

DHCD, DBFR 2009 Code Change Process

May 13, 2009 Workgroup 4 (USBC/International Residential Code - IRC) Meeting Agenda Package

CARRY OVER ISSUES FROM LAST WORKGROUP MEETING:

1. R302.1 and P2904 – Townhouse sprinkler systems and porches (**Page 4**)
2. R310.1 – Emergency escape opening sprinkler exception (**Page 7**)
3. R317.1/R302.3 – Duplexes with lot lines between dwelling units (**Page 10**)
4. R401.3 – Drainage (**Page 12**)
5. G2411.1 – CSST (**Page 17**)
6. R314.2 – Household fire alarm systems (**Page 28**)
7. R301.2.1.1 – Engineered design for eastern shore (**Page 29**)
8. Chapter 11 – Energy Efficiency (**Page 32**)
9. E3902.11 – Arc-fault (**Page 35**)
10. R315 – Carbon monoxide alarms (**Page 39**)
11. Appendix O – Gray water recycling systems (**Page 40**)

NEW ISSUES/PROPOSALS

1. E4002.14 – Tamper-resistant receptacles (**Page 45**)
2. R602.10 – Wall bracing scope (**Page 53**)

**Board of Housing and Community Development (BHCD), Fire Services Board
(FSB) and BHCD's Codes and Standards Committee
2009 Regulatory Action and Meeting Dates**

These dates are subject to change.

January 26, 2009: BHCD presented with 2009 regulatory schedule.

March 23, 2009: BHCD approves Notice of Intended Regulatory Action (NOIRA).

May 18, 2009: BHCD's Codes and Standards Committee will meet from approximately 11:00 a.m. to 4:00 p.m. at DHCD, 1st floor board room (right after the BHCD board meeting that will be from 10:00 a.m. to 11:00 p.m.). Four Work Groups, advisory committees, Fire Services Code Committee and associations should have identified their 2009 code changes and gained consensus where possible.

June 22, 2009: BHCD's Codes and Standards Committee will meet to review non-consensus items at DHCD, 1st floor board room from 9:30 a.m. to 4:00 p.m.

July 27, 2009: BHCD will meet at VDHA, 4224 Cox Road (Innsbrook), 1st floor. BHCD and FSB Public Hearing at 9:30 a.m., Codes and Standards Committee following the hearing from approximately 11:00 a.m. to 12:15 p.m. and BHCD Board meeting at 1:00 p.m. to approve the 2009 proposed regulations.

August, September, and October, 2009: No meetings during this time as regulations are approved for publication and 60 days comment period.

November 16th or December 21st, 2009: BHCD's Codes and Standards Committee will meet to review public comments on the proposed regulations, carry-over code changes and new code changes.

January 18th or 25th, 2010: BHCD and FSB will hold a public hearing on the proposed regulations.

March 1, 2010: Deadline for new code changes.

May 17, 2010: BHCD's Codes and Standards Committee will meet to consider all code changes not approved, public comments or any new code changes and a final review of the regulations and approval to submit for the BHCD to approve.

June 21, 2010: BHCD approve final regulations with input from the FSB on the SFPC. Codes and Standards Committee will have a short meeting prior to the BHCD meeting.

September 30, 2010: Effective date of final regulations if approved by the OAG and Governor's Office.

(Updated March 27, 2009)

2009 BHCD Regulatory Cycle Schedule and Meetings for the USBC, SFPC, VADR, VCS, MHSR and the IBSR

March 19, 2009: Work Group 2 - Administrative and Selected Technical Issues for the USBC, SFPC, MHSR, IBSR, VADR and VCS Regulations meets.

March 23, 2009: BHCD approves the publication of the NOIRA's for each regulation.

March 26, 2009: Work Group 1 - USBC Energy Code Requirements meets.

April 2, 2009: Work Group 3 - USBC/SFPC Technical Amendments meets.

April 9, 2009: Work Group 4 - International Residential Code meets.

April 23, 2009: Work Group 1 - USBC Energy Code Requirements meets.

April 30, 2009: Work Group 2 - Administrative and Selected Technical Issues for the USBC, SFPC, MHSR, IBSR, VADR and VCS Regulations meets.

May 6, 2009: Work Group 3 - USBC/SFPC Technical Amendments meets.

May 13, 2009: Work Group 4 - International Residential Code meets.

May 18, 2009: BHCD's Codes and Standards Committee meets - 1st floor board room at DHCD from approximately 11:00 to 4:00 (following the regular scheduled BHCD meeting).

June 22, 2009: BHCD's Codes and Standards Committee meets 1st floor board room at DHCD from 9:30 to 4:00.

July 27, 2009: BHCD and Fire Services Board will hold a public hearing at 9:30 a.m. The Codes and Standards Committee will meet from approximately 11:00 to 12:15. The BHCD will meet at 1:00 to approve the draft regulations. The meetings will be held at VDHA in Innsbrook at 4224 Cox Road, 1st floor.

August to October, 2009: 60 day public comment period for the proposed USBC, SFPC and related regulations.

November 16th or December 21st, 2009: BHCD's Codes and Standards Committee meets to consider public comments, carry-over code changes from the Work Groups 1-4 meetings and any new code changes.

January 18th or 25th, 2010: BHCD and Fire Service Board will hold a second public hearing.

March 1, 2010: Deadline for 2009 code changes.

May 17, 2010: BHCD's Codes and Standards Committee meets to consider all remaining code changes and approve the final regulations for submission to the full BHCD.

June 21, 2010: BHCD approve final regulations with input from the FSB.

Effective Date: September 30, 2010.

(Updated March 27, 2009)

Exterior walls with plaster or stucco finish	H/360
Exterior walls—wind loads ^a with brittle finishes	H/240
Exterior walls—wind loads ^a with flexible finishes	H/120 ^d
Veneer masonry walls	L/600

Note: L = span length, H = span height.

- a. The wind load shall be permitted to be taken as 0.7 times the Component and Cladding loads for the purpose of determining deflection limits herein.
- b. For cantilever members, L shall be taken as twice the length of the cantilever.
- c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed L/60. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed L/120.
- d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of H/180.

6. Change Section R302.1 to read:

R302.1 Exterior walls. Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1.

Exceptions:

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

7. Add an exception to Section R303.8 to read:

Exception: Seasonal structures not used as a primary residence for more than 90 days per year, unless rented, leased or let on terms expressed or implied to furnish heat, shall not be required to comply with this section.

8. Add Section R303.8.1 to read:

R303.8.1 Nonowner occupied required heating. Every dwelling unit or portion thereof which is to be rented, leased or let on terms either expressed or implied to furnish heat to the occupants thereof shall be provided with facilities in accordance with Section R303.8 during the period from October 15 to May 1.

9. Add Section R303.9 to read:

R303.9 Insect screens. Every door, window and other outside opening required for ventilation purposes shall be supplied with approved tightly fitted screens of not less than 16 mesh per inch (16 mesh per 25 mm) and every screen door used for insect control shall have a self-closing device.

10. Add Section R306.5 to read:

R306.5 Water supply sources and sewage disposal systems. The water and drainage system of any building or premises where plumbing fixtures are installed shall be connected to a public or private water-supply and a public or private sewer system. As provided for in Section 103.11 for functional design, water supply sources and sewage disposal systems are regulated and approved by the Virginia Department of Health and the Virginia Department of Environmental Quality.

**SECTION R302
FIRE-RESISTANT CONSTRUCTION**

R302.1 Exterior walls. Construction, projections, openings and penetrations of *exterior walls* of *dwelling*s and accessory buildings shall comply with Table R302.1.

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.

R302.2 Townhouses. Each *townhouse* shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302.1 for exterior walls.

Exception: A common 1-hour fire-resistance-rated wall assembly tested in accordance with ASTM E 119 or UL 263 is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be installed in accordance with Chapters 34 through 43. Penetrations of electrical outlet boxes shall be in accordance with Section R302.4.

R302.2.1 Continuity. The fire-resistance-rated wall or assembly separating *townhouses* shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed *accessory structures*.

R302.2.2 Parapets. Parapets constructed in accordance with Section R302.2.3 shall be constructed for *townhouses* as an extension of exterior walls or common walls in accordance with the following:

1. Where roof surfaces adjacent to the wall or walls are at the same elevation, the parapet shall extend not less than 30 inches (762 mm) above the roof surfaces.
2. Where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is not more than 30 inches (762 mm) above the lower roof, the parapet shall extend not less than 30 inches (762 mm) above the lower roof surface.

Exception: A parapet is not required in the two cases above when the roof is covered with a minimum class C roof covering, and the roof decking or sheathing is of noncombustible materials or approved fire-retardant-treated wood for a distance of 4 feet (1219 mm) on each side of the wall or walls, or one layer of 5/8-inch (15.9 mm) Type X gypsum board is installed directly beneath the roof decking or sheathing, supported by a minimum of nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a minimum distance of 4 feet (1219 mm) on each side of the wall or walls.

3. A parapet is not required where roof surfaces adjacent to the wall or walls are at different elevations and the higher roof is more than 30 inches (762 mm) above the lower roof. The common wall construction from the lower roof to the underside of the higher roof deck shall have not less than a 1-hour fire-resistance rating. The wall shall be rated for exposure from both sides.

**TABLE R302.1
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
	(Not fire-resistance rated)	0 hours	≥ 5 feet
Projections	(Fire-resistance rated)	1 hour on the underside	≥ 2 feet to 5 feet
	(Not fire-resistance rated)	0 hours	5 feet
Openings in walls	Not allowed	N/A	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R317.3	< 5 feet
		None required	5 feet

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

P2903.10 Hose bibb. Hose bibbs subject to freezing, including the “frost-proof” type, shall be equipped with an accessible stop-and-waste-type valve inside the building so that they can be controlled and/or drained during cold periods.

Exception: Frostproof hose bibbs installed such that the stem extends through the building insulation into an open heated or semiconditioned space need not be separately valved (see Figure P2903.10).

**SECTION P2904
DWELLING UNIT FIRE SPRINKLER SYSTEMS**

P2904.1 General. Where installed, residential fire sprinkler systems, or portions thereof, shall be in accordance with NFPA 13D or Section P2904, which shall be considered equivalent to NFPA 13D. 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 supply domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. A backflow preventer shall not be required to separate a stand-alone sprinkler system from the water distribution system.

P2904.1.1 Required sprinkler locations. Sprinklers shall be installed to protect all areas of a *dwelling unit*.

Exceptions:

1. Attics, crawl spaces and normally unoccupied concealed spaces that do not contain fuel-fired appliances do not require sprinklers. In *attics*, crawl spaces and normally unoccupied concealed spaces that contain fuel-fired equipment, a sprinkler shall be installed above the equipment; however, sprinklers shall not be required in the remainder of the space.
2. Clothes closets, linen closets and pantries not exceeding 24 square feet (2.2 m²) in area, with the

smallest dimension not greater than 3 feet (915 mm) and having wall and ceiling surfaces of gypsum board.

3. Bathrooms not more than 55 square feet (5.1 m²) in area.
4. Garages; carports; exterior porches; unheated entry areas, such as mud rooms, that are adjacent to an exterior door; and similar areas.

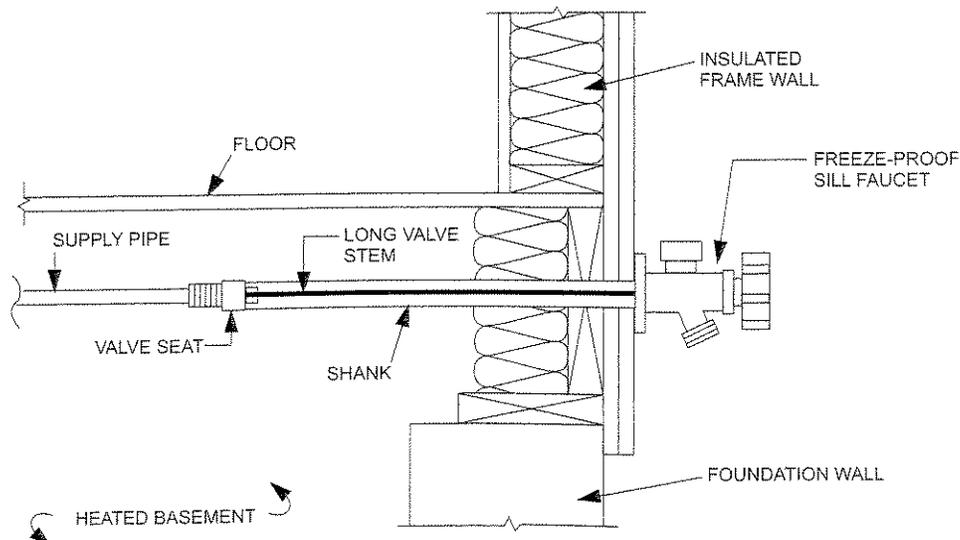
P2904.2 Sprinklers. Sprinklers shall be new listed residential sprinklers and shall be installed in accordance with the sprinkler manufacturer’s installation instructions.

P2904.2.1 Temperature rating and separation from heat sources. Except as provided for in Section P2904.2.2, sprinklers shall have a temperature rating of not less than 135°F (57°C) and not more than 170°F (77°C). Sprinklers shall be separated from heat sources as required by the sprinkler manufacturer’s installation instructions.

P2904.2.2 Intermediate temperature sprinklers. Sprinklers shall have an intermediate temperature rating not less than 175°F (79°C) and not more than 225°F (107°C) where installed in the following locations:

1. Directly under skylights, where the sprinkler is exposed to direct sunlight.
2. In *attics*.
3. In concealed spaces located directly beneath a roof.
4. Within the distance to a heat source as specified in Table P2904.2.2

P2904.2.3 Freezing areas. Piping shall be protected from freezing as required by Section P2603.6. Where sprinklers are required in areas that are subject to freezing, dry-side-wall or dry-pendent sprinklers extending from a nonfreezing area into a freezing area shall be installed.



**FIGURE P2903.10
TYPICAL FROSTPROOF HOSE BIBB INSTALLATION NOT REQUIRING SEPARATE VALVE**

Note: See also the Memorandums of Agreement in the “Related Laws Package” which is available from the Virginia Department of Housing and Community Development.

11. Change Section R310.1 to read:

R310.1 Emergency escape and rescue required. Basements and each sleeping room designated on the construction documents shall have at least one openable emergency escape and rescue opening. Such opening shall be directly to the exterior of the building or to a deck, screen porch or egress court, all of which shall provide access to a public street, public alley or yard. Where emergency escape and rescue openings are provided, they shall have a sill height of not more than 44 inches (1118 mm) above the floor. Where a door opening having a threshold below the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside, except that tilt-out or removable sash designed windows shall be permitted to be used. Emergency escape and rescue openings with a finished height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2.

Exceptions:

1. Dwelling units equipped throughout with an approved automatic sprinkler system installed in accordance with NFPA 13, 13R or 13D.
2. Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet (18.58 m²).

12. Change Section R310.1.1 to read:

R310.1.1 Minimum opening area. All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet (0.530 m²), including the tilting or removal of the sash as the normal operation to comply with sections R310.1.2 and R310.1.3.

Exception: Grade floor openings shall have a minimum net clear opening of 5 square feet (0.465 m²).

13. Change Section R311.5.3.1 to read:

R311.5.3.1 Riser height. The maximum riser height shall be 8-1/4 inches (210 mm). The riser shall be measured vertically between the 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).

14. Change Section R311.5.3.2 to read:

R311.5.3.2 Tread depth. The minimum tread depth shall be 9 inches (229 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). Winder treads shall have a minimum tread depth of 10 inches (254 mm) measured as above at a point 12 inches (305 mm) from the side where the treads are narrower. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point. Within any flight of stairs, the greatest winder tread depth at the 12 inch (305 mm) walk line shall not exceed the smallest by more than 3/8 inch (9.5 mm).

