R507.2.3(2). Where the lateral load connection is provided in accordance with Figure R507.2.3(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672 N). Where the lateral load connections are provided in accordance with Figure R507.2.3(2), the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds (3336 N).~~

R602.3.5 Braced wall panel uplift load path. Braced wall panels located at exterior walls that support roof rafters or trusses (including stories below top story) shall have the framing members connected in accordance with one of the following:

1. Fastening in accordance with Table 602.3(1) where:
 - 1.1 The ultimate design wind speed does not exceed ~~45~~ 125 mph (~~51~~ 56 m/s), the wind exposure category is B, the roof pitch is 5:12 or greater, and the roof span is 32 feet (9754 mm) or less.

1.2 The net uplift value at the top of a wall does not exceed 100 plf (146 N/mm). The net uplift value shall be determined in accordance with Section R802.11 and shall be permitted to be reduced by 60 plf (86 N/mm) for each full wall above.

~~2. Where the net uplift value at the top of a wall exceeds 100 plf (146 N/mm), installing approved uplift framing connectors to provide a continuous load path from the top of the wall to the foundation or to point where the uplift force is 100 plf (146 N/mm) or less. The net uplift value shall be as determined in Item 1.2 above.~~

2. Wall sheathing and fasteners designed to resist combined uplift and shear forces in accordance with accepted engineering practice.

R602.7.5 Supports for headers. Headers shall be supported on each end with one or more jack studs or with approved framing anchors in accordance with table R602.7(1) or R602.7.(2). The full-height stud adjacent to each end of the header shall be end nailed to each end of the header with four-16d nails (3.5 inches x 0.135 inches). The minimum number of full-height studs at each end of a header shall be in accordance with Table R602.7.5.

Table R602.7.5

Minimum Number of Full Height Studs at Each End of Headers in Exterior Walls

Header Span (feet)	Maximum Stud Spacing (Inches) [per Table R602.3(5)]	
	16	24
≤3'	1	1
4'	2 <u>1</u>	1
8'	3 <u>1</u>	2 <u>1</u>
12'	5 <u>1</u>	3 <u>1</u>
16'	6 <u>1</u>	4 <u>1</u>

R602.13 Alternate simplified bracing method for one- and two-family dwellings when the entire structure is sheathed with wood structural panels and located in wind exposure A or B. The

construction documents shall detail the locations and widths of all braced wall panels in accordance with this section.

R602.13.1 Wood structural sheathing. The building exterior walls shall be sheathed with 7/16 inch (11.1 mm) or thicker plywood or OSB wood structural panels. The wood structural panels shall be applied to all exterior walls, gable ends and band boards. All vertical joints between panels shall be blocked. Horizontal joints in braced wall panels shall be blocked.

R602.13.2 Braced wall panel locations. Braced wall panels shall be located in every exterior braced wall line in accordance with the following criteria:

1. The outside edge of the first braced wall panel meeting the width established in Table R602.13.3 shall be a maximum of 12.5 feet (3810 mm) or less from each end of the braced wall line. The outside stud of the first braced wall panels closest to the end of the braced wall line shall be secured with a hold-down device securing the end stud to the foundation with a minimum uplift design value of 800 pounds.

Exception: The 800 pound hold-down device is not required when the braced wall panel is placed at the end of the braced wall line and there is a 24 inch (610 mm) wide full height sheathed wall placed 90 degrees to the end of the braced wall line and panel.

2. The centerline spacing of braced wall panels in a braced wall line may not exceed 25 feet (7620 mm).

R602.13.3 Braced wall panel widths. Braced wall panel locations shall be shown on the floor plans or elevation views and meet the widths established in Table R602.13.3.

Table 602.13.3
Simplified Bracing Panel Widths

		Width of Solid Panel ^{a, b}			
		8' wall height	9' wall height	10' wall height	12' wall height
Plywood/OSB Panel	3:1	32"	36"	40"	48"
Simplified Portal Wall ^c	6:1	16" ^d	18" ^d	20" ^d	24" ^d

- a. Linear interpolation is permitted.
- b. Wall height is the vertical distance from the bottom of the sole/sill plate to the top of the double top plate. An additional 2 inch (50.8 mm) variation in height is allowed for pre-cut stud framing.
- c. The Simplified Portal Wall, if applicable, shall be constructed in accordance with the applicable detail in Figure R602.13.3. The designer shall provide this detail on the construction documents.
- d. The Simplified Portal Wall width assumes the beam is placed under the top plate of the wall. A smaller width may be calculated for a lower top of beam height using the 6:1 height to width ratio.

R602.13.4 Corner framing. The exterior wall corners shall be constructed in accordance with the applicable detail in Figure R602.10.10.4.

Exception: Braced wall panels located in accordance with Section R602.13.2.

R602.13.5 Braced wall line spacing. When the perpendicular distance between the exterior braced wall lines exceeds 50 feet (15240 mm), the registered design professional shall include the following certification on the drawings: The interior and exterior wall configuration braces for the structure in accordance with or equivalent to the lateral bracing provisions of Section R602.10 of the *International Residential Code*, 2009 edition or Section 2305 of the *International Building Code*, 2009 edition.

R602.13.6 Maximum wall height. Walls greater than 12 feet (3658 mm) (12 feet 2 inches (3708 mm) actual) in height and 12 feet (3658 mm) in width shall be designed and detailed by the registered design professional to resist wind loads in both the longitudinal and transverse directions.

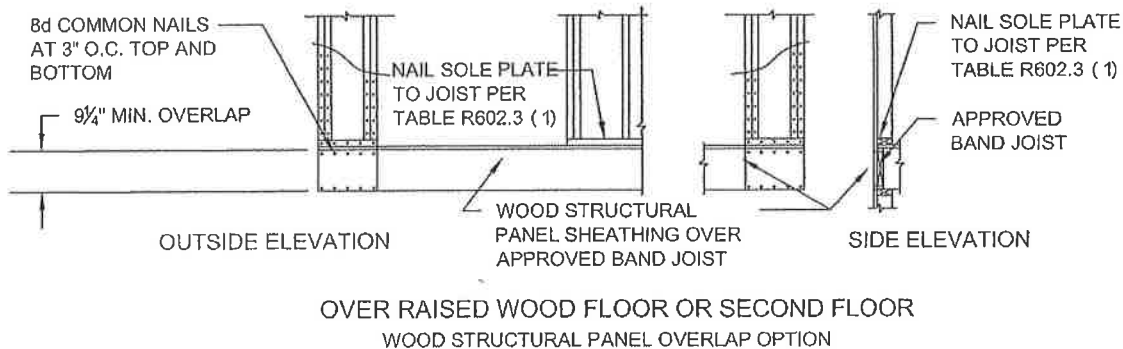
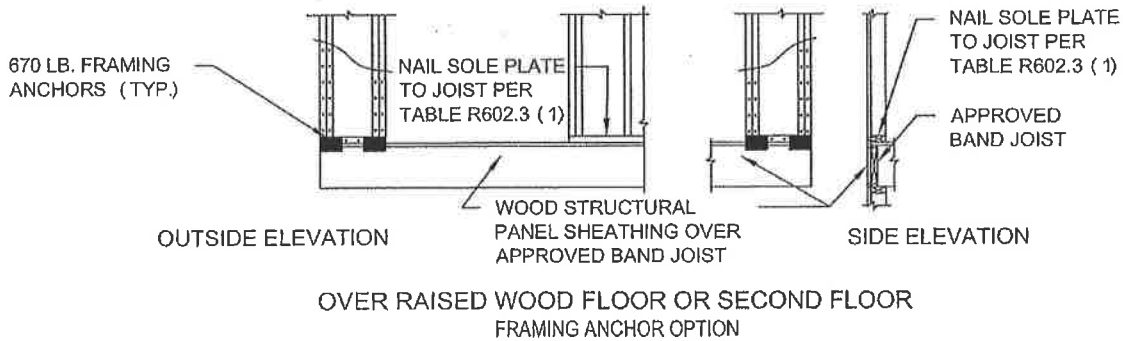
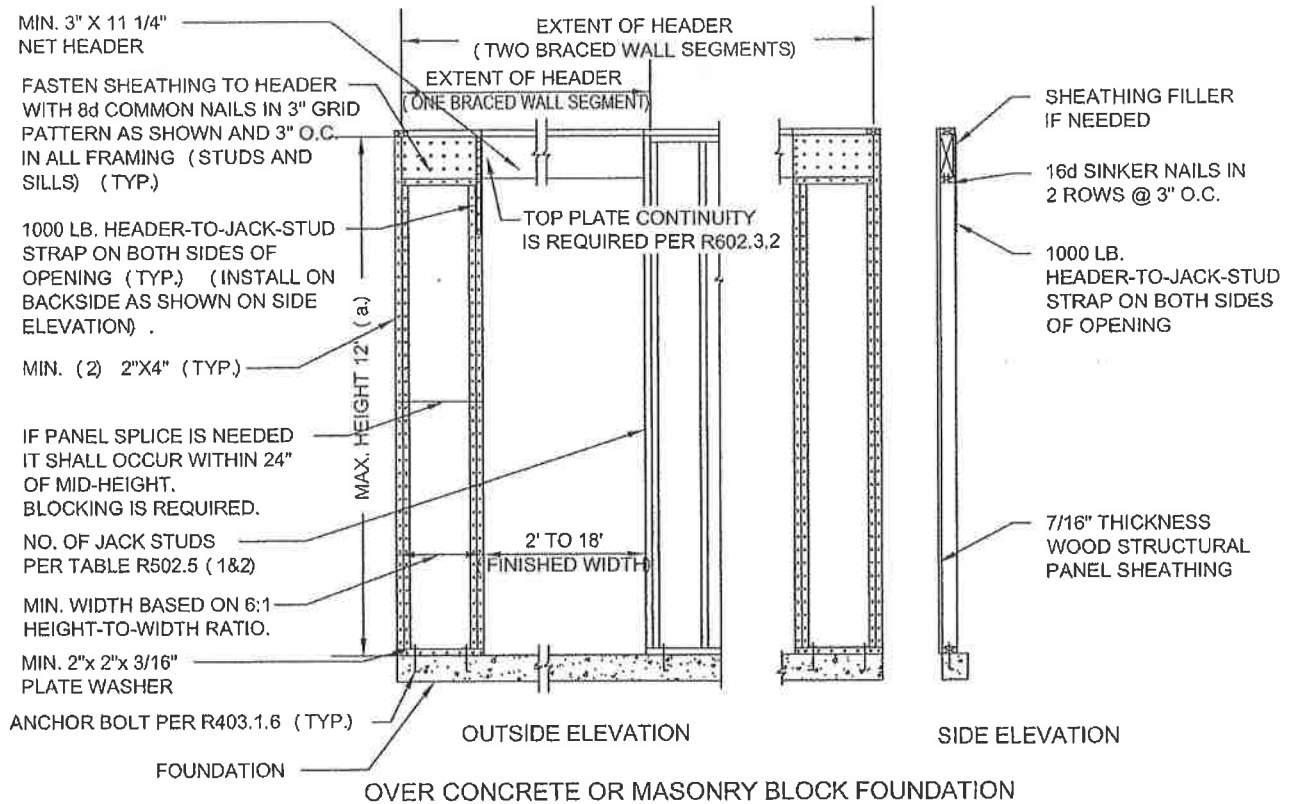


FIGURE R602.13.3

SIMPLIFIED PORTAL WALL

- a. CRIPPLE WALL FRAMING CONSISTING OF STUD FRAMING, SINGLE BOTTOM PLATE, AND DOUBLE TOP PLATE MAY BE ADDED TO THE TOP OF THE NARROW PORTAL WALL AS LONG AS THE COMBINED HEIGHT OF THE TWO WALLS IS LESS THAN OR EQUAL TO 12 FEET AND THE TWO WALLS ARE STRAPPED TOGETHER ON THE INTERIOR SIDE WITH A 16 GAUGE METAL 1 1/2 INCH WIDE BY 21 INCH LONG STRAP. A MINIMUM 10 INCHES OF THE STRAP SHALL BE CONNECTED TO EACH WALL OR GABLE TRUSS WITH 9 - 16D NAILS FOR A TOTAL OF 18-16D NAILS IN THE ENTIRE STRAP. STRAPS SHALL BE LOCATED AT EACH END OF THE CONNECTED WALLS OR WALL AND GABLE TRUSS WHERE SPACE ALLOWS FOR THE 10 INCH LENGTH OF STRAP. THE SPACING BETWEEN THE STRAPS MAY NOT EXCEED 4 FEET ON CENTER. THE STRAPS SHALL NOT BE BENT HORIZONTALLY TO ACCOMMODATE WOOD FRAMING. IF APPLICABLE, NAILERS SHALL BE ADDED TO ONE OF THE WALLS OR GABLE END USING A MINIMUM OF 9-16D NAILS TO CREATE THE VERTICAL PLANE NEEDED TO MOUNT THE STRAP.

MINIMUM 24" WIDE FULL HEIGHT
7/16" WOOD STRUCTURAL PANEL
8d NAIL AT 6" O.C. ON ALL
FRAMING MEMBERS AT PANEL EDGES
AND 12" O.C. ON ALL FRAMING
MEMBERS NOT AT PANEL EDGES

2-16d NAILS AT 24" O.C.

8d NAIL AT 8" O.C.
(ALL PANEL EDGES)

GYPSUM WALL BOARD INSTALLED IN
ACCORDANCE WITH TABLE R602.3(1)

WOOD STRUCTURAL
PANEL INSTALLED IN
ACCORDANCE WITH
TABLE 602.10.10.3

8d NAIL AT 12" O.C. ON ALL
FRAMING MEMBERS NOT AT PANEL EDGES

(a.)

OUTSIDE CORNER DETAIL

GYPSUM WALL BOARD INSTALLED IN
ACCORDANCE WITH TABLE R602.3(1)

2-16d NAILS AT 24" O.C.

WOOD STRUCTURAL
PANEL INSTALLED IN
ACCORDANCE WITH
TABLE 602.10.10.3

MINIMUM 24" WIDE FULL HEIGHT 7/16" WOOD
STRUCTURAL PANEL 8d NAIL AT 6" O.C.
ON ALL FRAMING MEMBERS AT PANEL EDGES
AND 12" O.C. ON ALL FRAMING MEMBERS NOT
AT PANEL EDGES

INSIDE CORNER DETAIL

MINIMUM 24" WIDE FULL
HEIGHT 7/16" WOOD
STRUCTURAL PANEL

8d NAIL AT 6" O.C. IN ALL
PANEL EDGES AND 12" O.C.
ON ALL FRAMING MEMBERS
NOT AT PANEL EDGES THAT
IS NOT PART OF PORTAL FRAME

(2) 16d NAILS AT 24" O.C.