15. Change Section R311.5.5 to read:

R311.5.5 Stairway walking surface. The walking surface of treads and landings of stairways shall be level or sloped no steeper than one unit vertical in 48 inches horizontal (two-percent slope).

16. Change Section R317.1 to read:

R308.6.2 Permitted materials. The following types of glazing may be used:

1. Laminated glass with a minimum 0.015-inch (0.38 mm) polyvinyl butyral interlayer for glass panes 16 square feet (1.5 m²) or less in area located such that the highest point of the glass is not more than 12 feet (3658 mm) above a walking surface or other accessible area; for higher or larger sizes, the minimum interlayer thickness shall be 0.030 inch (0.76 mm).
2. Fully tempered glass.
3. Heat-strengthened glass.
4. Wired glass.
5. *Approved* rigid plastics.

R308.6.3 Screens, general. For fully tempered or heat-strengthened glass, a retaining screen meeting the requirements of Section R308.6.7 shall be installed below the glass, except for fully tempered glass that meets either condition listed in Section R308.6.5.

R308.6.4 Screens with multiple glazing. When the inboard pane is fully tempered, heat-strengthened or wired glass, a retaining screen meeting the requirements of Section R308.6.7 shall be installed below the glass, except for either condition listed in Section R308.6.5. All other panes in the multiple glazing may be of any type listed in Section R308.6.2.

R308.6.5 Screens not required. Screens shall not be required when fully tempered glass is used as single glazing or the inboard pane in multiple glazing and either of the following conditions are met:

1. Glass area 16 square feet (1.49 m²) or less. Highest point of glass not more than 12 feet (3658 mm) above a walking surface or other accessible area, nominal glass thickness not more than $\frac{3}{16}$ inch (4.8 mm), and (for multiple glazing only) the other pane or panes fully tempered, laminated or wired glass.
2. Glass area greater than 16 square feet (1.49 m²). Glass sloped 30 degrees (0.52 rad) or less from vertical, and highest point of glass not more than 10 feet (3048 mm) above a walking surface or other accessible area.

R308.6.6 Glass in greenhouses. Any glazing material is permitted to be installed without screening in the sloped areas of greenhouses, provided the greenhouse height at the ridge does not exceed 20 feet (6096 mm) above *grade*.

R308.6.7 Screen characteristics. The screen and its fastenings shall be capable of supporting twice the weight of the glazing, be firmly and substantially fastened to the framing members, and have a mesh opening of no more than 1 inch by 1 inch (25 mm by 25 mm).

R308.6.8 Curbs for skylights. All unit skylights installed in a roof with a pitch flatter than three units vertical in 12 units horizontal (25-percent slope) shall be mounted on a curb extending at least 4 inches (102 mm) above the plane of the roof unless otherwise specified in the manufacturer's installation instructions.

R308.6.9 Testing and labeling. Unit skylights shall be tested by an *approved* independent laboratory, and bear a *label* identifying manufacturer, performance *grade* rating and *approved* inspection agency to indicate compliance with the requirements of AAMA/WDMA/CSA 101/I.S.2/A440.

SECTION R309 GARAGES AND CARPORTS

R309.1 Floor surface. Garage floor surfaces shall be of *approved* noncombustible material.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

R309.2 Carports. Carports shall be open on at least two sides. Carport floor surfaces shall be of *approved* noncombustible material. Carports not open on at least two sides shall be considered a garage and shall comply with the provisions of this section for garages.

Exception: Asphalt surfaces shall be permitted at ground level in carports.

The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway.

R309.3 Flood hazard areas. For buildings located in flood hazard areas as established by Table R301.2(1), garage floors shall be:

1. Elevated to or above the design flood elevation as determined in Section R322; or
2. Located below the design flood elevation provided they are at or above *grade* on at least one side, are used solely for parking, building access or storage, meet the requirements of Section R322 and are otherwise constructed in accordance with this code.

R309.4 Automatic garage door openers. Automatic garage door openers, if provided, shall be listed in accordance with UL 325.

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue required. *Basements*, habitable attics and every sleeping room shall have at least one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches (1118 mm) above the floor. Where a door opening having a threshold below the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Emergency escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window

well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.

Exception: Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet (18.58 m²).

R310.1.1 Minimum opening area. All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet (0.530 m²).

Exception: Grade floor openings shall have a minimum net clear opening of 5 square feet (0.465 m²).

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

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

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

R310.2 Window wells. The minimum horizontal area of the window well shall be 9 square feet (0.9 m²), with a minimum horizontal projection and width of 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

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

R310.2.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Sections R311.7 and R311.8. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.3 Bulkhead enclosures. Bulkhead enclosures shall provide direct access to the *basement*. The bulkhead enclosure with the door panels in the fully open position shall provide the minimum net clear opening required by Section R310.1.1. Bulkhead enclosures shall also comply with Section R311.7.8.2.

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

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

SECTION R311 MEANS OF EGRESS

R311.1 Means of egress. All *dwellings* shall be provided with a means of egress as provided in this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the exterior of the *dwelling* at the required egress door without requiring travel through a garage.

R311.2 Egress door. At least one egress door shall be provided for each *dwelling* unit. The egress door shall be side-hinged, and shall provide a minimum clear width of 32 inches (813 mm) when measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). The minimum clear height of the door opening shall not be less than 78 inches (1981 mm) in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. Egress doors shall be readily openable from inside the *dwelling* without the use of a key or special knowledge or effort.

R311.3 Floors and landings at exterior doors. There shall be a landing or floor on each side of each exterior door. The width of each landing shall not be less than the door served. Every landing shall have a minimum dimension of 36 inches (914 mm) measured in the direction of travel. Exterior landings shall be permitted to have a slope 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.

R311.3.1 Floor elevations at the required egress doors. Landings or floors at the required egress door shall not be more than 1 1/2 inches (38 mm) lower than the top of the threshold.

Exception: The exterior landing or floor shall not be more than 7 3/4 inches (196 mm) below the top of the threshold provided the door does not swing over the landing or floor.

When exterior landings or floors serving the required egress door are not at *grade*, they shall be provided with access to *grade* by means of a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

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 landing is not required where a stairway of two or fewer risers is located on the exterior side of the door, provided the door does not swing over the stairway.

R311.3.3 Storm and screen doors. Storm and screen doors shall be permitted to swing over all exterior stairs and landings.

R311.4 Vertical egress. Egress from habitable levels including habitable attics and *basements* not provided with an egress door in accordance with Section R311.2 shall be by a ramp in

R317.1 Two-family dwellings. Dwelling units in two-family dwellings shall be separated from each other by wall and/or floor assemblies having not less than a 1-hour fire-resistance rating when tested in accordance with ASTM E 119. Fire-resistance-rated floor-ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend to and be tight against the underside of the roof sheathing. Dwelling unit separation wall assemblies, which are constructed on a lot line, shall be constructed as required in Section R317.1 for townhouses.

Exceptions:

1. A fire-resistance rating of ½ hour shall be permitted in buildings located entirely on the same lot and equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
2. For two-family dwellings located on the same lot, wall assemblies need not extend through attic spaces when the ceiling is protected by not less than ½-inch (15.9 mm) Type X gypsum board and an attic draft stop constructed as specified in Section R502.12.1 is provided above and along the wall assembly separating the dwellings. The structural framing supporting the ceiling shall also be protected by not less than ½-inch (12.7 mm) gypsum board or equivalent.

17. Add Section R325 Radon-Resistant Construction.

18. Add Section R325.1 to read:

R325.1 Local enforcement of radon requirements. Following official action under Article 7 (Section 15.2-2280 et seq.) of Chapter 22 of Title 15.2 of the Code of Virginia by a locality in areas of high radon potential, as indicated by Zone 1 on the U.S. EPA Map of Radon Zones (IRC Figure AF101), such locality shall enforce the provisions contained in Appendix F.

Exception: Buildings or portions thereof with crawl space foundations which are ventilated to the exterior, shall not be required to provide radon-resistant construction.

19. Add Section R326 Swimming Pools, Spas and Hot Tubs.

20. Add Section R326.1 to read:

R326.1 Use of Appendix G for swimming pools, spas and hot tubs. In addition to other applicable provisions of this code, swimming pools, spas and hot tubs shall comply with the provisions in Appendix G.

21. Add Section R327 Patio Covers.

22. Add Section R327.1 to read:

R327.1 Use of Appendix H for patio covers. Patio covers shall comply with the provisions in Appendix H.

23. Add Section R328 Sound Transmission.

24. Add Section R328.1 to read:

R328.1 Sound transmission between dwelling units. Construction assemblies separating dwelling units shall provide airborne sound insulation as required in Appendix K.

25. Add Section R328.2 to read:

R328.2 Airport noise attenuation. This section applies to the construction of the exterior envelope of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories high with separate means of egress within airport noise zones when enforced by a locality pursuant to Section 15.2-2295 of the Code of Virginia. The exterior envelope of such structures shall comply with Section 1207.4 of the state amendments to the IBC.

R302.2.3 Parapet construction. Parapets shall have the same fire-resistance rating as that required for the supporting wall or walls. On any side adjacent to a roof surface, the parapet shall have noncombustible faces for the uppermost 18 inches (457 mm), to include counterflashing and coping materials. Where the roof slopes toward a parapet at slopes greater than 2 units vertical in 12 units horizontal (16.7-percent slope), the parapet shall extend to the same height as any portion of the roof within a distance of 3 feet (914 mm), but in no case shall the height be less than 30 inches (762 mm).

R302.2.4 Structural independence. Each individual *townhouse* shall be structurally independent.

Exceptions:

1. Foundations supporting *exterior walls* or common walls.
2. Structural roof and wall sheathing from each unit may fasten to the common wall framing.
3. Nonstructural wall and roof coverings.
4. Flashing at termination of roof covering over common wall.
5. *Townhouses* separated by a common 1-hour fire-resistance-rated wall as provided in Section R302.2.

R302.3 Two-family dwellings. *Dwelling units* in two-family dwellings shall be separated from each other by wall and/or floor assemblies having not less than a 1-hour fire-resistance rating when tested in accordance with ASTM E 119 or UL 263. Fire-resistance-rated floor-ceiling and wall assemblies shall extend to and be tight against the *exterior wall*, and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

Exceptions:

1. A fire-resistance rating of $\frac{1}{2}$ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13.
2. Wall assemblies need not extend through *attic* spaces when the ceiling is protected by not less than $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board and an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separating the *dwellings*. The structural framing supporting the ceiling shall also be protected by not less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board or equivalent.

R302.3.1 Supporting construction. When floor assemblies are required to be fire-resistance rated by Section R302.3, the supporting construction of such assemblies shall have an equal or greater fire-resistance rating.

R302.4 Dwelling unit rated penetrations. Penetrations of wall or floor/ceiling assemblies required to be fire-resistance rated in accordance with Section R302.2 or R302.3 shall be protected in accordance with this section.

R302.4.1 Through penetrations. Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

Exception: Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space shall be protected as follows:

1. In concrete or masonry wall or floor assemblies, concrete, grout or mortar shall be permitted where installed to the full thickness of the wall or floor assembly or the thickness required to maintain the fire-resistance rating, provided:
 - 1.1. The nominal diameter of the penetrating item is a maximum of 6 inches (152 mm); and
 - 1.2. The area of the opening through the wall does not exceed 144 square inches (92 900 mm²).
2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time temperature fire conditions under a minimum positive pressure differential of 0.01 inch of water (3 Pa) at the location of the penetration for the time period equivalent to the fire resistance rating of the construction penetrated.

R302.4.1.1 Fire-resistance-rated assembly. Penetrations shall be installed as tested in the *approved* fire-resistance-rated assembly.

R302.4.1.2 Penetration firestop system. Penetrations shall be protected by an *approved* penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch of water (3 Pa) and shall have an F rating of not less than the required fire-resistance rating of the wall or floor/ceiling assembly penetrated.

R302.4.2 Membrane penetrations. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced.

Exceptions:

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m²) in area provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m²) in any 100 square feet (9.29 m²) of wall area. The annular space between the wall membrane and the box shall not exceed $\frac{1}{8}$ inch (3.1 mm). Such boxes on opposite sides of the wall shall be separated by one of the following:

- 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or parti-

**VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CODE CHANGE FORM**

Address to submit to: DHCD, The Jackson Center 501 North Second Street Richmond, VA 23219-1321 Tel. No. (804) 371 – 7150 Fax No. (804) 371 – 7092 Email: bhcd@dhcd.virginia.gov		Document No. _____ Committee Action: _____ BHCD Action: _____
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Submitted by: Douglas S. Jones

Representing: Keystone – RM, LLC

Address: 1207 Roseneath Road #200

Phone No. 804-358-5768 x303

Regulation Title: 2006 International Residential Code

Section No(s): Chapter 4 Foundations, Section R401 General, R401.3 Drainage

Date: February 27, 2009 (Revised 4/23/09)

Proposed Change:

Current Code

R401.3 Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection so as to not create a hazard. Lots shall be graded to drain surface water away from foundation walls. The grade shall fall a minimum of 6 inches (152 mm) within the first 10 feet (3048 mm).

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), the final grade shall slope away from the foundation at a minimum slope of 5 percent and the water shall be directed to drains or swales to ensure drainage away from the structure. Swales shall be sloped a minimum of 2 percent when located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

Proposal: Remove first sentence and replace with the following:

Surface drainage which may affect a foundation shall be diverted to a storm sewer conveyance or other approved point of collection.

Supporting Statement:

Rationale for Revision:

- Hazard is not defined. A hazard with regard to what?
- Local interpretation of hazard can include anything negative that occurs on a property, whether related to building code or not.
- Can be used improperly to turn two year statute of limitations into two year warranty period.
- Local application of code to “any disturbed area” represents improper extension of building code into matters unrelated to building or structure.
- ICC states that “...a detailed treatment of drainage design is beyond the scope of the code...” and that “...consideration of drainage patterns...shall be subject to the approval of the authority having jurisdiction.” (see attached)
- Drainage, erosion, etc. may be subjects for other local ordinances, but not the building code.
- Drainage, erosion, etc. are impacted by natural phenomena and owner activities after closing.

Hodge, Vernon

From: Rodgers, Emory
Sent: Thursday, April 23, 2009 2:04 PM
To: Hodge, Vernon
Subject: FW: DRAFT Form - Code Change 401.3 revised

Put with Jones's code change. Bill opposes.

From: Dupler, Bill [mailto:DuplerB@chesterfield.gov]
Sent: Thursday, April 23, 2009 9:49 AM
To: Rodgers, Emory
Subject: RE: DRAFT Form - Code Change 401.3 revised

This changes the whole intent of the code provision which applies generally to surface drainage. This language limits the application of this section. What's even worse is new the language is so open ended it will not clarify any thing and makes applying the provision more subjective. For example does water standing at the area where the foundation drain discharges affect the foundation?

-----Original Message-----

From: Rodgers, Emory [mailto:Emory.Rodgers@dhcd.virginia.gov]
Sent: Thursday, April 23, 2009 6:46 AM
To: Dupler, Bill; Robertson, Roger
Subject: FW: DRAFT Form - Code Change 401.3 revised

May 13th latest from Keystone.

From: Doug Jones [mailto:Doug_Jones@Keybuild.com]
Sent: Wednesday, April 22, 2009 5:06 PM
To: Rodgers, Emory; Hodge, Vernon
Cc: lynn.underwood@norfolk.gov; emckin@arlingtonva.us; Eubank, Paula
Subject: RE: DRAFT Form - Code Change 401.3 revised

All: I let this sit for a few weeks to see if any other ideas were proposed. Hearing none, I put both Vernon's and Emory's comments into the attached proposed wording, which I would plan on resubmitting unless I hear any loud opposition. Comments?