FRAMING BOARD FOR GYPSUM
WALL BOARD (OPTIONAL), THIS
STUD MAY BE ROTATED 90°

SIMPLIFIED PORTAL FRAME
WALL SEE FIGURE R602.10.10(3)

(a.)

CORNER DETAIL

USED IN CONJUNCTION WITH SIMPLIFIED PORTAL WALL

**FIGURE R602.10.10.4
SIMPLIFIED BRACING EXTERIOR CORNER FRAMING**

- a. END STUD INDICATED ON THE ABOVE DETAILS MAY BE SHIFTED 7/16" TO ALLOW STUD FACE TO BE ALIGNED WITH SHEATHING, OR AN OPTIONAL NON-STRUCTURAL FILLER PANEL MAY BE USED.

R905.2.8.2 Valleys. Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be not less than 24 inches (610 mm) wide and of any of the corrosion-resistant metals in table R905.2.8.2.
2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing, complying with ASTM D 3909 or ASTM D 6380 Class M, shall be permitted. The bottom layer shall be 18 inches (457 mm) and the top layer not less than 36 inches (914 mm) wide.
3. For closed valleys (valley covered with shingles), valley lining of ~~one~~ two ~~ply of smooth roll roofing No. 15 felt~~ complying with ~~ASTM D 6380 and not less than 36 inches wide (914 mm)~~ ASTM D 226 Type I, ASTM D 4869 Type I, or ASTM D 6757, or valley lining as described in Item 1 and 2 shall be permitted. Self-adhering polymer modified bitumen underlayment complying with ASTM D 1970 shall be permitted in lieu of the lining material.

~~**R905.2.8.5 Drip Edge.** A drip edge shall be provided at eaves and rake edges of shingle roofs. Adjacent segments of drip edge shall be overlapped not less than 2 inches (51 mm). Drip edges shall extend not less than 1/4 inch (6.4 mm) below the roof sheathing and extend up back onto the roof deck not less than 2 inches (51 mm). Drip edges shall be mechanically fastened to the roof deck at not more than 12 inches (305 mm) o.c. with fasteners as specified in Section R905.2.5. Underlayment shall be installed over the drip edge along eaves and under the underlayment along rake edges.~~

R1005.7 Factory-built chimney offsets. Where a factory-built chimney assembly incorporates offsets, no part of the chimney shall be at an angle of more than 30 degrees (0.52 rad) from vertical at any point in the assembly and the chimney assembly shall not include more than four elbows.

Exception: When chimneys are installed per manufacturer's installation instructions.

R1006.1.1 Factory-built fireplaces. Exterior *combustion air* ducts for factory-built fireplaces shall be a *listed* component of the fireplace or equivalent and shall be installed according to the fireplace manufacturer's instructions.

R1006.2 Exterior air intake. The exterior air intake on masonry fireplaces shall be capable of supplying ~~all~~ *combustion air* from the exterior of the *dwelling* or from spaces within the *dwelling* ventilated with outdoor air such as nonmechanically ventilated crawl or *attic* spaces. The exterior air intake shall not be located within the garage or basement of the dwelling. The exterior air intake, for other than listed factory-built fireplaces, shall not be located at an elevation higher than the firebox. The exterior air intake shall be covered with a corrosion-resistant screen of 1/4-inch (6.4 mm) mesh.

N1101.4 (R102.1.1) Above code programs. The *Building Official* or other authority having jurisdiction shall be permitted to deem a national, state or local energy-efficiency program to exceed the energy efficiency required by this code. Buildings *approved* in writing by such an energy-efficiency program shall be considered in compliance with this code. ~~The requirements identified as “mandatory” in this chapter, as applicable, shall be met.~~

~~**N1101.5 (R103.2) Information on construction documents.** Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *building official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable:~~

- ~~1. Insulation materials and their *R*-values.~~
- ~~2. Fenestration, *U*-factors and SHGCs.~~
- ~~3. Area-weighted *U*-factor and SHGC calculations.~~
- ~~4. Mechanical system design criteria.~~
- ~~5. Mechanical and service water heating system and equipment types, sizes and efficiencies.~~
- ~~6. Equipment and system controls.~~
- ~~7. Duct sealing, duct and pipe insulation and location.~~
- ~~8. Air sealing details.~~

~~**N1101.5.1 (R103.2.1) Thermal envelope depiction.** The building’s thermal envelope shall be represented on the construction drawings.~~

N1101.6 (R202) Defined terms.

PROJECTION FACTOR. The ratio of the horizontal depth of an overhang, eave, or permanently attached shading device, divided by the distance measured vertically from the bottom of the fenestration glazing to the underside of the overhang, eave, or permanently attached shading device.

N1101.13 (R401.2) Compliance. Projects shall comply with one of the following:

1. Sections N1101.14 through N1104 as amended.
2. Section N1105 and the provisions of Sections N1101.14 through N1104 labeled “Mandatory.”
3. An energy rating index (ERI) approach in Section N1106.

~~**N1101.14 (R401.3) Certificate (Mandatory).** A permanent certificate shall be completed by the builder or registered design professional and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an~~

electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawl space wall and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters.

Table N1102.1.2 (R402.1.2)

Insulation and Fenestration Requirements by Component^a

Climate Zone	Fenestration <i>U</i> -Factor ^b	Skylight ^b <i>U</i> -Factor	Glazed Fenestration SHGC ^{b,e}	Ceiling <i>R</i> -Value	Wood Frame Wall <i>R</i> -Value	Mass Wall <i>R</i> -Value ⁱ	Floor <i>R</i> -Value	Basement ^c Wall <i>R</i> -Value	Slab ^d <i>R</i> -Value & Depth	Crawl Space ^c Wall <i>R</i> -Value
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.35 <u>0.40</u>	0.55	0.40 <u>NR</u>	49 <u>38</u>	20 or 13 + 5 ^h <u>13</u>	8/13	19	10/13 <u>0^j</u>	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13 + 5 ^h	13/17	30 ^e	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 + 5 or 13 + 10 ^h	15/20	30 ^e	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 + 5 or 13 + 10 ^h	19/21	38 ^e	15/19	10, 4 ft	15/19

For SI: 1 foot = 304.8mm.

- a. *R*-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall not be less than the *R*-value specified in the table.

- b. The fenestration U -factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
- c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- d. R-5 shall be added to the required slab edge R -values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 or Table N1101.10.
- g. Or insulation sufficient to fill the framing cavity, R-19 minimum.
- h. The first value is cavity insulation, the second value is continuous insulation, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- i. The second R -value applies when more than half of the insulation is on the interior of the mass wall.
- j. Exception: Unfinished basements may have up to a maximum of 20 percent of the total basement wall area exposed above the outside finished grade/ground level as uninsulated concrete foundation walls. The foundation wall area above the outside grade/ground level that may be uninsulated is determined by the formula [.20 times the basement wall height of all walls (including insulated exterior frame walls for walkout basements and walls common to both basement and attached garages) times the perimeter of these basement walls]. In unfinished areas, the basement foundation wall insulation shall extend down to the basement floor slab or to a minimum of 24 inches below outside finished grade when the grade is above the floor slab elevation.

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

N1102.1.5 (R402.1.5) Total UA alternative. If the total *building envelope* UA (sum of U -factor times assembly area) is less than or equal to the total UA resulting from using the U -factors in Table N1102.1.4 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table N1102.1.2. The UA calculation shall be done using a method consistent with the ASHRAE *Handbook of Fundamentals* and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance.

Exception: Glazed fenestration SHGC. In Climate Zone 4, permanently shaded vertical fenestration shall be permitted to satisfy SHGC requirements. The projection factor of an overhang, eave, or permanently attached shading device shall be greater than or equal to the value listed in Table N1102.2.2.1 for the appropriate orientation. The minimum projection shall extend beyond each side of the glazing a minimum of 12 inches. Each orientation shall be rounded to the nearest cardinal orientation (+/- 45 degrees or 0.79 rad) for purposes of calculations and demonstrating compliance.

Table N1102.1.5
Minimum Projection Factor Required by Orientation for SHGC Exception

Orientation	Projection Factor
<u>North</u>	<u>$\geq 0.40^a$</u>
<u>South</u>	<u>≥ 0.20</u>
<u>East</u>	<u>≥ 0.50</u>
<u>West</u>	<u>≥ 0.50</u>

- a. For the north orientation, a vertical projection located on the west-edge of the fenestration with the equivalent of $PF \geq 0.15$ shall also satisfy the minimum projection factor requirement.

N1102.2.4 (R402.2.4) Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be ~~weatherstripped and~~ insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose-fill insulation is installed, the purpose of which is to prevent the loose-fill insulation from spilling into the living space when the attic access is opened, and to provide the permanent means of maintaining the installed *R*-value of the loose-fill insulation.

Exception: Vertical doors that provide access from the conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table R1102.1.2 based on the applicable climate zone specified in Chapter 3.

N1102.4 (R402.4) Air leakage (~~Mandatory~~). The *building thermal envelope* shall ~~may~~ be designed and constructed to limit air leakage in accordance with the requirements of Sections R1102.4.1 through R1102.4.4.

N1102.4.1 (R402.4.1) Building thermal envelope. The *building thermal envelope* shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1102.4.1.1 (R402.4.1.1) Installation. The components of the *building thermal envelope* as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction. Where required by the *Building Official*, an approved third party shall inspect all components and verify compliance.

N1102.4.1.2 (R402.4.1.2) Testing. ~~The~~ Any building or dwelling unit shall ~~may~~ be tested and verified as having an air leakage rate of not exceeding five air changes per hour in Climate Zones 1 and 2, and ~~three air changes per hour in Climate Zones 3 through 8~~ Zone 4. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *Code Official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *Code Official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

During testing:

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

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

Component	Air Barrier Criteria	Insulation Installation Criteria
General Requirements	<p>A continuous air barrier shall be installed in the building envelope.</p> <p>The exterior thermal envelope contains a continuous air barrier.</p> <p>Breaks or joints in the air barrier shall be sealed.</p>	<p>Air-permeable insulation shall not be used as a sealing material.</p>
Ceiling/attic	<p>The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed.</p> <p>Access openings, drop-down stairs or knee wall doors to unconditioned attic spaces shall be sealed.</p>	<p>The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</p>
Walls	<p>The junction of the foundation and sill plate shall be sealed.</p> <p>The junction of the top plate and the top of the exterior walls shall be sealed.</p> <p>Knee walls shall be sealed.</p>	<p>Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum.</p> <p>Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.</p>
Windows, skylights and doors	<p>The space between window/door jambs and framing, and skylights and framing shall be sealed.</p>	
Rim joists	<p>Rim joists shall include the air barrier.</p>	<p>Rim joists shall be insulated.</p>
Floors (including above garage and cantilevered floors)	<p>The air barrier shall be installed at any exposed edge of insulation.</p>	<p>Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side</p>

		of sheathing, or continuous insulation installed on the underside of floor framing; and extends from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with Class I vapor retarder with overlapping joists taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawl space walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC-rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from showers and tubs.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.	
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	

Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	
----------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

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

N1102.4.4 (R402.4.4) Rooms containing fuel-burning appliances. In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel-burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table N1102.1.2, where the walls, floors and ceilings shall meet a minimum of the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section N1103. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Sections N1102.4.2 and R1006.
3. Mechanical equipment in an unfinished space.

N1102.4.5 (R402.4.5) Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall may be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall may be IC-rated and labeled as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E 283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall may be sealed with a gasket or caulk between the housing and interior wall or ceiling covering.

N1103.1.1 (R403.1.1) Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed by the manufacturer with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C).

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

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

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

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

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

N1103.4.1 (R403.4.1) Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

N1103.6 (R403.6) Mechanical ventilation (Mandatory). The building shall be provided with ventilation that meets the requirements of Section M1507 of this code or the *International Mechanical Code*, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

N1103.6.1 (R403.6.1) Whole-house mechanical ventilation system fan efficacy. Mechanical ventilation system fans shall meet the efficacy requirements of Table N1103.6.1.

Exception: Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.

Table N1103.6.1 (R403.6.1)

Mechanical Ventilation System Fan Efficacy

Fan Location	Air Flow Rate Minimum (cfm)	Minimum Efficacy (cfm/watt)	Air Flow Rate Maximum (cfm)
--------------	--------------------------------	--------------------------------	--------------------------------

Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cubic foot per minute = 28.3 L/min.

N1103.7 (R403.7) Equipment sizing and efficiency rating (Mandatory). Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

~~N1104 (R404) Electrical Power and Lighting Systems (Mandatory)~~

~~N1104.1 (R404.1) Lighting equipment (Mandatory).~~ Not less than 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or not less than 75 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

~~Exception:~~ Low-voltage lighting.

~~N1104.1.1 (R404.1.1) Lighting equipment (Mandatory).~~ Fuel gas lighting systems shall not have continuously burning pilot lights.

**Table N1105.5.2(1) [R405.5.2(1)]
Specifications for the Standard Reference and Proposed Designs**

Building Component	Standard Reference Design	Proposed Design
Above-grade walls	Type: mass wall if proposed wall is mass; otherwise wood frame	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table N1102.1.4	As proposed
	Solar absorptance = 0.75	As proposed
	Remittance = 0.90	As proposed
Basement and crawl space walls	Type: same as proposed	As proposed
	Gross area: same as proposed	As proposed

	<i>U</i> -factor: from Table N1102.1.4, with insulation layer on interior side of walls	As proposed
Above-grade floors	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	<i>U</i> -factor: as specified in Table N1102.1.4	As proposed
Ceilings	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	<i>U</i> -factor: as specified in Table N1102.1.4	As proposed
Roofs	Type: composition shingle on wood sheathing	As proposed
	Gross area: same as proposed	As proposed
	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Attics	Type: vented with aperture = 1 ft ² per 300 ft ² ceiling area	As proposed
Foundations	Type: same as proposed	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed	As proposed
Opaque doors	Area: 40 ft ²	As proposed
	Orientation: North	As proposed
	<i>U</i> -factor: same as fenestration from Table N1102.1.4	As proposed
Vertical fenestration other than opaque doors	Total area ^b = <ul style="list-style-type: none"> a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area 	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W)	As proposed
	<i>U</i> -factor: as specified in Table N1102.1.4	As proposed

	SHGC: as specified in Table N1102.1.2 except that for climates with no requirement (NR) SHGC = 0.40 shall be used	As proposed
	Interior shade fraction: $0.92 - (0.21 \times \text{SHGC for the standard reference design})$	$0.92 - (0.21 \times \text{SHGC as proposed})$
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air exchange rate	<p>Air leakage rate of 5 air changes per hour in Climate Zones 4 and 2, and 3 air changes per hour in Climate Zones 3 through 8 at a pressure of 0.2 inches w.g. (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p>$CFA$ = conditioned floor area</p> <p>N_{br} = number of bedrooms</p> <p>Energy recovery shall not be assumed for mechanical ventilation</p>	<p>For residences that are not tested, the same air leakage rate as the standard reference design.</p> <p>For tested residences, the measured air exchange rate^a.</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be proposed.</p>
Mechanical ventilation	<p>None, except where mechanical ventilation is specified by the proposed design, in which case:</p> <p>Annual vent fan energy use:</p> <p>$\text{kWh/yr} = 0.03942 \times CFA + 29.565 \times (N_{br} + 1)$</p> <p>where:</p> <p>$CFA$ = conditioned floor area</p> <p>N_{br} = number of bedrooms</p>	As proposed