Doug Jones

From: Rodgers, Emory [mailto:Emory.Rodgers@dhcd.virginia.gov]
Sent: Friday, April 10, 2009 1:50 PM
To: Doug Jones; Hodge, Vernon
Cc: lynn.underwood@norfolk.gov; emckin@arlingtonva.us; Eubank, Paula
Subject: RE: DRAFT Form - Code Change 401.3 revised

Vernon and Doug: Need something beyond just deleting the 1st sentence. Vernon has it going in the right direction. Approved point of collection is terminology used in site plans by the engineers so is clear to building officials and public work folks. Could delete "hazard" in my opinion as it adds no value as the second part of draining overland water runoff is the point to avoid not an hazard but water entering the building.

From: Doug Jones [mailto:Doug_Jones@Keybuild.com]
Sent: Friday, April 10, 2009 10:08 AM

To: Hodge, Vernon
Cc: lynn.underwood@norfolk.gov; emckin@arlingtonva.us; Rodgers, Emory; Eubank, Paula
Subject: RE: DRAFT Form - Code Change 401.3 revised

Hmm...I need to think about that and see what the others suggest as well. I don't like the undefined "hazard" and "approved point of collection" terms. I also would want to see some sort of reasonability standard as to what MAY affect a foundation.

My original idea was to eliminate the first sentence in its entirety, but I thought that could cause a problem with conditions past the first 10 feet. Now that I look at it again, the second sentence says: "**Lots shall be graded to drain surface water away from foundation walls.**" Isn't that what we really want to accomplish? Maybe that is enough and we should just kill the first sentence with all of its ambiguities.

Thanks for your continued interest.

Doug Jones

From: Hodge, Vernon [mailto:Vernon.Hodge@dhcd.virginia.gov]
Sent: Friday, April 10, 2009 9:21 AM
To: Doug Jones
Cc: lynn.underwood@norfolk.gov; emckin@arlingtonva.us; Rodgers, Emory; Eubank, Paula
Subject: RE: DRAFT Form - Code Change 401.3 revised

Doug,

Why wouldn't the language below accomplish your intent with minimal change to the section?

Surface drainage which may affect a foundation shall be diverted to a storm sewer conveyance or other approved point of collection so as to not create a hazard.

Vernon Hodge, Technical Services Manager
Technical Assistance Services Office (TASO)
Division of Building and Fire Regulations
Va. Department of Housing and Community Development
Direct Dial: (804) 371-7174
Email: Vernon.Hodge@DHCD.virginia.gov
Blackberry: (804) 382-2973

From: Doug Jones [mailto:Doug_Jones@Keybuild.com]
Sent: Thursday, April 09, 2009 3:24 PM
To: Hodge, Vernon; lynn.underwood@norfolk.gov; emckin@arlingtonva.us
Subject: DRAFT Form - Code Change 401.3 revised

Gentlemen:

It was a pleasure to meet all of you this morning, and I hope that the rest of the day was productive for all involved. The scope and depth of the issues that need to be considered is incredible! Thanks for all of your hard work.

I thought I would get to the "wordsmithing" before too much time had passed, and I have attached a new draft of the proposed code change. The new wording is:

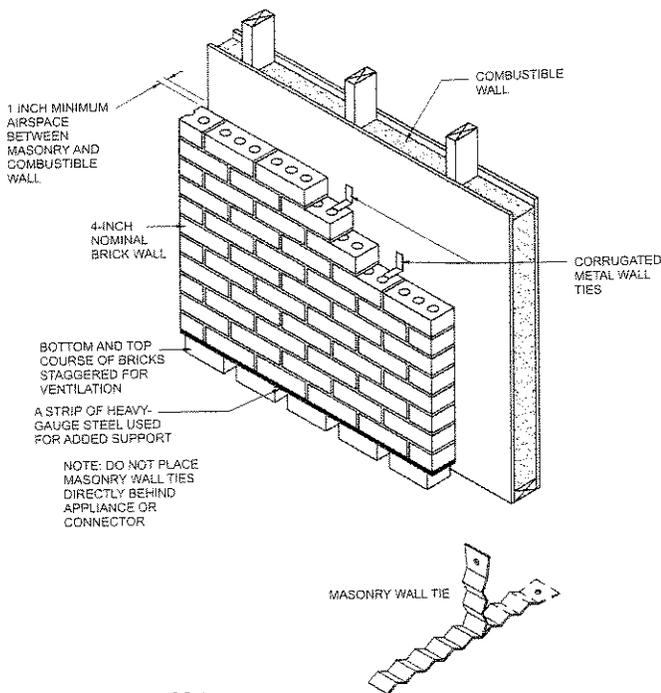
"The provisions of this section shall apply to drainage conditions occurring beyond the areas defined in this section only if failure to modify such drainage conditions could reasonably be anticipated to have an adverse impact on the foundation."

This wording deals with the 2 concerns I heard this morning:

- 1) **Make sure that the 10 foot number, the exception and the new language all work together:** I have removed the reference to 10 feet, and have instead referred to "areas defined in this section."
- 2) **Don't use the "beyond the scope of this code" language:** The "shall apply" language is used elsewhere and is less controversial.

Any suggestions appreciated.

Doug Jones



For SI: 1 inch = 25.4 mm.

**FIGURE G2409.2(3) [308.2(3)]
MASONRY CLEARANCE REDUCTION SYSTEM**

G2409.3.3 (308.3.3) Clearance reduction. Air-conditioning appliances installed in rooms that are large in comparison with the size of the appliance shall be permitted to be installed with reduced clearances to combustible material, provided that the combustible material or appliance is protected as described in Table G2409.2.

G2409.3.4 (308.3.4) Plenum clearances. Where the furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 inches (51 mm) or less.

G2409.3.5 (308.3.5) Clearance from supply ducts. Air-conditioning appliances shall have the clearance from supply ducts within 3 feet (914 mm) of the furnace plenum be not less than that specified from the furnace plenum. Clearance is not necessary beyond this distance.

G2409.4 (308.4) Central heating boilers and furnaces. Clearance requirements for central-heating boilers and furnaces shall comply with Sections G2409.4.1 through G2409.4.6. The clearance to these appliances shall not interfere with combustion air, draft hood clearance and relief, and accessibility for servicing.

G2409.4.1 (308.4.1) Appliances installed in rooms that are large in comparison with the size of the appliances. Central-heating furnaces and low-pressure boilers installed in rooms large in comparison with the size of the appliance shall be installed with clearances in accordance with the manufacturer's instructions.

G2409.4.2 (308.4.2) Appliances installed in rooms that are not large in comparison with the size of the appli-

ances. Central-heating furnaces and low-pressure boilers installed in rooms that are not large in comparison with the size of the appliance, such as alcoves and closets, shall be listed for such installations. Listed clearances shall not be reduced by the protection methods described in Table G2409.2 and illustrated in Figures G2409.2(1) through G2409.2(3), regardless of whether the enclosure is of combustible or noncombustible material.

G2409.4.3 (308.4.3) Clearance reduction. Central heating furnaces and low-pressure boilers installed in rooms that are large in comparison with the size of the appliance shall be permitted to be installed with reduced clearances to combustible material provided the combustible material or equipment is protected as described in Table G2409.2.

G2409.4.4 (308.4.5) Plenum clearances. Where the furnace plenum is adjacent to plaster on metal lath or noncombustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 inches (51 mm) or less.

G2409.4.5 (308.4.6) Clearance from supply ducts. Central-heating furnaces shall have the clearance from supply ducts within 3 feet (914 mm) of the furnace plenum be not less than that specified from the furnace plenum. No clearance is necessary beyond this distance.

G2409.4.6 (308.4.4) Clearance for servicing appliances. Front clearance shall be sufficient for servicing the burner and the furnace or boiler.

**SECTION G2410 (309)
ELECTRICAL**

G2410.1 (309.1) Grounding. Gas piping shall not be used as a grounding electrode.

G2410.2 (309.2) Connections. Electrical connections between appliances and the building wiring, including the grounding of the appliances, shall conform to Chapters 34 through 43.

**SECTION G2411 (310)
ELECTRICAL BONDING**

G2411.1 (310.1) Pipe and tubing other than CSST. Each above-ground portion of a gas piping system other than corrugated stainless steel tubing (CSST), that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping, other than CSST, shall be considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance.

G2411.1.1 (310.1.1) CSST. Corrugated stainless steel tubing (CSST) gas piping systems shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building. The bonding jumper shall be not smaller than 6 AWG copper wire or equivalent.

Vann
Impact on
our WNC
amendment 2

Technical Bulletin TB2008-02

Improved Routing Requirements for Gastite[®] CSST

November 21, 2008

This technical bulletin provides new routing requirements for Gastite[®] CSST designed to increase the safety of the product in the event of a lightning strike. Lightning is a highly destructive force. Direct and indirect lightning strikes can cause systems in the structure to become electrically energized. Differences in potential between systems may cause arcing to occur between the systems. This arcing can cause damage to CSST, including holes.

Bonding and grounding of all continuous metallic systems should help create equal potential between systems and reduce the risk of arcing. Physical separation between Gastite[®] CSST and other metallic systems should additionally reduce the risk of arcing.

In light of these safety measures the November 2008 Design & Installation Guide will contain the following changes:

Section 4.0 Installation Practices

4.1 (f) Supporting CSST – Tubing shall be supported in a workmanlike manner with pipe straps, bands or hangers suitable for the size and weight of the tubing, at intervals not to exceed those shown in Table 4-3. A proper support is one which is designed as a pipe hanger, does not damage the tubing during installation, and provides full support. “J” hooks may not be used as they may damage the CSST. Zip ties/cable ties are not to be used as a primary support, but may be used to organize or bundle CSST. See Table 4-5 for supporting CSST in a rooftop application.

When supporting CSST tubing runs the use of other conductive metallic systems such as metallic appliance vents, metallic ducting and piping, and electrical cables must be avoided.

4.3 Routing

4.3.1 Vertical Runs

Vertical runs are the preferred run method. Tubing runs should be relatively plumb and free to move within the wall cavity without any physical support between the floors. For support requirements refer to Section 4.1. Where any run is greater than two stories or 20-ft, additional support (appropriate to the weight of the tubing) must be provided at the point of penetration through the floor.

Care should be taken when installing vertical runs to maintain as much separation as reasonably possible from other electrically conductive systems in the building.

4.3.2 Horizontal Runs

Tubing routed on top of ceiling joists and other structural members which comply with the horizontal support spacing requirements will be considered sufficiently supported. See Figures 4-24, 4-25, 4-26 and 4-27 for examples of acceptable support configurations when routing Gastite. Gastite may be routed beneath, through and alongside floor and ceiling joists. Due consideration must be given to future construction possibilities. Horizontal runs in concealed areas must conform to Section 4.4 Protection.

Care should be taken when installing horizontal runs to maintain as much separation as reasonably possible from other electrically conductive systems in the building.

4.3.9 Installation within Chaseways

Gastite tubing shall not be installed within a chase and/or enclosure that includes a metallic appliance vent and/or metallic chimney liner that protrudes through and/or past the roof unless:

- *Permitted by local building code,*
- *An express separation distance as required by local code can be achieved along the entire length,*
- *The vent and/or liner is directly bonded to the grounding electrode system, **AND***
- *There is no physical contact between the metallic vent and/or liner and the Gastite tubing along the entire length of the vent.*

4.5 Meter

c) Electronic bonding connections made at the gas meter must also comply with section 4.10 of this guide regarding the inclusion of a rigid piping component for the mounting of a bonding clamp.

4.6.2 Direct Connection – Non Moveable Appliances

(a) When appliances such as water heaters, furnaces or fireplaces have metallic vents which extend beyond or protrude through the roof physical contact between the CSST and the appliance cabinet or vent is prohibited. Gastite recommends that all continuous metallic systems be bonded and grounded.

4.6.4 g) Gas Fireplaces

Where it is necessary to install Gastite through sheet metal enclosures (such as fireplaces) the tubing should be routed or supported to prevent physical contact with the enclosure. If direct contact cannot be avoided by routing and supporting, a rubber grommet may be used to prevent physical contact with the enclosure. Otherwise a Gastite angle stub or rigid pipe components must be used.

No physical contact with the metal appliance cabinet is allowed.

11/25/08

STATE OF CONNECTICUT
REGULATION

of

NAME OF AGENCY

DEPARTMENT OF PUBLIC SAFETY

Concerning

SUBJECT MATTER OF REGULATIONS

STATE BUILDING CODE-2005 CONNECTICUT
SUPPLEMENT – 2009 AMENDMENT

- (NEW) (Amd) **N1101.2.2 Townhouses.** Compliance shall be demonstrated by either:
1. Meeting the requirements of this chapter for buildings with a glazing area that does not exceed 25 per cent of the gross area of those exterior walls that comprise a portion of the thermal envelope; or
 2. Meeting the requirements of the 2006 International Energy Conservation Code.

(NEW) (Add) **N1105 SECTION N1105 – SWIMMING POOLS**

(NEW) (Add) **N1105.1 Swimming pools.** Swimming pools shall be equipped with energy saving measures in accordance with Section 504.7 of the 2006 International Energy Conservation Code portion of the 2005 State Building Code.

Sec. 80. Section 29-252-1d, State Building Code – 2005 Connecticut Supplement, the 2003 International Residential Code, is amended to add:

(NEW) CHAPTER 17 – COMBUSTION AIR

(NEW) (Add) **M1703.6 Mechanical combustion air supply.** Mechanical combustion air supply systems shall comply with manufacturer's installation instructions for both the fuel-burning appliance and the combustion air supply system.

CHAPTER 24 – FUEL GAS

Sec. 81. Section 29-252-1d, State Building Code – 2005 Connecticut Supplement, Chapter 24, of the 2003 International Residential Code, is amended to add:

(NEW) (Add) **G2411.1.1 Corrugated stainless steel tubing (CSST).** CSST gas piping shall be bonded in accordance with manufacturer's installation instructions.

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

Sec. 82. Section 29-252-1d, State Building Code – 2005 Connecticut Supplement, the 2003 International Residential Code, is amended to add:

(NEW) CHAPTER 29 – WATER SUPPLY AND DISTRIBUTION

(NEW) (Amd) **P2904.9.1.3 PVC plastic pipe.** A purple primer complying with ASTM F 656-96a shall be applied to all PVC solvent cemented joints. Solvent cement that is not purple in color for PVC plastic pipe conforming to ASTM D 2564-96a shall be applied to

Hodge, Vernon

From: William Rich [bill.rich@omegaflex.net]
Sent: Thursday, April 16, 2009 10:08 AM
To: Peter Ryan; Mike Rutherford
Cc: Mark Albino; Bruce Kelly
Subject: CSST permitted in NY and CT
Attachments: CT_2009_amendment-11-25-08.pdf; New York State CSST.pdf

Gentlemen,

Attached are recent state code amendments from New York and Connecticut concerning bonding requirements for CSST. CSST is permitted under the ICC codes adopted by each state IFGC or IRC. Please contact me if you have any questions.

Bill

William Rich
Omega Flex -TracPipe
Director of Codes/Standards
860 704-6820 corporate office
413 686-9323 home office
413 218-7408 cel

Corrugated Stainless Steel Tubing (CSST)

At its meeting held on July 24, 2008, the State Fire Prevention and Building Code Council determined that adopting this rule on an emergency basis is necessary to preserve public safety by clarifying requirements for electrical bonding of gas piping, clarifying requirements for protection of gas piping against physical damage, and adding new requirements for installation of gas piping made of corrugated stainless steel tubing (CSST), which will increase protection against fires caused by lightning strikes in the vicinity of buildings equipped with CSST gas piping and fires caused by accidental punctures of CSST gas piping.