Internal gains	$IGain = 17,900 + 23.8 \times CFA + 4104 \times N_{br}$ (Btu/day per dwelling unit)	Same as standard reference design.
Internal mass	An internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element ^c but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs, 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air	As proposed
	For masonry basement walls, as proposed, but with insulation required by Table R402.1.4 located on the interior side of the walls	As proposed
	For other walls, for ceilings, floors, and interior walls, wood frame construction	As proposed
Heating systems ^{d, e}	<p>As proposed for other than electric heating without a heat pump, where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC Commercial Provisions. <u>Fuel type: same as the proposed design</u></p> <p><u>Efficiencies:</u> <u>Electric: air-source heat pump with prevailing federal minimum standards</u> <u>Nonelectric Furnaces: natural gas furnace with prevailing federal minimum standards</u> <u>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards</u></p> <p>Capacity: sized in accordance with Section N1103.7</p>	As proposed
Cooling systems ^{d, f}	<p>As proposed <u>Fuel type: electric</u> <u>Efficiency: in accordance with prevailing federal minimum standards</u> Capacity: sized in accordance with Section</p>	As proposed

	N1103.7	
Service water heating ^{d, e, f}	<p>As proposed</p> <p>Use: same as proposed design</p> <p>Fuel type: same as proposed design</p> <p>Efficiency: in accordance with prevailing federal minimum standards</p> <p>Use: $gal/day = 30 + 10 \times N_{br}$</p> <p>Tank temperature: 120°F</p>	<p>As proposed</p> <p>$gal/day = 30 + (10 \times N_{br})$</p> <p>Same as standard reference</p>
Thermal distribution systems	<p>Duct insulation: from Section N1103.2.1</p> <p>A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft² (9.29 m²) of conditioned floor area at a pressure of differential of 0.1 inches w.g. (25 Pa)</p>	<p>As tested or specified in Table R405.5.2(2) if not tested. Duct insulation shall be as proposed.</p>
Thermostat	<p>Type: Manual, cooling temperature setpoint = 75°F;</p> <p>Heating temperature setpoint = 72°F</p>	<p>Same as standard reference</p>

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad

- Where required by the *Code Official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent shall be used to determine the energy loads resulting from infiltration.
- The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- Thermal storage element shall mean a component not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.
- For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

- e. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For the case of a proposed design without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

M1301.2 Identification. ~~Each length of pipe and tubing and each pipe fitting utilized in a mechanical system shall bear the identification of the manufacturer.~~

M1301.3 Installation of materials. ~~Materials shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer's instructions shall be followed. Where the requirements of referenced standards or manufacturer's instructions do not conform to minimum provisions of this code, the provisions of this code shall apply.~~

M1301.4 Plastic pipe, fittings and components. ~~Plastic pipe, fittings and components shall be third-party certified as conforming to NSF 14.~~

M1301.5 Third-party testing and certification. ~~Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section M1301.2. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved third-party certification agency.~~

M1305.1.4.1 Ground clearance. *Equipment and appliances* supported from the ground shall be level and firmly supported on a concrete slab or other *approved* material extending not less than 3 2 inches (76 50.8 mm) above the adjoining ground. Such support shall be in accordance with the manufacturer's installation instructions. *Appliances* suspended from the floor shall have a clearance of not less than 6 inches (152 mm) from the ground.

M1305.1.4.3 Electrical requirements. A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be installed at or near the *appliance* location in accordance with Chapter 39. Exposed lamps shall be protected from damage by location or lamp guards.

Exception: Basements

M1307.2 Anchorage of appliances. *Appliances* designed to be fixed in position shall be fastened or anchored in an *approved* manner. In Seismic Design Categories D₀, D₁ and D₂, and in townhouses in Seismic Design Category C, water heaters and thermal storage units shall be anchored or strapped to resist horizontal displacement caused by earthquake motion in accordance with one of the following:

1. Anchorage and strapping shall be designed to resist a horizontal force equal to one-third of the operating weight of the water heater storage tank, acting in any horizontal direction. Strapping shall be at points within the upper one-third and lower one-third of the *appliance's* vertical dimensions. At the lower point, the strapping shall maintain a minimum distance of 4 inches (102 mm) above the controls.
2. The anchorage strapping shall be in accordance with the appliance manufacturer's recommendations.

M1401.3 Equipment and appliance sizing. Heating and cooling *equipment and appliances* shall be sized in accordance with ~~ACCA Manual S or other approved sizing methodologies based on building loads calculated in accordance~~ with ACCA Manual J or other *approved* heating and cooling calculation methodologies.

Exception: Heating and cooling equipment and appliance sizing shall not be limited to the capacities determined in accordance with Manual S where either of the following conditions applies:

1. The specified equipment or appliance utilizes multistage technology or variable refrigerant flow technology and the loads calculated in accordance with the approved heating and cooling calculation methodology are within the range of the manufacturer's published capacities for that equipment or appliance.
2. The specified equipment or appliance manufacturer's published capacities cannot satisfy both the total and sensible heat gains calculated in accordance with the approved heating and cooling calculation methodology and the next larger standard size unit is specified.

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 or not less than 1/8 unit vertical in 12 units horizontal (1-percent slope). Drain piping shall be not less than 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 be not 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. Galvanized sheet steel pans shall have a minimum thickness of not less than ~~0.0236 inch (0.6010 mm)~~ (No. 24 26 Gage). Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).

M1501.1 Outdoor discharge. The air removed by every mechanical exhaust system shall be discharged to the outdoors in accordance with Section M1506.2. ~~Air shall not be exhausted into an attic, soffit, ridge vent or crawl space.~~

Exception: Whole-house *ventilation-type attic* fans that discharge into the *attic* space of *dwelling units* having private *attics* shall be permitted.

M1502.4.1 Material and size. Exhaust ducts shall have a smooth interior finish and be constructed of metal having a minimum thickness of 0.0157 inch (0.3950 mm) (No. ~~28~~ 30 gage). The duct shall be 4 inches (102 mm) nominal in diameter.

M1502.4.2 Duct installation. Exhaust ducts shall be supported at intervals not to exceed 12 feet (3658 mm) and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed in accordance with Section M1601.4.1 ~~and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude more than 1/8 inch (3.2 mm) into the inside of the duct.~~

M1502.4.5.1 Specified length. The maximum length of the exhaust duct shall be 35 feet (10 688 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table M1502.4.5.1. The maximum length of the exhaust duct does not include the transition duct.

Exception: The maximum developed length may be extended to 55 feet if clearly labeled cleanouts are provided within 12 inches of the second elbow, at every elbow thereafter, and at least every 15 feet of developed length thereafter.

M1503.4 Makeup air required. Exhaust hood systems capable of exhausting in excess of 400 ~~600~~ cubic feet per minute (~~0.19~~ m^3/s) shall be mechanically or naturally provided with makeup air at a rate approximately equal to the exhaust air rate. ~~Such makeup air systems shall be equipped with not less than one damper. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be accessible for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or replaced. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system.~~

M1506.3 Exhaust openings. Air exhaust openings shall terminate not less than 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable and nonoperable openings into the building and 10 feet (3048 mm) from mechanical air intakes except where the opening is located 3 feet (914 mm) above the air intake. Openings shall comply with Sections R303.5.2 and R303.6.

M1601.1 Duct design. *Duct systems* serving heating, cooling and *ventilation equipment* shall be installed in accordance with the provisions of this section, ~~and ACCA Manual D~~ the appliance manufacturer's installation instructions or other *approved* methods.

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

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

Table M1601.1.1

Duct Construction Minimum Sheet Metal Thickness for Single Dwelling Units^a

Round Duct Diameter (inches)	Static Pressure			
	½ inch water gage		1 inch water gage	
	Thickness (inches)		Thickness (inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤ 12	0.013	0.018	0.013	0.018
12 to 14	0.013	0.018	0.016	0.023
15 to 17	0.016	0.023	0.019	0.027
18	0.016	0.023	0.024	0.034
19 to 20	0.019	0.027	0.024	0.034

Rectangular Duct Dimension (<u>largest dimension</u>)	Static Pressure			
	½ inch water gage		1 inch water gage	
	Thickness (inches)		Thickness (inches)	
	Galvanized	Aluminum	Galvanized	Aluminum
≤ 8	0.013	0.018	0.013	0.018
9 to 10	0.013	0.018	0.016	0.023
11 to 12	0.016	0.023	0.019	0.027
13 to 16	0.019 0.016	0.027	0.019	0.027
17 to 18	0.019	0.027	0.024	0.034
19 to 20	0.024 0.019	0.034	0.024	0.034

For SI: 1 inch = 25.4 mm, 1 inch water gage = 249 Pa.

M1601.4.1 Joints, seams and connections. Joints of *duct systems* shall be made substantially airtight in an unconditioned area by means of tapes, mastics, liquid sealants, 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, 181A-M for mastic or 181A-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 1½ inches or at least three sheet metal screws or rivets equally spaced around the joint. Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer's installation instructions.

~~Longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards –Metal and Flexible and NAIMA Fibrous Glass Duct Construction Standards. Joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic plus embedded-fabric systems, liquid sealants or tapes. Tapes and mastics used to seal fibrous glass ductwork shall be listed and labeled in accordance with UL 181A and shall be marked “181A P” for pressure sensitive tape, “181A M” for mastic or “181A H” for heat-sensitive tape.~~

~~Tapes and mastics used to seal metallic and flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure sensitive tape or “181B-M” for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metallic ducts shall have a contact lap of not less than 1 inch (25 mm) and shall be mechanically fastened by means of not less than three sheet metal screws or rivets equally spaced around the joint.~~

~~Closure systems used to seal all ductwork shall be installed in accordance with the manufacturer's instructions.~~

Exceptions:

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

M1602.2 Return air openings. Return air openings for heating, ventilation and air conditioning systems shall comply with all of the following:

1. Openings shall not be located less than 10 feet (3048 mm) measured in any direction from an open combustion chamber or draft hood of another appliance located in the same room or space.
- ~~2. The amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space.~~
2. Return and transfer openings shall be sized in accordance with the appliance or equipment manufacturers' installation instructions, ~~Manual D~~ or the design of the registered design professional.
3. Return air shall not be taken from a ~~closet~~, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking appliances.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.
3. Taking return air from an unconditioned crawl space shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the crawl space enclosure shall not be prohibited.
4. Return air from one dwelling unit shall not be discharged into another dwelling unit.

G2408.4 (305.7) Clearances from grade. *Equipment and appliances* installed at grade level shall be supported on a level concrete slab or other *approved* material extending not less than ~~3~~ 2 inches (76 50.8 mm) above adjoining grade or shall be suspended not less than 6 inches (152 mm) above adjoining grade. Such supports shall be installed in accordance with the manufacturer's installation instructions.

G2409.1 (308.1) Scope. This section shall govern the reduction in required clearances to *combustible materials*, ~~including gypsum board~~, and *combustible assemblies* for chimneys, vents, appliances, devices and equipment. Clearance requirements for air-conditioning equipment and central heating boilers and furnaces shall comply with Sections G2409.3 and G2409.4.

G2412.9 (401.9) Identification. ~~Each length of pipe and tubing and each pipe fitting, utilized in a fuel gas system, shall bear the identification of the manufacturer.~~

G2412.10 (401.10) Third-party testing and certification. ~~Piping, tubing and fittings shall comply with the applicable referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section G2412.9. Piping, tubing and fittings shall either be tested by an approved third-party testing agency or certified by an approved *third-party certification agency*.~~

G2415.3 (404.3) Prohibited locations. *Piping* shall not be installed in or through a ducted supply, return or exhaust, or a clothes chute, *chimney* or gas vent, 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*.

G2428.3.16 (504.3.20) Chimney and vent locations. Tables G2428.3(1), G2428.3(2), G2428.3(3) and G2428.3(4) shall be used only for chimneys and vents not exposed to the outdoors below the roof line. A Type B vent or *listed* chimney lining system passing through an unused masonry chimney flue shall not be considered to be exposed to the outdoors. ~~Where vents extend outdoors above the roof more than 5 feet (1524 mm) higher than required by Figure G2427.6.3 and where vents terminate in accordance with the Section G2427.6.3, Item 2, the outdoor portion of the vent shall be enclosed as required by this section for vents not considered to be exposed to the outdoors or such venting system shall be engineered.~~ A Type B vent shall not be considered to be exposed to the outdoors where it passes through an unventilated enclosure or chase insulated to a value of not less than R8.

G2439.7.4.1 (614.8.4.1) Specified length. The maximum length of the exhaust duct shall be 35 feet (10 688 mm) from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table G2439.7.4.1. The maximum length of the exhaust duct does not include the transition duct.

Exception: The maximum developed length may be extended to 55 feet if clearly labeled cleanouts are provided within 12 inches of the second elbow, at every elbow thereafter, and at least every 15 feet of developed length thereafter.

G2442.4 (618.4) Prohibited sources. Outdoor or return air for forced-air heating and cooling systems shall not be taken from the following locations:

1. Closer than 10 feet (3048 mm) from an *appliance* vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet.
2. Where there is the presence of objectionable odors, fumes or flammable vapors; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley or driveway.
3. A hazardous or insanitary location or a refrigeration machinery room as identified in the *International Mechanical Code*.
4. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with Section G2442.2, 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 shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to such room or space.

5. A room or space containing an *appliance* where such a room or space serves as the sole source of return air.

Exception: This shall not apply where:

1. The *appliance* is a direct-vent *appliance* or an *appliance* not requiring a vent in accordance with Section G2425.8.
 2. The room or space complies with the following requirements:
 - 2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6L/W) of combined input rating of all fuel-burning appliances therein.
 - 2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.
 - 2.3. Return-air inlets shall not be located within 10 feet (3048 mm) of a draft hood in the same room or space or the combustion chamber of any atmospheric burner *appliance* in the same room or space.
 3. Rooms or spaces containing solid fuel-burning appliances, provided that return-air inlets are located not less than 10 feet (3048 mm) from the firebox of such appliances.
6. A closet, bathroom, toilet room, kitchen, garage, boiler room, furnace room or unconditioned attic.