BACK

TEXT

EFFECTIVE AUGUST 13, 2008

Subdivision (d) of section 1220.1 of title 19 NYCRR is amended by adding new paragraphs (9), (10), (11), and (12) to read as follows:

(9) 2007 RCNYS Section G2411.1. For the purposes of applying the 2007 RCNYS in this State, the text of Section G2411.1 in Chapter 24 of the 2007 RCNYS shall be deemed to be amended and restated in its entirety to read as follows:

“G2411.1 (310.1) Gas pipe bonding - systems that contain no CSST. In the case of a gas piping system that contains no corrugated stainless steel tubing (CSST), each above-ground portion of the gas piping system that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping shall be considered to be likely to become energized if any gas utilization equipment is connected to any portion of the gas piping system and to any electrical circuit(s). For the purposes of this Section G2411.1, gas piping shall be considered to be bonded to an effective ground-fault current path if such gas piping is connected to gas utilization equipment that is connected to the equipment grounding conductor of the circuit supplying that equipment. Nothing in this Section G2411.1 shall prohibit the bonding a gas piping system that contains no CSST in any manner described in Section E3509.7 of this code. (10) 2007 RCNYS Section G2411.2.”

(10) For the purposes of applying the 2007 RCNYS in this State, a new Section G2411.2 (to include sections G2411.2, G2411.2.1, G2411.2.2, and G2411.2.3) shall be deemed to be added to Chapter 24 of the 2007 RCNYS, immediately following Section G2411.1, said new Section G2411.2 to read as follows:

“G2411.2 (310.2) Gas pipe bonding - systems that contain CSST. A gas piping system that contains any corrugated stainless steel tubing (CSST) shall be electrically continuous and shall be bonded to the electrical service grounding

electrode system at the point where the gas service enters the building or structure. No portion of the gas piping system shall be used as or considered to be a grounding electrode or a grounding electrode conductor. CSST shall be installed and bonded in accordance with this section G2411.2, and the stricter of: (a) the requirements set forth in the CSST manufacturer's installation instructions, or (b) the requirements set forth in Sections G2411.2.1, G2411.2.2, G2411.2.3, and G2415.5.

"G2411.2.1 Bonding jumper. Where the electric service for the individual installation is 200 amperes or less, the bonding jumper shall not be smaller than 6 AWG copper wire or 4 AWG aluminum or copper-clad aluminum wire, and shall be permanently connected to the grounding electrode system. Where the electric service for the individual installation is more than 200 amperes, the bonding jumper size shall be determined in accordance with Table E 3503.1, and shall be permanently connected to the grounding electrode system.

"G2411.2.2 Bonding clamp. The bonding jumper shall be connected to the gas piping system with a bonding clamp that is listed for the material of the bonding jumper and for the material of the component of the gas piping system to which the bonding clamp is attached. The bonding clamp shall be attached to the gas piping system at a point which is inside the building or structure in which the gas piping is installed, on the downstream side of the gas meter or regulator, in an unconcealed and readily accessible space, and as close as practicable to the point where the gas service enters the building or structure. The bonding clamp shall be attached to a segment of metallic fuel gas pipe which (a) is a component of the gas piping system, (b) is electrically continuous with all CSST components of the gas piping system, (c) is made of steel or wrought-iron, (d) complies with Section G2414.4.2 of this code and with all other applicable provisions of Section G2414 of this code, and (e) is not less than 3 inches (76 mm) in length. Neither the CSST nor the brass hexagonal nut on the CSST fitting shall be used as an attachment point for the bonding clamp.

"G2411.2.3 Prohibited uses. CSST shall not be supported on or by other electrically conductive systems including copper water pipe, electric power cables, air conditioning and heating ducts, communication cables and structural steel beams. Electrical wiring, including the bonding jumper, shall be supported and secured independently of the CSST so that it does not come in contact with the CSST."

(11) 2007 RCNYS Section G2415.5. For the purposes of applying the 2007 RCNYS in this State, the text of Section G2415.5 in Chapter 24 of the 2007 RCNYS shall be deemed to be amended and restated in its entirety, to include sections G2415.5 and G2415.5.1 and to read as follows:

"G2415.5 (404.5) Protection against physical damage. In concealed locations, where piping other than black or galvanized steel is installed through holes or

notches in wood studs, joists, rafters or similar members less than 1.75 inches (44.45 mm) from the nearest edge of the member, the pipe shall be protected by shield plates. Such shield plates shall comply with the requirements of Section G2415.5.1, shall cover the area of the pipe where the member is notched or bored, and shall extend a minimum of 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist or rafter. The movement of piping made of corrugated stainless steel tubing (CSST) shall not be otherwise constrained by straps, clips or other support devices. In addition, where CSST is installed in a concealed location and parallel to any stud, joist, rafter, or similar member, the CSST shall be protected by shield plates in any area where the CSST is not (a) physically supported in a manner that ensures the CSST will always be at least 1.75 inches (44.45 mm) away from the nearest edge of any member or (b) encased in a protective metal pipe made of schedule 40 steel or iron pipe or in a protective pipe sleeve made of a material approved by the code enforcement official as the equivalent of schedule 40 steel or iron pipe. Such shield plates shall comply with the requirements of Section G2415.5.1, shall cover the area the CSST is located, and shall extend a minimum of 4 inches (102 mm) to each side of the CSST.

“G2415.5.1. Shield plates. In all cases, shield plates shall be certified or listed as complying with ANSI LC-1. In addition, in the case of piping made of CSST, shield plates shall be listed for use with the manufacturer’s CSST system.”

(12) 2007 RCNYS Section E3509.7. For the purposes of applying the 2007 RCNYS in this State, the text of Section E3509.7 in Chapter 35 of the 2007 RCNYS shall be deemed to be amended and restated in its entirety to read as follows:

“E3509.7 Bonding other metal piping. Where installed in or attached to a building or structure, metal piping systems likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. A piping system shall be considered to be likely to become energized if any equipment or appliance is connected to any portion of the piping system and to any electrical circuit(s). The bonding jumper shall be sized in accordance with Table E3808.12 using the rating of the circuit capable of energizing the piping. The equipment grounding conductor for the circuit that is capable of energizing the piping shall be permitted to serve as the bonding means. The points of attachment of the bonding jumper (s) shall be accessible.

“EXCEPTIONS:

“1. Interior metal water piping systems shall be bonded in accordance with Section E3509.6 of this code.

“2. Gas piping systems that contain no corrugated stainless steel tubing (CSST) shall be bonded in accordance with Section G2411.1 of this code.

“3. Gas piping systems that contain CSST shall be installed and bonded in accordance with Section G2411.2 of this code.”

Subdivision (b) of section 1224.1 of title 19 NYCRR is amended to read as

follows:

(b) Referenced standards. Certain published standards are denoted in the 2007 FGCNYS as incorporated by reference into 19 NYCRR Part 1222. Such standards are incorporated by reference into this Part 1224. Such standards are identified in the 2007 FGCNYS, and the names and addresses of the publishers of such standards from which copies of such standards may be obtained are specified in the 2007 FGCNYS. Such standards are available for public inspection and copying at the office of the New York State Department of State specified in subdivision (a) of this section. In addition, the 2005 edition of standard NFPA 70, entitled "National Electrical Code" (said standard being hereinafter referred to as NFPA 70-2005) shall be deemed to be one of the standards incorporated by reference into this Part 1224. The name and address of the publisher of NFPA 70-2005 from which copies of said standard may be obtained are:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269.

NFPA 70-2005 is available for public inspection and copying at the office of the New York State Department of State specified in subdivision (a) of this section.

Subdivision (c) of 1224.1 of Title 19 NYCRR is amended by adding new paragraphs (2), (3), and (4), to read as follows:

(2) 2007 FGCNYS Section 310.1. For the purposes of applying the 2007 FGCNYS in this State, Section 310.1 in Chapter 3 of the 2007 FGCNYS shall be deemed to be amended and restated in its entirety to read as follows:

"310.1 Gas pipe bonding – systems that contain no CSST. In the case of a gas piping system that contains no corrugated stainless steel tubing (CSST), each above-ground portion of the gas piping system that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping shall be considered to be likely to become energized if any gas utilization equipment is connected to any portion of the gas piping system and to any electrical circuit(s). For the purposes of this Section 310.1, gas piping shall be considered to be bonded to an effective ground-fault current path if such gas piping is connected to gas utilization equipment that is connected to the equipment grounding conductor of the circuit supplying that equipment. Nothing in this Section 310.1 shall prohibit the bonding a gas piping system that contains no CSST in any manner described in Section 250.104(B) of NFPA 70-2005."

(3) 2007 FGCNYS Section 310.2. For the purposes of applying the 2007 FGCNYS in this State, a new Section 310.2 (to include sections 310.2, 310.2.1, 310.2.2, and 310.2.3) shall be deemed to be added to Chapter 3 of the 2007 FGCNYS, immediately following Section 310.1, said new Section 310.2 to read as follows:

"310.2 Gas pipe bonding – systems that contain CSST. A gas piping system that contains any corrugated stainless steel tubing (CSST) shall be electrically continuous and shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building or structure. No

portion of the gas piping system shall be used as or considered to be a grounding electrode or a grounding electrode conductor. CSST shall be installed and bonded in accordance with this section 310.2, and the stricter of: (a) the requirements set forth in the CSST manufacturer's installation instructions, or (b) the requirements set forth in Sections 310.2.1, 310.2.2, 310.2.3, and 404.5 of this code.

“310.2.1 Bonding jumper. Where the electric service for the individual installation is 200 amperes or less, the bonding jumper shall not be smaller than 6 AWG copper wire or 4 AWG aluminum or copper-clad aluminum wire, and shall be permanently connected to the grounding electrode system. Where the electric service for the individual installation is more than 200 amperes, the bonding jumper size shall be determined in accordance with Table 250.66 and Sections 250.66(A) through 250.66(C) of NFPA 70-2005, and shall be permanently connected to the grounding electrode system.

“310.2.2 Bonding clamp. The bonding jumper shall be connected to the gas piping system with a bonding clamp that is listed for the material of the bonding jumper and for the material of the component of the gas piping system to which the bonding clamp is attached. The bonding clamp shall be attached to the gas piping system at a point which is inside the building or structure in which the gas piping is installed, on the downstream side of the gas meter or regulator, in an unconcealed and readily accessible space, and as close as practicable to the point where the gas service enters the building or structure. The bonding clamp shall be attached to a segment of metallic fuel gas pipe which (a) is a component of the gas piping system, (b) is electrically continuous with all CSST components of the gas piping system, (c) is made of steel, wrought-iron, copper (if permitted by Section 403.4.3 of this code), or brass (if permitted by Section 403.4.3 of this code), or aluminum, (d) complies with the applicable provisions of Section 403.4 of this code and with all other applicable provisions of Section 403 of this code, and (e) is not less than 3 inches (76 mm) in length. Neither the CSST nor the brass hexagonal nut on the CSST fitting shall be used as an attachment point for the bonding clamp.

“310.2.3 Prohibited uses. CSST shall not be supported on or by other electrically conductive systems including copper water pipe, electric power cables, air conditioning and heating ducts, communication cables and structural steel beams. Electrical wiring, including the bonding conductor, shall be supported and secured independently of the CSST so that it does not come in contact with the CSST.”

(4) 2007 FGCNYS Section 404.5. For the purposes of applying the 2007 FGCNYS in this State, Section 404.5 in Chapter 4 of the 2007 FGCNYS shall be deemed to be amended and restated in its entirety, to include sections 404.5 and 404.5.1 and to read as follows:

“404.5 Protection against physical damage. In concealed locations, where piping other than black or galvanized steel is installed through holes or notches in wood studs, joists, rafters or similar members less than 1.75 inches (44.45 mm) from the nearest edge of the member, the pipe shall be protected by shield plates. Such shield plates shall comply with the requirements of Section 405.5.1, shall cover the area of the pipe where the member is notched or bored, and shall extend a minimum of 4 inches (102 mm) above sole plates, below top plates and to each side of a stud, joist or rafter. The movement of piping made of corrugated stainless steel tubing (CSST) shall not be otherwise constrained by straps, clips or other support devices. In addition, where CSST is installed in a concealed location and parallel to any stud, joist, rafter, or similar member, the CSST shall be protected by shield plates in any area where the CSST is not (a) physically supported in a manner that ensures the CSST will always be at least 1.75 inches (44.45 mm) away from the nearest edge of any member or (b) encased in a protective metal pipe made of schedule 40 steel or iron pipe or in a protective pipe sleeve made of a material approved by the code enforcement official as the equivalent of schedule 40 steel or iron pipe. Such shield plates shall comply with the requirements of Section 405.5.1, shall cover the area the CSST is located, and shall extend a minimum of 4 inches (102 mm) to each side of the CSST.

“405.5.1. Shield plates. In all cases, shield plates shall be certified or listed as complying with ANSI LC-1. In addition, in the case of piping made of CSST, shield plates shall be listed for use with the manufacturer’s CSST system.”

EFFECTIVE AUGUST 13, 2008

BACK

SECTION R312 GUARDS

R312.1 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 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 Height. Required *guards* at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connecting the leading edges of the treads.

Exceptions:

1. *Guards* on the open sides of stairs shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.
2. Where the top of the *guard* also serves as a handrail on the open sides of stairs, the top of the *guard* shall not be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.

R312.3 Opening limitations. Required *guards* shall not have openings from the walking surface to the required *guard* height which allow passage of a sphere 4 inches (102 mm) in diameter.

Exceptions:

1. The triangular openings at the open side of a stair, formed by the riser, tread and bottom rail of a *guard*, shall not allow passage of a sphere 6 inches (153 mm) in diameter.
2. *Guards* on the open sides of stairs shall not have openings which allow passage of a sphere $4\frac{3}{8}$ inches (111 mm) in diameter.

R312.4 Exterior woodplastic composite guards. Woodplastic composite *guards* shall comply with the provisions of Section R317.4.

SECTION R313 AUTOMATIC FIRE SPRINKLER SYSTEMS

R313.1 Townhouse automatic fire sprinkler systems. An automatic residential fire sprinkler system shall be installed in *townhouses*.

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

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

R313.2 One- and two-family dwellings automatic fire systems. Effective January 1, 2011, an automatic residential fire sprinkler system shall be installed in one- and two- family *dwellings*.

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

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

SECTION R314 SMOKE ALARMS

R314.1 Smoke detection and notification. All smoke alarms shall be listed in accordance with UL 217 and installed in accordance with the provisions of this code and the household fire warning *equipment* provisions of NFPA 72.

R314.2 Smoke detection systems. Household fire alarm systems installed in accordance with NFPA 72 that include smoke alarms, or a combination of smoke detector and audible notification device installed as required by this section for smoke alarms, shall be permitted. The household fire alarm system shall provide the same level of smoke detection and alarm as required by this section for smoke alarms. Where a household fire warning system is installed using a combination of smoke detector and audible notification device(s), it shall become a permanent fixture of the occupancy and owned by the homeowner. The system shall be monitored by an *approved* supervising station and be maintained in accordance with NFPA 72.

Exception: Where smoke alarms are provided meeting the requirements of Section R314.4.

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

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

When more than one smoke alarm is required to be installed within an individual *dwelling* unit the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit.

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

Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the *addition* or replacement of windows or doors, or

2. Change the definition of “Story Above Grade” in Section R202 to read:

STORY ABOVE GRADE. Any story having its finished floor surface entirely above grade, except that a basement shall be considered as a story above grade where the finished surface of the floor above the basement meets any one of the following:

1. Is more than 6 feet (1829 mm) above the grade plane.
2. Is more than 6 feet (1829 mm) above the finished ground level for more than 50% of the total building perimeter.
3. Is more than 12 feet (3658 mm) above the finished ground level at any point.