Exceptions:

1. Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances and serve only the kitchen area, taking return air from a kitchen area shall not be prohibited.
 2. Dedicated forced air systems serving only a garage shall not be prohibited from obtaining return air from the garage
 3. Where a closet is provided with a supply register, taking return air from the closet shall not be prohibited.
7. A crawl space by means of direct connection to the return side of a forced-air system. Transfer openings in the crawl space enclosure shall not be prohibited.

P2503.5.1 Rough plumbing. DWV systems shall be tested on completion of the rough piping installation by water or, ~~for piping systems other than plastic,~~ by air without evidence of leakage. Either test shall be applied to the drainage system in its entirety or in sections after rough-in piping has been installed, as follows:

1. Water test. Each section shall be filled with water to a point not less than 5 feet (1524 mm) above the highest fitting connection in that section, or to the highest point in the completed system. Water shall be held in the section under test for a period of 15 minutes. The system shall prove leak free by visual inspection.
2. Air test. The portion under test shall be maintained at a gauge pressure of 5 pounds per square inch (psi) (34 kPa) or 10 inches of mercury column (34 kPa). This pressure shall be held without introduction of additional air for a period of 15 minutes.

P2603.4 Pipes through foundation walls. A pipe that passes through a foundation wall shall be provided with a relieving arch, or a pipe sleeve shall be built into the foundation wall. ~~The sleeve shall be two pipe sizes greater than the pipe passing through the wall.~~

~~Section P2603.5.1 Insert: 30 INTO THE 1ST [NUMBER]~~

~~Section P2603.5.1 Insert: 30 INTO THE 2ND [NUMBER]~~

~~**P2690.1 Identification.** Each length of pipe and each pipe fitting, trap, fixture, material and device utilized in a plumbing system shall bear the identification of the manufacturer and any markings required by the applicable referenced standards. Nipples created from the cutting and threading of *approved* pipe shall not be required to be identified.~~

~~**Exception:** Where the manufacturer identification cannot be marked on pipe fittings and pipe nipples because of the small size of such fittings, the identification shall be printed on the item packaging or on documentation provided with the item.~~

~~**P2609.2 Installation of materials.** Materials used shall be installed in strict accordance with the standards under which the materials are accepted and *approved*. In the absence of such installation procedures, the manufacturer's instructions shall be followed. Where the requirements of referenced standards or manufacturer's instructions do not conform to minimum provisions of this code, the provisions of this code shall apply.~~

~~**P2609.3 Plastic pipe, fittings and components.** Plastic pipe, fittings and components shall be third-party certified as conforming to NSF 14.~~

~~**P2609.4 Third-party certification.** Plumbing products and materials required by the code to be in compliance with a referenced standard shall be *listed* by a third-party certification agency as complying with the referenced standards. Products and materials shall be identified in accordance with Section P2609.1.~~

P2706.3 Prohibited waste receptors. Plumbing fixtures that are used for washing or bathing shall not be used to receive the discharge of indirect waste piping.

Exceptions:

1. A kitchen sink trap is acceptable for use as a receptor for a dishwasher.
2. A laundry tray is acceptable for use as a receptor for a clothes washing machine.
3. A drain or waste pipe above a trap is acceptable for use as a receptor for mechanical equipment condensate drains.

P2801.8 Water heater seismic bracing. In Seismic Design Categories D₀, D₁ and D₂ ~~and townhouses in Seismic Design Category C~~, water heaters shall be anchored or strapped in the upper one-third and in the lower one-third of the appliance to resist a horizontal force equal to one-third of the operating weight of the water heater, acting in any horizontal direction, or in accordance with the appliance manufacturer's recommendations.

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 the manufacturer's installation instructions. Water-hammer arrestors shall conform to ASSE 1010.

P2904.1 General. When installed, the design and installation of residential fire sprinkler systems shall be in accordance with NFPA 13D or Section 2904, which shall be considered equivalent to NFPA 13D. Partial residential sprinkler systems shall be permitted to be installed only in buildings not required to be equipped with a residential sprinkler system. Section P2904 shall apply to stand-alone and multipurpose wet-pipe sprinkler systems that do not include the use of antifreeze. A multipurpose fire sprinkler system shall provide domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. A backflow preventer shall not be required to separate a stand-alone system from the water distribution system.

R3201.2.1 Trap seal protection. Traps seals of emergency floor drain traps and traps subject to evaporation shall be protected by one of the methods in Sections P3201.2.1.1 through P3201.2.1.4.

Exception: Basement floor drains with a condensate line draining to it.

~~**E3609.3 Bonding for other systems.** An intersystem bonding termination for connecting intersystem bonding conductors required for other systems shall be provided external to enclosures at the service equipment or metering equipment enclosure and at the disconnecting means for any additional buildings or structures. The intersystem bonding termination shall comply with the following:~~

- ~~1. It shall be accessible for connection and inspection.~~
- ~~2. It shall consist of a set of terminals with the capacity for connection of not less than three intersystem bonding conductors.~~
- ~~3. It shall not interfere with opening of the enclosure for a service, building or structure disconnecting means, or metering equipment.~~
- ~~4. Where located at the service equipment, it shall be securely mounted and electrically connected to an enclosure for the service equipment, to the meter enclosure, or to an exposed nonflexible metallic service raceway, or shall be mounted at one of these enclosures and connected to the enclosure or to the grounding electrode conductor with a 6 AWG or larger copper conductor.~~
- ~~5. Where located at the disconnecting means for a building or structure, it shall be securely mounted and electrically connected to the metallic enclosure for the building or structure disconnecting means, or shall be mounted at the disconnecting means and connected to the metallic enclosure or to the grounding electrode conductor with a 6 AWG or larger copper conductor.~~
- ~~6. It shall be listed as grounding and bonding equipment. (250.94)~~

E3701.5.1 Disconnecting means. Each multiwire branch circuit shall may be provided with a means that will simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates. [210.4(B)]

E3901.2.2 Wall Space. As used in this section, a wall space shall include the following.

- 1 Any space that is 2 feet or more in width, including space measured around corners, and that is unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets.
- 2 The space occupied by fixed panels in exterior walls, excluding sliding panels.
- ~~3 The space created by fixed room dividers such as railings and freestanding bar-type counters.~~

E3902.2 Garage and accessory building receptacles. 125-volt, single-phase, 15- or 20-ampere receptacles installed in garage and grade-level portions of unfinished accessory buildings used for storage or work areas shall have ground-fault circuit-interrupter protection for personnel. [210.8(A)(2)]

Exception: Fastened in place appliances or outlets designated for refrigerators/freezers.

E3902.5 Unfinished basement receptacles. 125-volt, single-phase, 15- and 20-ampere receptacles installed in unfinished basements shall have ground-fault circuit-interrupter protection for personnel. For purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and similar areas. [210.8(A)(5)]

Exceptions:

1. A receptacle supplying only a permanently installed fire alarm or burglar alarm system. Receptacles installed in accordance with this exception shall not be considered as meeting the requirements of Section E3901.9.

2. Fastened in place appliances or outlets designated for refrigerators/freezers.

E3902.6 Kitchen receptacles. 125-volt, single-phase, 15- and 20-ampere receptacles that serve countertop surfaces shall have ground-fault circuit-interrupter protection for personnel. [210.8(A)(6)]

Exception: Fastened in place appliances or outlets designated for refrigerators/freezers.