3. Change Section R301.2.1 to read:

R301.2.1 Wind limitations. Buildings and portions thereof shall be limited by wind speed, as defined in Table R301.2(1), and construction methods in accordance with this code. Basic wind speeds shall be determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply. Where loads for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors are not otherwise specified, the loads listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3) shall be used to determine design load performance requirements for wall coverings, curtain walls, roof coverings, exterior windows, skylights, garage doors and exterior doors. Asphalt shingles shall be designed for wind speeds in accordance with Section R905.2.6. Wind speeds for localities in special wind regions, near mountainous terrain and near gorges shall be based on elevation. Areas at 4,000 feet in elevation or higher shall use 110 V mph (48.4 m/s) and areas under 4,000 feet in elevation shall use 90 V mph (39.6 m/s). Gorge areas shall be based on the highest recorded speed per locality or in accordance with local jurisdiction requirements determined in accordance with Section 6.5.4 of ASCE 7.

4. Change Section R301.2.1.1 to read:

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

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

5. Change Table R301.7 to read:

**TABLE R301.7
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS^{a,b,c,d}**

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Rafters having slopes greater than 3/12 with no finished ceiling attached to rafters	L/180
Interior walls and partitions	H/180
Floors and plastered ceilings	L/360
All other structural members	L/240



COMMONWEALTH of VIRGINIA

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT Division of Building and Fire Regulation

Timothy M. Kaine
Governor

Patrick O. Gottschalk
Secretary of
Commerce and Trade

William C. Shelton
Director

August 27, 2008

Mr. Richard A. Anthes, Ph.D.
University of Corporation for Atmospheric Research
P.O. Box 3000
Boulder, Colorado 80307-3000

Dear Mr. Anthes:

I appreciate your letter dated August 17, 2008, regarding the 2003 and 2006 International Residential Code (IRC) wind zones for the eastern shore of Virginia.

First, I welcome your input and area of expertise and as we gear up towards the 2009 Uniform Statewide Building Code (USBC) in the last half of 2009, it would be great if you might avail yourself to provide insight and recommendations as we review this matter for the 2009 USBC and for the 2012 IRC code development cycles.

Virginia was one of the first states in 1972 to adopt and mandate a state building code based on the model codes and their consensus based process. Virginia is an active participant at the national level, so if there is a need to amend the IRC our building officials with support from builders and design professionals are well positioned to submit code changes. Related to your eastern shore issue, our Board of Housing and Community Development evaluated and amended the IRC to allow 90m.p.h as the wind zone for our very large special wind region in southwest Virginia this past year.

As your may well know, FEMA and other federal agencies, along with the design community, the insurance industry and experts like yourself, crafted a new measurement method for the wind zones and made more stringent the structural wall bracing requirements and the impact resistance of glazing for wind-borne debris. It is certainly appropriate for Mr. Tarr, the builder of your home, and yourself to ask the questions and to raise the concerns that you posed in your letter.

Since the USBC/IRC clearly allows interpolation to be made by the building officials and in the IRC Section 301.2.1 there is reference to some industry designs, our USBC already then provides a great deal of discretion for the local building officials to grant modifications based on factors that you have raised on the past 50 year history and the barrier island protection. The building officials could accept such factors and agree on a prescriptive wall bracing and anchoring design for the eastern shore. Other options to keep engineering costs down would be to accept an engineered design for a range of model homes built to a certain set of parameters.

Partners for Better Communities



www.dhcd.virginia.gov

Mr. Richard A. Anthes, Ph.D.
August 27, 2008
Page Two

At the same time building officials, builders or design professionals could develop and collaborate on code changes for our 2009 USBC that will get underway in the last half of 2009 and expected to be completed by the end of 2010. These code changes could then be vetted next year with the stakeholders for a consensus technical amendment.

You mentioned in your letter that porches and decks over 256 square feet also had to be designed by a design professional. I am unclear as to where that requirement comes from in the IRC. We will try to work with the building officials on the eastern shore and tidewater area on this issue where a common sense approach could be reached for decks and porches.

Again, we appreciate your interest and technical advice. I am asking the building officials in the tidewater and eastern shore area, by copy of this letter, to consider formulating what they might see as a reasonable and technically sound approach over the concerns you raise on the cost to engineer large homes with lots of glazing versus a starter home with limited glazing and size where the engineer costs might be an issue. On the other hand federal studies done for Congress say that for every one dollar spent on mitigation there is a four dollar payback in reduced property damage.

Should you have further questions, please free to contact me at 804-372-7151, or email at emory.rodgers@dhcd.virginia.gov.

Sincerely,



Emory R. Rodgers, Deputy Director
Division of Building and Fire Regulation

CC: Vernon Hodge ✓
Dave Fluhart
Mark Cline
Ken Lewis
Cheri Hainer
Lynn Underwood
John Glover
Roger Robertson
Steve Shapiro
Bill Dupler
Clifton Wallace
Paula Eubank
Jerry Tarr

Part IV—Energy Conservation

CHAPTER 11 ENERGY EFFICIENCY

SECTION N1101 GENERAL

N1101.1 Scope. This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code.

Exception: Portions of the building envelope that do not enclose *conditioned space*.

N1101.2 Compliance. Compliance shall be demonstrated by either meeting the requirements of the *International Energy Conservation Code* or meeting the requirements of this chapter. Climate zones from Figure N1101.2 or Table N1101.2 shall be used in determining the applicable requirements from this chapter.

N1101.2.1 Warm humid counties. Warm humid counties are identified in Table N1101.2 by an asterisk.

N1101.3 Identification. Materials, systems and *equipment* shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this chapter.

N1101.4 Building thermal envelope insulation. An *R*-value identification *mark* shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or more wide. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the area covered and *R*-value of installed thickness shall be listed on the certificate. The insulation installer shall sign, date and post the certificate in a conspicuous location on the job site.

N1101.4.1 Blown or sprayed roof/ceiling insulation. The thickness of blown in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 ft² (28 m²) throughout the *attic* space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) high. Each marker shall face the *attic* access opening. Spray polyurethane foam thickness and installed *R*-value shall be listed on the certificate provided by the insulation installer.

N1101.4.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value *mark* is readily observable upon inspection.

N1101.5 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and *labeled* and certified by the manu-

facturer. Products lacking such a *labeled U*-factor shall be assigned a default *U*-factor from Tables N1101.5(1) and N1101.5(2). The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Products lacking such a *labeled* SHGC shall be assigned a default SHGC from Table N1101.5(3).

N1101.6 Insulation product rating. The thermal resistance (*R*-value) of insulation shall be determined in accordance with the CFR Title 16, Part 460, in units of h · ft² · °F/Btu at a mean temperature of 75°F (24°C).

N1101.7 Installation. All materials, systems and *equipment* shall be installed in accordance with the manufacturer's installation instructions and the provisions of this code.

N1101.7.1 Protection of exposed foundation insulation.

Insulation applied to the exterior of *basement* walls, crawl space walls, and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (152 mm) below *grade*.

N1101.8 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 chapter. Buildings *approved* in writing by such an energy efficiency program shall be considered in compliance with this chapter.

N1101.9 Certificate. A permanent certificate shall be posted on or in the electrical distribution 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 be completed by the builder or registered *design professional*. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, *basement wall*, crawlspace wall and/or floor) and ducts outside *conditioned spaces*; *U*-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating *equipment*. Where a gas-fired unvented room heater, electric furnace and/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 base board heaters.

N1102.4 Air leakage.

N1102.4.1 Building thermal envelope. The *building thermal envelope* shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.

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

N1102.4.2 Air sealing and insulation. Building envelope air tightness and insulation installation shall be demonstrated to comply with one of the following options given by Section N1102.4.2.1 or N1102.4.2.2.

N1102.4.2.1 Testing option. Tested air leakage is less than 7 ACH when tested with a blower door at a pressure of 50 pascals (0.007 psi). Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliances.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
2. Dampers shall be closed, but not sealed; including exhaust, intake, makeup air, back draft, and flue dampers;
3. Interior doors shall be open;
4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling system(s) shall be turned off;
6. HVAC ducts shall not be sealed; and
7. Supply and return registers shall not be sealed.

N1102.4.2.2 Visual inspection option. The items listed in Table N1102.4.2, applicable to the method of construction, are field verified. Where required by the code official, an *approved* party independent from the installer

of the insulation, shall inspect the air barrier and insulation.

N1102.4.3 Fireplaces. New wood-burning fireplaces shall have gasketed doors and outdoor combustion air.

N1102.4.4 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cubic foot per minute per square foot [1.5(L/s)/m²], and swinging doors no more than 0.5 cubic foot per minute per square foot [2.5(L/s)/m²], when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory, and listed and *labeled* by the manufacturer.

Exception: Site-built windows, skylights and doors.

N1102.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and *labeled* as meeting ASTM E 283 when tested at 1.57 psi (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the *conditioned space* to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

SECTION N1103 SYSTEMS

N1103.1 Controls. At least one thermostat shall be installed for each separate heating and cooling system.

N1103.1.1 Programmable thermostat. Where the primary heating system is a forced air furnace, at least one thermostat per *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 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).

N1103.1.2 Heat pump supplementary heat. Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

N1103.2 Ducts.

N1103.2.1 Insulation. Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

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

N1103.2.2 Sealing. Ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.4. Duct tightness shall be verified by either of the following:

1. Post-construction test: Leakage to outdoors shall be less than or equal to 8 cfm (3.78 L/s) per 100 ft² (9.29

m²) of conditioned floor area or a total leakage less than or equal to 12 cfm (5.66 L/s) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler end closure. All register boots shall be taped or otherwise sealed during the test.

2. Rough-in test: Total leakage shall be less than or equal to 6 cfm (2.83 L/s) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the roughed in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm (1.89 L/s) per 100 ft² (9.29 m²) of conditioned floor area.

Exception: Duct tightness test is not required if the air handler and all ducts are located within *conditioned space*.

N1103.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.

N1103.3 Mechanical system piping insulation. Mechanical system piping capable of carrying fluids above 105°F (40°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

N1103.4 Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-2. Circulating hot water systems shall include an automatic or *readily accessible* manual switch that can turn off the hot water circulating pump when the system is not in use.

N1103.5 Mechanical ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

TABLE N1102.4.2
AIR BARRIER AND INSULATION INSPECTION

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material.
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of floor.
Crawlspace walls	Insulation is permanently attached to walls. Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are airtight, IC rated and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior wall	Air barrier extends behind boxes or air sealed type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

above the countertop, such as in an overhead cabinet. Receptacles mounted below the countertop in accordance with this exception shall not be located where the countertop extends more than 6 inches (152 mm) beyond its support base.

E3901.5 Appliance receptacle outlets. Appliance receptacle outlets installed for specific appliances, such as laundry equipment, shall be installed within 6 feet (1829 mm) of the intended location of the appliance.

E3901.6 Bathroom. At least one wall receptacle outlet shall be installed in bathrooms and such outlet shall be located within 36 inches (914 mm) of the outside edge of each lavatory basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the lavatory basin location, or installed on the side or face of the basin cabinet not more than 12 inches (305 mm) below the countertop.

Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.

E3901.7 Outdoor outlets. At least one receptacle outlet that is accessible while standing at grade level and located not more than 6 feet, 6 inches (1981 mm) above grade, shall be installed outdoors at the front and back of each dwelling unit having direct access to grade. Balconies, decks, and porches that are accessible from inside of the dwelling unit and that have a usable area of 20 square feet (1.86 m²) or greater shall have at least one receptacle outlet installed within the perimeter of the balcony, deck, or porch. The receptacle shall be located not more than 6 feet, 6 inches (1981 mm) above the balcony, deck, or porch surface.

E3901.8 Laundry areas. At least one receptacle outlet shall be installed to serve laundry appliances.

E3901.9 Basements and garages. At least one receptacle outlet, in addition to any provided for specific equipment, shall be installed in each basement and in each attached garage, and in each detached garage that is provided with electrical power. Where a portion of the basement is finished into one or more habitable room(s), each separate unfinished portion shall have a receptacle outlet installed in accordance with this section.

E3901.10 Hallways. Hallways of 10 feet (3048 mm) or more in length shall have at least one receptacle outlet. The hall length shall be considered the length measured along the centerline of the hall without passing through a doorway.

E3901.11 HVAC outlet. A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning and refrigeration equipment. The receptacle shall be located on the same level and within 25 feet (7620 mm) of the heating, air-conditioning and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the HVAC equipment disconnecting means.

Exception: A receptacle outlet shall not be required for the servicing of evaporative coolers.

SECTION E3902 GROUND-FAULT AND ARC-FAULT CIRCUIT-INTERRUPTER PROTECTION

E3902.1 Bathroom receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in bathrooms shall have ground-fault circuit-interrupter protection for personnel.

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

E3902.3 Outdoor receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles installed outdoors shall have ground-fault circuit-interrupter protection for personnel.

Exception: Receptacles as covered in Section E4101.7.

E3902.4 Crawl space receptacles. Where a crawl space is at or below grade level, all 125-volt, single-phase, 15- and 20-ampere receptacles installed in such spaces shall have ground-fault circuit-interrupter protection for personnel.

E3902.5 Unfinished basement receptacles. All 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 the like.

Exception: A receptacle supplying only a permanently installed fire alarm or burglar alarm system.

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

E3902.7 Laundry, utility, and bar sink receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles that are located within 6 feet (1829 mm) of the outside edge of a laundry, utility or wet bar sink shall have ground-fault circuit-interrupter protection for personnel. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.

E3902.8 Boathouse receptacles. All 125-volt, single-phase, 15- or 20-ampere receptacles installed in boathouses shall have ground-fault circuit-interrupter protection for personnel.

E3902.9 Boat hoists. Ground-fault circuit-interrupter protection for personnel shall be provided for 240-volt and less outlets that supply boat hoists.

E3902.10 Electrically heated floors. Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, and in hydromassage bathtub, spa and hot tub locations.

E3902.11 Arc-fault circuit-interrupter protection. All branch circuits that supply 120-volt, single-phase, 15- and 20-ampere outlets installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreational rooms, closets, hallways and similar rooms or areas shall

National Association of Home Builders Recommended State & Local Amendments to the 2008 Edition of the National Electrical Code (NEC)

Issue: Arc-Fault Receptacles

2008 NEC Section: Section 210.12 (B)

Recommended Amendment: Delete text as follows

~~(B) Dwelling Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit bedrooms, family rooms, living rooms, parlors, libraries, dens, sun rooms, recreation rooms or similar rooms shall be protected by a listed arc-fault circuit interrupter, combination type installed to provide protection of the branch circuit.~~

Reason: During the recent code revision cycle to the 2008 *National Electrical Code*, there was a lack of fire data used to support the expansion of arc-fault circuit interrupters (AFCI's) to all receptacles in the dwelling, let alone the mandatory installation of AFCI's in bedrooms. Looking at the latest data from NFPA in the report "The U.S. Home Product Report (Appliances and Equipment Involved in Fires)", by John R. Hall, Jr. of the Fire Analysis and Research Division of NFPA dated November 2005, the report shows that the annual average of home fires is 372,900, with direct property damage of \$443,000,000. Of this number 32,000 (or 9% = \$39,870,000) of these fires are caused by "electrical distribution equipment." Of that 9%, only 14,500 (or 4% = \$17,720,000) of those fires are attributed to "fixed wiring, switches, outlets, and receptacles." And, there is no data or study to support that of these 14,500 fires an the installation of an AFCI device would have prevented the fire. Using the U.S. Census Bureau data on building permits for 2004 (Table (S-3) Final) shows 1,656,413 one- & two-family dwelling units and 413,664 multifamily units for that year.

Calling this a "limited approach to the expansion of AFCI" still does not result in any cost-benefit to society, it just needlessly increases the cost of housing. There is still no justification for any jurisdiction to burden its citizens with this unneeded expense. As it was during the 1999 revision cycle, there has been a failure to provide any fire study or cost benefit study to support installing these devices in bedrooms. Since then NO data or study has ever been assembled to support the expansion to the whole house.

There are typically 20 (twenty) 20-volt, single phase, 15- and 20-ampere branch circuits in each one- & two-family dwelling unit, and 10 in each multifamily dwelling unit. Using these numbers, there will be approximately 33,128,260 AFCI's in one- and two-family dwellings and 4,136,640 for multifamily units, for a total of 37,264,900 AFCI's. Using a wholesale cost of \$41.20 per breaker, marked-up the industry standard percentage of 66%, produces a cost per breaker of \$68.32 to the home owner. In all, the average annual total cost to the public for the mandatory installation of AFCI's will be \$2,548,621,040 (\$1,535,313,880 wholesale). That is 2 BILLION, 548 MILLION, 621 THOUSAND, and 40 DOLLARS. Using current fire loss data society will be spending

\$2,548,621,040 per year to cover losses of only \$39,870,000. That means spending 63 times the amount of money that would be lost if the devices were not installed, and that is if the devices work 100% of the time. If you use the losses relating only to "fixed wiring, switches, outlets, and receptacles" (the part of the wiring that is claimed to be protected by AFCI breakers) the ratio to money spent relative to monetary loss (\$17,720,000) is 143 times, again, if they work 100% of the time.

If you break that down by each state, that lack of a cost-benefit becomes apparently clear. All jurisdictions that contemplate adopting the 2008 NEC, especially jurisdictions which are required by law to show a cost-benefit in the adoption, are encouraged to look closely at this cost-benefit fact and not adopt the 2008 NEC until all provisions requiring AFCIs are stricken (Section 210.12). In addition, there is no data to support the contention of a neither "excellent track record", nor information that these "installations have found numerous wiring errors" or "they have found wiring damage and equipment damage that could have been a potential source of fire". That statement alone provides no correlation between the purported problems and the use of AFCI's. The Panel needs to reconsider the mandatory installation of AFCI's, let alone the expansion of requiring these devices for all 120-volt, single phase, 15- and 20-ampere branch circuits in dwelling units. Until true field test data on the efficacy of AFCI's can be directly related to saving society monetary loss there is no cost benefit in this provision.

Notes/additional background:

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Fact Sheet

Arc-Fault Circuit Interrupters

What are Arc-Fault Circuit Interrupters (AFCIs)?

The 2008 *National Electrical Code® (NEC®)* requirement for AFCI protection considerably expands this fire prevention technology to the majority of circuits installed in new and renovated homes. The type of AFCI currently available commercially is a next-generation circuit breaker that not only provides the conventional safety functions, but its advanced design also rapidly detects potentially dangerous arcs and disconnects power in the circuit before a fire can start. Fire safety officials throughout the U.S. endorse AFCIs as a significant step forward in electrical fire safety.

Why should they be installed in homes?

AFCIs will save lives and make homes safer. According to the U.S. Fire Administration, each year home electrical problems cause about 70,000 fires, resulting in 485 deaths and \$868 million in property loss.

Why mandate AFCIs for newer homes when statistics show the majority of problems have occurred in older homes?

Fire safety officials recommend the use of AFCIs in all dwellings. While it is true that fire statistics in many cases are derived from older dwellings, damage to appliance cords or to wires hidden in a wall can occur regardless of the home's age. In addition, incorrectly performed electrical installations can occur in both new and old homes. As technology evolves and the *NEC* is revised, the enhanced level of safety is typically required only in new construction that is subject to the latest adopted edition. Homes wired per the 2008 *NEC* will have the majority of their circuits protect by AFCIs for the life of the electrical system.

How do you know AFCIs will prevent fires and save lives?

Since 1999, AFCIs have been thoroughly field-tested. Underwriters Laboratories, the National Association of State Fire Marshals (NASFM), the U.S. Consumer Product Safety Commission, and many other experts have found AFCIs to be reliable and effective. By eliminating a significant source of electrically related fires, future statistics will demonstrate a reduction in fires of electrical origin.

Are AFCIs expensive?

The cost of the enhanced protection is directly related to the size of the dwelling and the number of circuits installed. Current retail prices of AFCI-type circuit breakers at several national building supply chains are in the range of \$35 to \$40 per unit. Even for larger homes with more circuits, the cost increase is insignificant compared to the total cost of the home, particularly when the increased level of safety is factored.

Do AFCIs interfere with smoke alarms and appliances, and trip unnecessarily?

AFCIs do not interfere with power supply reliability. These state-of-the-art devices identify problems that current circuit breakers are not designed to protect against, which can result in what appears to be an unexplained circuit breaker trip. By actually identifying these problems, residents are safer.

What is the *NEC*?

The *NEC* is the *National Electrical Code*. The *NEC's* mission is to provide practical safeguards from the hazards that arise from using electricity. It is the most widely adopted safety code in the United States and the world, and it is the benchmark for safe electrical installations. The *NEC* is an evolving document, developed through an open consensus process. A new edition is issued every three years.

For more information, visit www.nfpa.org.

the *addition* of a porch or deck, are exempt from the requirements of this section.

2. Installation, *alteration* or repairs of plumbing or mechanical systems are exempt from the requirements of this section.

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

Exceptions:

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

SECTION R315 CARBON MONOXIDE ALARMS

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

R315.2 Where required in existing dwellings. Where work requiring a *permit* occurs in existing *dwellings* that have attached garages or in existing dwellings within which fuel-fired *appliances* exist, carbon monoxide alarms shall be provided in accordance with Section R315.1.

R315.3 Alarm requirements. Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.

SECTION R316 FOAM PLASTIC

R316.1 General. The provisions of this section shall govern the materials, design, application, construction and installation of foam plastic materials.

R316.2 Labeling and identification. Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the *label* of an *approved agency* showing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with the requirements.

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5 or R316.6, all foam plastic or foam plastic cores used as a component in manufactured assemblies used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723. Loose-fill type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

Exception: Foam plastic insulation more than 4 inches (102 mm) thick shall have a maximum flame spread index of 75 and a smoke-developed index of 450 where tested at a minimum thickness of 4 inches (102 mm), provided the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

R316.4 Thermal barrier. Unless otherwise allowed in Section R316.5 or Section R316.6, foam plastic shall be separated from the interior of a building by an *approved* thermal barrier of minimum $\frac{1}{2}$ inch (12.7 mm) gypsum wallboard or an *approved* finish material equivalent to a thermal barrier material that will limit the average temperature rise of the unexposed surface to no more than 250°F (139°C) after 15 minutes of fire exposure complying with the ASTM E 119 or UL 263 standard time temperature curve. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on NFPA 286 with the acceptance criteria of Section R302.9.4, FM 4880, UL 1040 or UL 1715.

R316.5 Specific requirements. The following requirements shall apply to these uses of foam plastic unless specifically *approved* in accordance with Section R316.6 or by other sections of the code or the requirements of Sections R316.2 through R316.4 have been met.

R316.5.1 Masonry or concrete construction. The thermal barrier specified in Section R316.4 is not required in a masonry or concrete wall, floor or roof when the foam plastic insulation is separated from the interior of the building by a minimum 1-inch (25 mm) thickness of masonry or concrete.

R316.5.2 Roofing. The thermal barrier specified in Section R316.4 is not required when the foam plastic in a roof assembly or under a roof covering is installed in accordance with the code and the manufacturer's installation instructions and is separated from the interior of the building by tongue-and-groove wood planks or wood structural panel sheathing in accordance with Section R803, not less than $\frac{15}{32}$ inch (11.9 mm) thick bonded with exterior glue and identified as Exposure 1, with edges supported by blocking or tongue-and-groove joints or an equivalent material. The smoke-developed index for roof applications shall not be limited.

R316.5.3 Attics. The thermal barrier specified in Section R316.4 is not required where all of the following apply:

1. *Attic* access is required by Section R807.1.
2. The space is entered only for purposes of repairs or maintenance.

APPENDIX O

GRAY WATER RECYCLING SYSTEMS

(The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)

Note: Section P2601.2 of the International Residential Code requires all plumbing fixtures that receive water or waste to discharge to the sanitary drainage system of the structure. To allow for the use of a gray water recycling system, Section P2601.2 of the International Residential Code should be revised to read as follows:

P2601.2 Connections. Plumbing fixtures, drains and appliances used to receive or discharge liquid wastes or sewage shall be directly connected to the sanitary drainage system of the building or premises, in accordance with the requirements of this code. This section shall not be construed to prevent indirect waste systems.

Exception: Bathtubs, showers, lavatories, clothes washers and laundry trays are not required to discharge to the sanitary drainage system where those fixtures discharge to an approved gray water recycling system.

SECTION AO101 GENERAL

AO101.1 Scope. The provisions of this appendix shall govern the materials, design, construction and installation of gray water systems for flushing of water closets and urinals and for subsurface landscape irrigation [see Figures AO101.1(1) and AO101.1(2)].

AO101.2 Definition. The following term shall have the meaning shown herein.

GRAY WATER. Waste discharged from lavatories, bathtubs, showers, clothes washers and laundry trays.

AO101.3 Permits. Permits shall be required in accordance with Section R105 of the *International Residential Code*.

AO101.4 Installation. In addition to the provisions of Section AO101, systems for flushing of water closets and urinals shall comply with Section AO102 and systems for subsurface landscape irrigation shall comply with Section AO103. Except as provided for in Appendix O, all systems shall comply with the provisions of the *International Residential Code*.

AO101.5 Materials. Above-ground drain, waste and vent piping for gray water systems shall conform to one of the standards listed in Table P3002.1(1) of the *International Residential Code*. Gray water underground building drainage and vent pipe shall conform to one of the standards listed in Table P3002.1(2) of the *International Residential Code*.

AO101.6 Tests. Drain, waste and vent piping for gray water systems shall be tested in accordance with Section P2503 of the *International Residential Code*.

AO101.7 Inspections. Gray water systems shall be inspected in accordance with Section P2503 of the *International Residential Code*.

AO101.8 Potable water connections. Only connections in accordance with Section AO102.3 shall be made between a gray water recycling system and a potable water system.

AO101.9 Waste water connections. Gray water recycling systems shall receive the waste discharge only of bathtubs, showers, lavatories, clothes washers and laundry trays.

AO101.10 Filtration. Gray water entering the reservoir shall pass through an approved filter such as a media, sand or diatomaceous earth filter.

AO101.10.1 Required valve. A full-open valve shall be installed downstream of the last fixture connection to the gray water discharge pipe before entering the required filter.

AO101.11 Collection reservoir. Gray water shall be collected in an approved reservoir constructed of durable, nonabsorbent and corrosion-resistant materials. The reservoir shall be a closed and gas-tight vessel. Access openings shall be provided to allow inspection and cleaning of the reservoir interior.

AO101.12 Overflow. The collection reservoir shall be equipped with an overflow pipe of the same diameter as, or larger than, the influent pipe for the gray water. The overflow pipe shall be trapped and shall be indirectly connected to the sanitary drainage system.

AO101.13 Drain. A drain shall be located at the lowest point of the collection reservoir and shall be indirectly connected to the sanitary drainage system. The drain shall be the same diameter as the overflow pipe required in Section AO101.12.

AO101.14 Vent required. The reservoir shall be provided with a vent sized in accordance with Chapter 31 of the *International Residential Code* and based on the diameter of the reservoir influent pipe.

SECTION AO102 SYSTEMS FOR FLUSHING WATER CLOSETS AND URINALS

AO102.1 Collection reservoir. The holding capacity of the reservoir shall be a minimum of twice the volume of water required to meet the daily flushing requirements of the fixtures supplied with gray water, but not less than 50 gallons (189 L). The reservoir shall be sized to limit the retention time of gray water to a maximum of 72 hours.

AO102.2 Disinfection. Gray water shall be disinfected by an approved method that uses one or more disinfectants such as chlorine, iodine or ozone that are recommended for use with the pipes, fittings and equipment by the manufacturer of the pipes, fittings and equipment.