~~**E3902.9 Laundry areas.** 125-volt, single-phase, 15- and 20-ampere receptacles installed in laundry areas shall have ground fault circuit interrupter protection for personnel. [210.8(A)(9)]~~

~~**E3902.10 Kitchen dishwasher branch circuit.** Ground-fault circuit-interrupter protection shall be provided for outlets that supply dishwashers in dwelling unit locations. [210.8(D)]~~

E3902.14 Location of ground-fault circuit interrupters. Ground-fault circuit interrupters shall be installed only in a readily accessible location. [210.8(A)]

~~**E3902.16 Arc-fault circuit-interrupter protection.** Branch circuits that supply 120-volt, single phase, 15- and 20-ampere outlets installed in kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas and similar rooms or areas shall be protected by any of following: [210.12(A)]~~

1. ~~A listed combination type arc fault circuit interrupter, installed to provide protection of the entire branch circuit. [210.12(A)(1)]~~
2. ~~A listed branch/feeder type AFCI installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit. [210.12(A)(2)]~~
3. ~~A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
 - 3.1 ~~The branch circuit wiring shall be continuous from the branch circuit overcurrent device to the outlet branch circuit arc fault circuit interrupter.~~
 - 3.2 ~~The maximum length of the branch circuit wiring from the branch circuit overcurrent device to the first outlet shall not exceed 50 feet (15.2 m) for 14 AWG conductors and 70 feet (21.3 m) for 12 AWG conductors.~~
 - 3.3 ~~The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit. [210.12(A)(3)]~~~~

4. ~~A listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet on the branch-circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:
 - 4.1 ~~The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.~~
 - 4.2 ~~The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 50 feet (15.2 m) for 14 AWG conductors and 70 feet (21.3 m) for 12 AWG conductors.~~
 - 4.3 ~~The first outlet box in the branch-circuit shall be marked to indicate that it is the first outlet on the circuit.~~
 - 4.4 ~~The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination type AFCI and shall be listed as such. [210.12(A)(4)]~~~~
5. ~~Where metal outlet boxes and junction boxes and RMC, IMC, EMT, Type MC or steel-armored Types AC cables meeting the requirements of Section E3908.8, metal wireways or metal auxiliary gutters are installed for the portion of the branch-circuit between the branch-circuit overcurrent device and the first outlet, a listed outlet branch-circuit type AFCI installed at the first outlet shall be considered as providing protection for the remaining portion of the branch-circuit. [210.12(A)(5)]~~
6. ~~Where a listed metal or nonmetallic conduit or tubing or Type MC cable is encased in not less than 2 inches (50.8 mm) of concrete for the portion of the branch-circuit between the branch-circuit overcurrent device and the first outlet, a listed outlet branch-circuit type AFCI installed at the first outlet shall be considered as providing protection for the remaining portion of the branch-circuit. [210.12(A)(6)]~~

Exception: AFCI protection is not required for an individual branch circuit supplying only a fire alarm system where the branch circuit is wired with metal outlet and junction boxes and RMC, IMC, EMT or steel-sheathed armored cable Type AC or Type MC meeting the requirements of Section E3908.8.

E3902.17 Arc-fault circuit interrupter protection for branch circuit extensions or modifications. Where branch-circuit wiring is modified, replaced, or extended in any of the areas specified in Section E3902.16, the branch-circuit shall be protected by one of the following:

1. ~~A combination type AFCI located at the origin of the branch circuit.~~
2. ~~An outlet branch-circuit type AFCI located at the first receptacle outlet of the existing branch circuit. [210.12(B)]~~

Exception: AFCI protection shall not be required where the extension of the existing conductors is not more than 6 feet (1.8 m) 30 feet (9.5 m) in length and does not include any additional outlets or devices. [210.12(B) Exception]

~~E4002.14 Tamper-resistant receptacles. In areas specified in Section E3901.1, 125-volt, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles. [406.12(A)]~~

~~**Exception:** Receptacles in the following locations shall not be required to be tamper-resistant.~~

- ~~1. Receptacles located more than 5.5 feet (1676 mm) above the floor.~~
- ~~2. Receptacles that are part of a luminaire or appliance.~~
- ~~3. A single receptacle for a single appliance or a duplex receptacle for two appliances where such receptacles are located in spaces dedicated for the appliances served and, under conditions of normal use, the appliances are not easily moved from one place to another. The appliances shall be cord and plug connected to such receptacles in accordance with Section E3909.4.~~

~~[406.12(A) Exception]~~

- D. That ORDINANCE NO 937A OF THE CITY OF TROY entitled 2009 International Residential Code and all other ordinances, laws or parts of ordinances and laws in conflict herewith are hereby repealed.
- E. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- F. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

8. Section 8: 500.037 International Swimming Pool and Spa Code (2015)4

- A. That a certain document, three (3) copies of which are on file in the office of the Building Official of City of Troy, being marked and designated as the *International Swimming Pool and Spa Code*, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Pool and Spa Code of the City of Troy, in the State of Missouri regulating and governing the design, construction, alteration, movement, renovation, replacement, repair and maintenance of swimming pools, spas, hot tubs, aquatic facilities and related equipment as herein provided; providing for the issuance of permits and collection of fees therefore; and each and all of the regulations, provisions, penalties, conditions and terms of said Pool and Spa Code on file in the office of the Building Official are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in Section 2 of this ordinance.
- B. The following sections of the International Swimming Pool and Spa Code (2015) are hereby revised:
 - Section 101.1. Insert: City of Troy into [NAME OF JURISDICTION]
 - Section 103 is deleted
 - Section 105.6 is deleted
 - Section 105.6.1 is deleted

Section 105.6.2. Insert: PER THE BUILDING PERMIT FEE SCHEDULE (SEE TABLE I TO TITLE IV OF THE MUNICIPAL CODE OF THE CITY OF TROY INTO [JURISDICTION TO INSERT APPROPRIATE SCHEDULE]

Section 105.6.3: Insert Zero into 2nd paragraph [SPECIFY PERCENTAGE]

Section 105.6.3: Insert One Hundred into 3rd paragraph [SPECIFY PERCENTAGE]

Section 107.4. Insert: PROCEEDING WITH WORK WITHOUT THE REQUIRED INSPECTION INTO [SPECIFY OFFENSE]

Section 107.4. Insert: \$500.00 into [AMOUNT]

Section 107.4. Insert: Zero into [NUMBER OF DAYS]

Section 107.5. Insert: Zero into 1st [AMOUNT]

Section 107.5. Insert: \$500.00 into 2nd [AMOUNT]

Section 108 is deleted

- C. That this Section and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.
- D. The City of Troy, Building Official is hereby ordered and directed to cause this legislation to be published.

9. **SECTION 9.** That if any section, subsection, sentence, clause or phrase of this legislation is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this ordinance. The BOARD OF ALDERMEN hereby declares that it would have passed this law, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional.

10. **SECTION 10.** That nothing in this legislation or in the Building Code hereby adopted shall be construed to affect any suit or proceeding impending in any court, or any rights acquired, or liability incurred, or any cause or causes of action acquired or existing, under any act or ordinance hereby repealed; nor shall any just or legal right or remedy of any character be lost, impaired or affected by this legislation.

11. **SECTION 11.** That this Ordinance and the laws, rules, regulations, provisions, requirements, orders and matters established and adopted hereby shall take effect and be in full force and effective on September 1st, 2016 which is after the date of the Ordinance's final passage and adoption.

Read and passed by the Board of Aldermen of the City of Troy, Missouri, This 17th Day of May 2016

Approved by the Mayor of the City of Troy this 17th Day of May 2016

Effective on September 1st, 2016

Mark A Cross

Mayor Mark A. Cross

ATTEST

Jodi L Schneider

City Clerk, Jodi L. Schneider