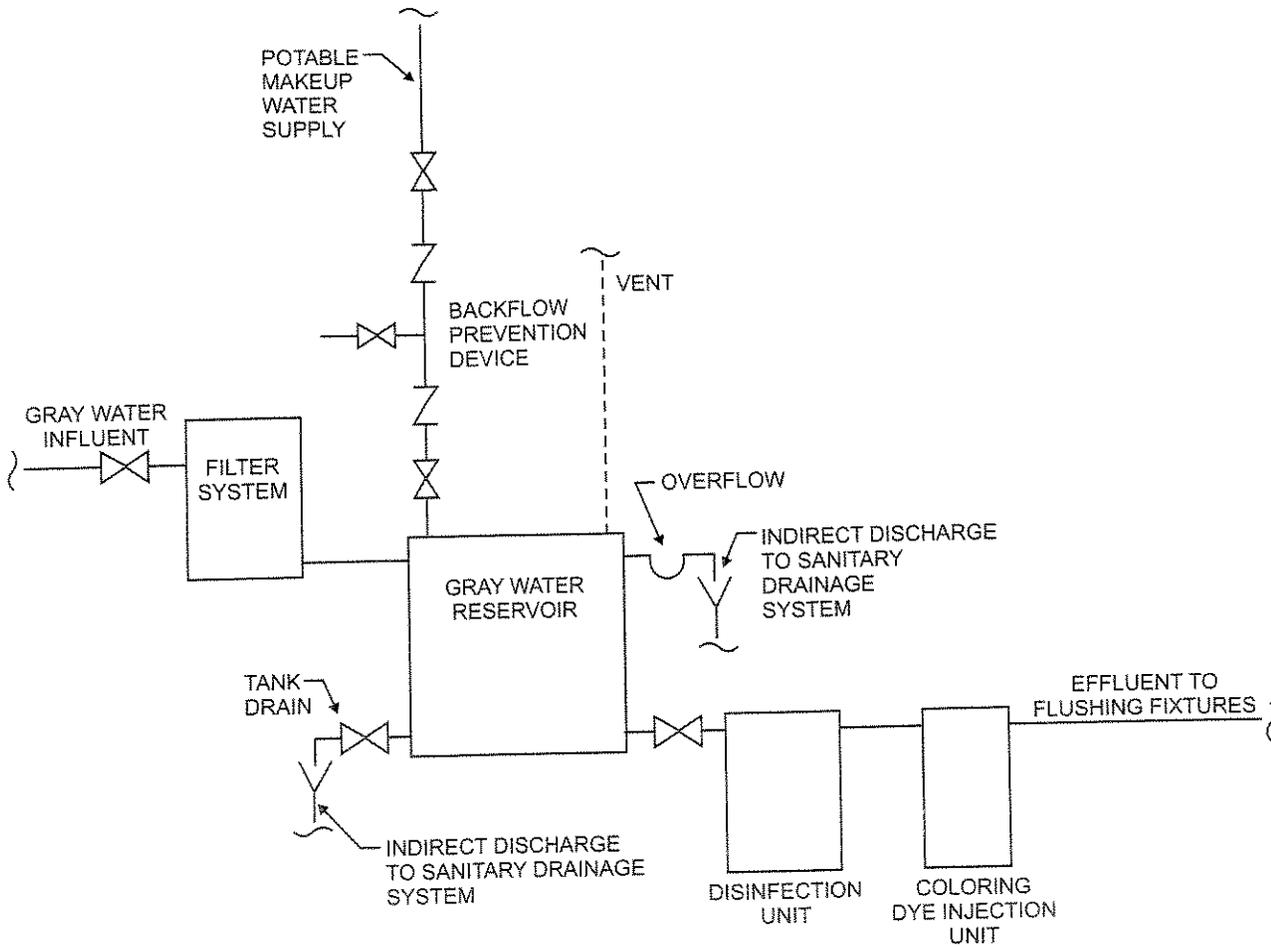


FIGURE AO101.1(1)
GRAY WATER RECYCLING SYSTEM FOR FLUSHING WATER CLOSETS AND URINALS

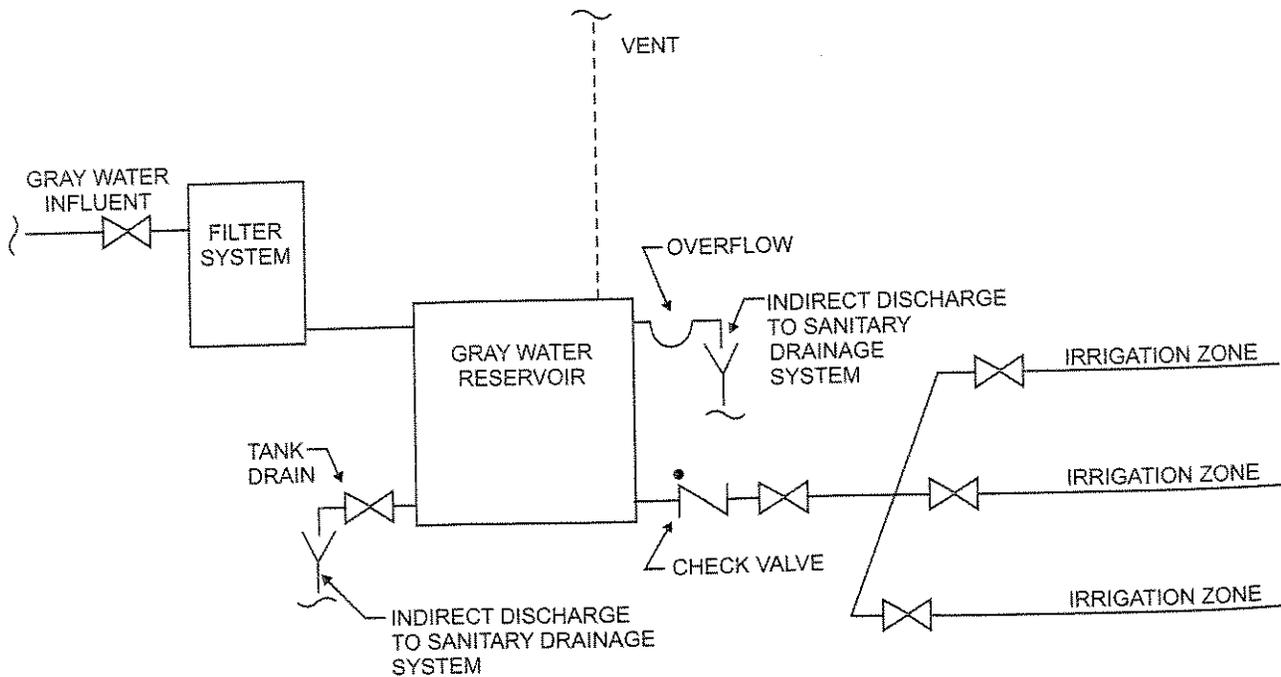


FIGURE AO101.1(2)
GRAY WATER RECYCLING SYSTEM FOR SUBSURFACE LANDSCAPE IRRIGATION

AO102.3 Makeup water. Potable water shall be supplied as a source of makeup water for the gray water system. The potable water supply shall be protected against backflow in accordance with Section P2902 of the *International Residential Code*. A full-open valve shall be located on the makeup water supply line to the collection reservoir.

AO102.4 Coloring. The gray water shall be dyed blue or green with a food grade vegetable dye before such water is supplied to the fixtures.

AO102.5 Materials. Distribution piping shall conform to one of the standards listed in Table P2905.4 of the *International Residential Code*.

AO102.6 Identification. Distribution piping and reservoirs shall be identified as containing nonpotable water. Piping identification shall be in accordance with Section 608.8 of the *International Plumbing Code*®.

SECTION AO103 SUBSURFACE LANDSCAPE IRRIGATION SYSTEMS

AO103.1 Collection reservoir. Reservoirs shall be sized to limit the retention time of gray water to a maximum of 24 hours.

AO103.1.1 Identification. The reservoir shall be identified as containing nonpotable water.

AO103.2 Valves required. A check valve, and a full-open valve located on the discharge side of the check valve, shall be installed on the effluent pipe of the collection reservoir.

AO103.3 Makeup water. Makeup water shall not be required for subsurface landscape irrigation systems. Where makeup water is supplied, the installation shall be in accordance with Section AO102.3.

AO103.4 Disinfection. Disinfection shall not be required for gray water used for subsurface landscape irrigation systems.

AO103.5 Coloring. Gray water used for subsurface landscape irrigation systems shall not be required to be dyed.

AO103.6 Estimating gray water discharge. The system shall be sized in accordance with the demands per day per occupant based on the type of fixtures connected to the gray water system. The discharge shall be calculated by the following equation:

$$C = A \times B \quad \text{(Equation AO-1)}$$

A = Number of occupants:

Number of occupants shall be determined by the actual number of occupants but not less than two occupants for 1 bedroom and one occupant for each additional bedroom.

B = Estimated flow demands for each occupant:

25 gallons per day (95 Lpd) per occupant for showers, bathtubs and lavatories and 15 gallons per day (57 Lpd) per occupant for clothes washers or laundry trays.

C = Estimated gray water discharge based on the total number of occupants.

AO103.7 Percolation tests. The permeability of the soil in the proposed absorption system shall be determined by percolation tests or permeability evaluation.

AO103.7.1 Percolation tests and procedures. At least three percolation tests shall be conducted in each system area. The holes shall be spaced uniformly in relation to the bottom depth of the proposed absorption system. More percolation tests shall be made where necessary, depending on system design.

AO103.7.1.1 Percolation test hole. The test hole shall be dug or bored. The test hole shall have vertical sides and a horizontal dimension of 4 inches to 8 inches (102 mm to 203 mm). The bottom and sides of the hole shall be scratched with a sharp-pointed instrument to expose the natural soil. All loose material shall be removed from the hole and the bottom shall be covered with 2 inches (51 mm) of gravel or coarse sand.

AO103.7.1.2 Test procedure, sandy soils. The hole shall be filled with clear water to a minimum of 12 inches (305 mm) above the bottom of the hole for tests in sandy soils. The time for this amount of water to seep away shall be determined and this procedure shall be repeated if the water from the second filling of the hole seeps away in 10 minutes or less. The test shall proceed as follows: Water shall be added to a point not more than 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, water levels shall be measured at 10-minute intervals for a period of 1 hour. Where 6 inches (152 mm) of water seeps away in less than 10 minutes, a shorter interval between measurements shall be used, but in no case shall the water depth exceed 6 inches (152 mm). Where 6 inches (152 mm) of water seeps away in less than 2 minutes, the test shall be stopped and a rate of less than 3 minutes per inch (7 s/mm) shall be reported. The final water level drop shall be used to calculate the percolation rate. Soils not meeting the requirements of this section shall be tested in accordance with Section AO103.7.1.3.

AO103.7.1.3 Test procedure, other soils. The hole shall be filled with clear water, and a minimum water depth of 12 inches (305 mm) shall be maintained above the bottom of the hole for a 4-hour period by refilling whenever necessary or by use of an automatic siphon. Water remaining in the hole after 4 hours shall not be removed. Thereafter, the soil shall be allowed to swell not less than 16 hours or more than 30 hours. Immediately after the soil swelling period, the measurements for determining the percolation rate shall be made as follows: Any soil sloughed into the hole shall be removed, and the water level shall be adjusted to 6 inches (152 mm) above the gravel or coarse sand. Thereupon, from a fixed reference point, the water level shall be measured at 30-minute intervals for a period of 4 hours, unless two successive water level drops do not vary by more than 0.62 inch (16 mm). At least three water level drops shall be observed and recorded. The hole shall be filled with clear water to a point not more than 6 inches (152 mm) above the gravel or coarse sand whenever it becomes nearly empty. The water level shall not be adjusted during the three measurement periods except to the limits of the last measured

water level drop. When the first 6 inches (152 mm) of water seeps away in less than 30 minutes, the time interval between measurements shall be 10 minutes and the test run for 1 hour. The water depth shall not exceed 5 inches (127 mm) at any time during the measurement period. The drop that occurs during the final measurement period shall be used in calculating the percolation rate.

AO103.7.1.4 Mechanical test equipment. Mechanical percolation test equipment shall be of an *approved* type.

AO103.7.2 Permeability evaluation. Soil shall be evaluated for estimated percolation based on structure and texture in accordance with accepted soil evaluation practices. Borings shall be made in accordance with Section AO103.7.1 for evaluating the soil.

AO103.8 Subsurface landscape irrigation site location. The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any water well or reservoir on the same or adjoining property. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table AO103.8. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots.

**TABLE AO103.8
LOCATION OF GRAY WATER SYSTEM**

ELEMENT	MINIMUM HORIZONTAL DISTANCE	
	HOLDING TANK (feet)	IRRIGATION DISPOSAL FIELD (feet)
Buildings	5	2
Property line adjoining private property	5	5
Public water main	10	10
Seepage pits	5	5
Septic tanks	0	5
Streams and lakes	50	50
Water service	5	5
Water wells	50	100

For SI: 1 foot = 304.8 mm.

AO103.9 Installation. Absorption systems shall be installed in accordance with Sections AO103.9.1 through AO103.9.5 to provide landscape irrigation without surfacing of gray water.

AO103.9.1 Absorption area. The total absorption area required shall be computed from the estimated daily gray water discharge and the design-loading rate based on the percolation rate for the site. The required absorption area equals the estimated gray water discharge divided by the design-loading rate from Table AO103.9.1.

**TABLE AO103.9.1
DESIGN LOADING RATE**

PERCOLATION RATE (minutes per inch)	DESIGN LOAD FACTOR (gallons per square foot per day)
0 to less than 10	1.2
10 to less than 30	0.8
30 to less than 45	0.72
45 to 60	0.4

For SI: 1 minute per inch = 2.362 s/mm;
1 gallon per square foot = 40.743 L/m².

AO103.9.2 Seepage trench excavations. Seepage trench excavations shall be a minimum of 1 foot (305 mm) to a maximum of 5 feet (1524 mm) wide. Trench excavations shall be spaced a minimum of 2 feet (610 mm) apart. The soil absorption area of a seepage trench shall be computed by using the bottom of the trench area (width) multiplied by the length of pipe. Individual seepage trenches shall be a maximum of 100 feet (30 480 mm) in *developed length*.

AO103.9.3 Seepage bed excavations. Seepage bed excavations shall be a minimum of 5 feet (1524 mm) wide and have more than one distribution pipe. The absorption area of a seepage bed shall be computed by using the bottom of the trench area. Distribution piping in a seepage bed shall be uniformly spaced a maximum of 5 feet (1524 mm) and a minimum of 3 feet (914 mm) apart, and a maximum of 3 feet (914 mm) and a minimum of 1 foot (305 mm) from the side-wall or headwall.

AO103.9.4 Excavation and construction. The bottom of a trench or bed excavation shall be level. Seepage trenches or beds shall not be excavated where the soil is so wet that such material rolled between the hands forms a soil wire. All smeared or compacted soil surfaces in the sidewalls or bottom of seepage trench or bed excavations shall be scarified to the depth of smearing or compaction and the loose material removed. Where rain falls on an open excavation, the soil shall be left until sufficiently dry so a soil wire will not form when soil from the excavation bottom is rolled between the hands. The bottom area shall then be scarified and loose material removed.

AO103.9.5 Aggregate and backfill. A minimum of 6 inches (152 mm) of aggregate ranging in size from 1/2 to 2 1/2 inches (13 mm to 64 mm) shall be laid into the trench below the distribution piping elevation. The aggregate shall be evenly distributed a minimum of 2 inches (51 mm) over the top of the distribution pipe. The aggregate shall be covered with *approved* synthetic materials or 9 inches (229 mm) of uncompacted marsh hay or straw. Building paper shall not be used to cover the aggregate. A minimum of 9 inches (229 mm) of soil backfill shall be laid above the covering.

AO103.10 Distribution piping. Distribution piping shall be not less than 3 inches (76 mm) in diameter. Materials shall comply with Table AO103.10. The top of the distribution pipe shall be not less than 8 inches (203 mm) below the original surface. The slope of the distribution pipes shall be a minimum of

2 inches (51 mm) and a maximum of 4 inches (102 mm) per 100 feet (30 480 mm).

AO103.11 Joints. Distribution pipe shall be joined in accordance with Section P3003 of the *International Residential Code*.

**TABLE AO103.10
DISTRIBUTION PIPE**

MATERIAL	STANDARD
Polyethylene (PE) plastic pipe	ASTM F 405
Polyvinyl chloride (PVC) plastic pipe	ASTM D 2729
Polyvinyl chloride (PVC) plastic pipe with pipe stiffness of PS 35 and PS 50	ASTM F 1488

National Association of Home Builders Recommended State & Local Amendments to the 2008 Edition of the National Electrical Code (NEC)

Issue: Tamper-resistant Receptacles

2008 NEC Section: Section 406.11 Tamper-resistant Receptacles

Recommended Amendment: Delete text as follows

~~**406.11 Tamper-Resistant Receptacles in Dwelling Units.** In all areas specified in 240.52, all 125-volt, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles.~~

Reason:

This new requirement is not based on sound technical information that adequately substantiates that such a requirement will result in protecting small children from burns or injury. During the previous code revision cycle to the *National Electrical Code*, the supporting documentation for the proposal was based on the summarization of several National Electronic Injury Surveillance System reports from 1991-2001. The NEISS system gathers its data by sampling a group of monitored hospitals for the total number of injuries treated. They then take these figures and calculate the estimated national average. The NEISS reports do not provide any supporting information of where the child was located at the time the injury occurred, much less that all incidents occurred in dwelling units or if any child safety devices were present at the time the injury occurred. There is no scientific research available which has proven tamper-resistant receptacles are more effective than other safety devices that are currently available on the market. The fact sheet, produced by the National Fire Protection Association, states that TR receptacles are preferred over plastic safety caps for the reason that the caps **may** be lost and **may** be a choking hazard for some ages.

Based on the supporting information given at the time of the proposal, it is still unclear why dwellings were singled out among all other related occupancies where children are found and often left unattended. In the substantiation it was noted that these devices are designed to protect children when their parents or guardians turn away for that split moment when a tragedy could occur. This type of tragedy could occur in any number of occupancies that children are present, not just in one- and two-family dwellings. As written the proposal is too broad in scope and requires tamper-resistant receptacles in areas of the home that should not pose a threat to unattended children. Receptacles that are not readily accessible or that are dedicated for equipment should not be required to be tamper resistant. Examples of these areas that tamper-resistant receptacles should not be required are those found in attics, crawlspaces, mechanical rooms, behind equipment such as dishwasher, stoves, refrigerators, countertops, etc. To require tamper-resistant receptacles in these and other areas, not accessible to children under the age 4, shows a complete lack of forethought of the code requirement and a lack of common sense on the part of the committee that approved the proposal.

To arbitrarily require without any supporting statistics or data linking these areas to any recorded instance of an injury, shows a complete lack of due process.

Another concern that was shared by many on the technical review committee was the amount of force that must be applied to insert cords into the tamper-resistant device and how it will affect the elderly community. The devices are designed in a way that the springs will not open unless the prongs are properly aligned with the shutters and are receiving equal amounts of pressure. Many on the panel voiced their opinions that there was a lack of product testing showing whether there will be an impact to the aging community's ability to use the new devices.

NAHB urges all jurisdictions that will be adopting the 2008 edition of the National Electrical Code to amend by deleting Article 406.11.

Notes/additional background:

During the 2008 revision Cycle, the National Electrical Manufacturers Association submitted the proposal to require tamper-resistant receptacles in all areas of a dwelling as indicated in Article 210.52 of the NEC®. Over 29 negative comments were submitted in response to the proposal and all 29 comments were rejected by the technical committee. The negative comments were submitted by electrical contractors, electrical inspectors, and some manufactures. Below is a list concerns that were raised by negative comments:

1. The required force to insert cords into the device may prove too much for the elderly or disabled.
2. There is no scientific data directly comparing current available safety devices to tamper-resistant receptacles to support the claim that TR are more effective and will reduce the number of accidents.
3. That the proponent should provide data listing the areas of the dwelling where injuries have occurred, thereby proving the need for tamper receptacle in areas such as attics, crawlspaces, mechanical rooms, countertops and other areas where the receptacles are normally out of reach of children.
4. At the time the proposal was approved, it was unknown whether any manufacturers were producing tamper-resistant devices that were compatible or integrated with arc-fault and ground-fault circuit interrupters.
5. The supporting documentation submitted by the proponent clearly stated "the results of these incidents are rarely fatal", and that further research should be conducted along with more product development before any such mandate should be implemented.
6. That the technical committee should remember, the code is not able to protect each person, in every situations, from every conceivable harm and should not be used as a tool to differ the responsibilities of the parent or caregiver who should be monitoring the children.
7. That the substantiation lacked any credible justification for disallowing the use of plastic safety caps other than claiming that they could be lost or become a choking hazard.

8. Why limit tamper-resistant receptacles to dwellings? There are several other occupancies that do not require these devices, yet children are present and the receptacles are accessible.
9. Tamper-resistant receptacles should be an option for dwellings that children occupy and not mandatory for dwellings where children are not present.

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Tamper-Resistant Electrical Receptacles

What are tamper-resistant electrical receptacles and what is the new requirement?

The 2008 *National Electrical Code® (NEC®)* will require new and renovated dwellings to have tamper-resistant (TR) receptacles. These receptacles have spring-loaded shutters that close off the contact openings, or slots, of the receptacles. When a plug is inserted into the receptacle, both springs are compressed and the shutters then open, allowing for the metal prongs to make contact to create an electrical circuit. Because both springs must be compressed at the same time, the shutters do not open when a child attempts to insert an object into only one contact opening, and there is no contact with electricity. Tamper-resistant receptacles are an important next step to making the home a safer place for children.

Why require tamper-resistant electrical receptacles?

Each year, approximately 2,400 children suffer severe shock and burns when they stick items into the slots of electrical receptacles. It is estimated that there are six to 12 child fatalities a year related to this.

If homeowners do not have children, are TR receptacles required?

Yes. Owners or tenants of homes and apartments change frequently. In addition, exposure to electrical shock and burn accidents are not limited to a child's own home. Children visit homes of relatives and friends who don't have children of their own. This requirement ensures all new homes and apartments are safe for children, whether the home is their own or they are there on a temporary basis.

Do TR receptacles require greater insertion strength than standard receptacles?

TR receptacles require comparable force to other receptacles. The insertion force may vary depending on the newness of the device to the shape or style of the plug being inserted.

Are TR receptacles costly?

No. The projected cost of a TR receptacle adds about \$0.50 to the cost of an unprotected receptacle. Based on current statistics, the average home has about 75 receptacles resulting in an overall added cost of under \$40. This amount may vary slightly based on the type and style of TR receptacle used. This minimal increase in cost buys a significant increase in electrical safety for children.

Shouldn't people accept responsibility for their children and teach their children not to stick items in receptacles?

Accidents involving children and receptacles cannot be blamed entirely on poor parenting. They involve people who look away for a moment, only to face undue tragedy and pain as the result of a child's curiosity. The *NEC's* mission is to provide electrical safety in the home. TR receptacles are a simple and easy way to protect children from serious injuries that continue to happen every year.

Why are TR receptacles preferred over products such as receptacles with caps or with sliding receptacle covers?

Receptacle caps may be lost and also may be a choking hazard for some ages. Children can learn to defeat sliding receptacle covers when they watch their parents. TR receptacles provide security against the insertion of objects other than cord plugs into the energized parts.

What is the *NEC*?

The *NEC* is the *National Electrical Code*. The *NEC's* mission is to provide practical safeguards from the hazards that arise from using electricity. It is the most widely adopted safety code in the United States and the world, and it is the benchmark for safe electrical installations. The *NEC* is an evolving document, developed through an open consensus process. A new edition is issued every three years.

For more information, visit www.nfpa.org.

nonconducting, noncombustible material or shall be protected by a ground-fault circuit interrupter.

E4001.12 Dimmer switches. General-use dimmer switches shall be used only to control permanently installed incandescent luminaires (lighting fixtures) except where listed for the control of other loads and installed accordingly.

E4001.13 Multipole snap switches. A multipole, general-use snap switch shall not be fed from more than a single circuit unless it is listed and marked as a two-circuit or three-circuit switch, or unless its voltage rating is not less than the nominal line-to-line voltage of the system supplying the circuits.

**SECTION E4002
RECEPTACLES**

E4002.1 Rating and type. Receptacles and cord connectors shall be rated at not less than 15 amperes, 125 volts, or 15 amperes, 250 volts, and shall not be a lampholder type. Receptacles shall be rated in accordance with this section.

E4002.1.1 Single receptacle. A single receptacle installed on an individual branch circuit shall have an ampere rating not less than that of the branch circuit.

E4002.1.2 Two or more receptacles. Where connected to a branch circuit supplying two or more receptacles or outlets, receptacles shall conform to the values listed in Table E4002.1.2.

**TABLE E4002.1.2
RECEPTACLE RATINGS FOR VARIOUS SIZE
MULTI-OUTLET CIRCUITS**

CIRCUIT RATING (amperes)	RECEPTACLE RATING (amperes)
15	15
20	15 or 20
30	30
40	40 or 50
50	50

E4002.2 Grounding type. Receptacles installed on 15- and 20-ampere-rated branch circuits shall be of the grounding type.

E4002.3 CO/ALR receptacles. Receptacles rated at 20 amperes or less and directly connected to aluminum conductors shall be marked CO/ALR.

E4002.4 Faceplates. Metal face plates shall be grounded.

E4002.5 Position of receptacle faces. After installation, receptacle faces shall be flush with or project from face plates of insulating material and shall project a minimum of 0.015 inch (0.381 mm) from metal face plates. Faceplates shall be installed so as to completely cover the opening and seat against the mounting surface.

Exception: Listed kits or assemblies encompassing receptacles and nonmetallic faceplates that cover the receptacle face, where the plate cannot be installed on any other receptacle, shall be permitted.

E4002.6 Receptacle mounted in boxes. Receptacles mounted in boxes that are set back from the finished wall surface as permitted by Section E3906.5 shall be installed so that the mounting yoke or strap of the receptacle is held rigidly at the finished surface of the wall. Receptacles mounted in boxes that are flush with the wall surface or project therefrom shall be so installed that the mounting yoke or strap is seated against the box or raised cover.

E4002.7 Receptacles mounted on covers. Receptacles mounted to and supported by a cover shall be held rigidly against the cover by more than one screw or shall be a device assembly or box cover listed and identified for securing by a single screw.

E4002.8 Damp locations. A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle cover(s) is closed and an attachment plug cap is not inserted. An installation suitable for wet locations shall also be considered suitable for damp locations. A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies and similar structures and not subject to rain or water runoff. Fifteen- and 20-ampere, 125- and 250-volt nonlocking receptacles installed in damp locations shall be listed a weather-resistant type.

E4002.9 Fifteen- and 20-ampere receptacles in wet locations. Where installed in a wet location, 15- and 20-ampere, 125- and 250-volt receptacles shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted. Fifteen- and 20-ampere, 125- and 250-volt nonlocking receptacles installed in wet locations shall be a listed weather-resistant type.

E4002.10 Other receptacles in wet locations. Where a receptacle other than a 15- or 20-amp, 125- or 250-volt receptacle is installed in a wet location and where the product intended to be plugged into it is not attended while in use, the receptacle shall have an enclosure that is weatherproof both when the attachment plug cap is inserted and when it is removed. Where such receptacle is installed in a wet location and where the product intended to be plugged into it will be attended while in use, the receptacle shall have an enclosure that is weatherproof when the attachment plug cap is removed.

E4002.11 Bathtub and shower space. A receptacle shall not be installed within or directly over a bathtub or shower stall.

E4002.12 Flush mounting with faceplate. In damp or wet locations, the enclosure for a receptacle installed in an outlet box flush-mounted in a finished surface shall be made weatherproof by means of a weatherproof faceplate assembly that provides a water-tight connection between the plate and the finished surface.

E4002.13 Exposed terminals. Receptacles shall be enclosed so that live wiring terminals are not exposed to contact.

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.

CHAPTER 39

POWER AND LIGHTING DISTRIBUTION

SECTION E3901 RECEPTACLE OUTLETS

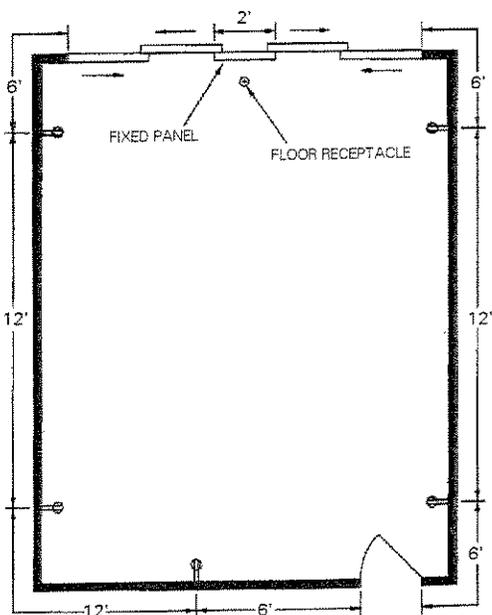
E3901.1 General. Outlets for receptacles rated at 125 volts, 15- and 20-amperes shall be provided in accordance with Sections E3901.2 through E3901.11. Receptacle outlets required by this section shall be in addition to any receptacle that is:

1. Part of a luminaire or appliance;
2. Located within cabinets or cupboards;
3. Controlled by a wall switch in accordance with Section E3903.2, Exception 1; or
4. Located over 5.5 feet (1676 mm) above the floor.

Permanently installed electric baseboard heaters equipped with factory-installed receptacle outlets, or outlets provided as a separate assembly by the baseboard manufacturer shall be permitted as the required outlet or outlets for the wall space utilized by such permanently installed heaters. Such receptacle outlets shall not be connected to the heater circuits.

E3901.2 General purpose receptacle distribution. In every kitchen, family room, dining room, living room, parlor, library, den, sun room, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in Sections E3901.2.1 through E3901.2.3 (see Figure E3901.2).

E3901.2.1 Spacing. Receptacles shall be installed so that no point measured horizontally along the floor line in any wall space is more than 6 feet 1829 mm, from a receptacle outlet.



For SI: 1 foot = 304.8 mm.

FIGURE E3901.2
GENERAL USE RECEPTACLE DISTRIBUTION

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

1. Any space that is 2 feet (610 mm) or more in width, including space measured around corners, and that is unbroken along the floor line by doorways, fireplaces, and similar openings.
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.

E3901.2.3 Floor receptacles. Receptacle outlets in floors shall not be counted as part of the required number of receptacle outlets except where located within 18 inches (457 mm) of the wall.

E3901.3 Small appliance receptacles. In the kitchen, pantry, breakfast room, dining room, or similar area of a dwelling unit, the two or more 20-ampere small-appliance branch circuits required by Section E3703.2, shall serve all wall and floor receptacle outlets covered by Sections E3901.2 and E3901.4 and those receptacle outlets provided for refrigeration appliances.

Exceptions:

1. In addition to the required receptacles specified by Sections E3901.1 and E3901.2, switched receptacles supplied from a general-purpose branch circuit as defined in Section E3903.2, Exception 1 shall be permitted.
2. The receptacle outlet for refrigeration appliances shall be permitted to be supplied from an individual branch circuit rated at 15 amperes or greater.

E3901.3.1 Other outlets prohibited. The two or more small-appliance branch circuits specified in Section E3901.3 shall serve no other outlets.

Exceptions:

1. A receptacle installed solely for the electrical supply to and support of an electric clock in any of the rooms specified in Section E3901.3.
2. Receptacles installed to provide power for supplemental equipment and lighting on gas-fired ranges, ovens, and counter-mounted cooking units.

E3901.3.2 Limitations. Receptacles installed in a kitchen to serve countertop surfaces shall be supplied by not less than two small-appliance branch circuits, either or both of which shall also be permitted to supply receptacle outlets in the same kitchen and in other rooms specified in Section E3901.3. Additional small-appliance branch circuits shall be permitted to supply receptacle outlets in the kitchen and other rooms specified in Section E3901.3. A small-appliance branch circuit shall not serve more than one kitchen.

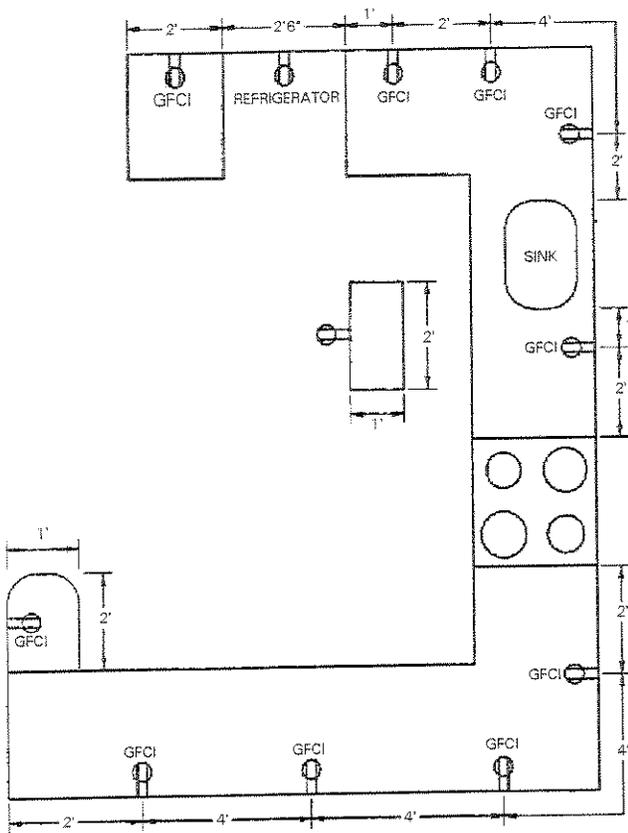
E3901.4 Countertop receptacles. In kitchens pantries, breakfast rooms, dining rooms and similar areas of dwelling units,

receptacle outlets for countertop spaces shall be installed in accordance with Sections E3901.4.1 through E3901.4.5 (see Figure E3901.4). Where a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop and the width of the countertop behind the range, counter-mounted cooking unit, or sink is less than 12 inches (305 mm), the range, counter-mounted cooking unit, or sink has divided the countertop space into two separate countertop spaces as defined in Section E3901.4.4. Each separate countertop space shall comply with the applicable requirements of this section.

E3901.4.1 Wall countertop space. A receptacle outlet shall be installed at each wall countertop space 12 inches (305 mm) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 24 inches (610 mm), measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit or sink in the installation described in Figure E3901.4.1.

E3901.4.2 Island countertop spaces. At least one receptacle outlet shall be installed at each island countertop space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater.



For SI: 1 foot = 304.8 mm.

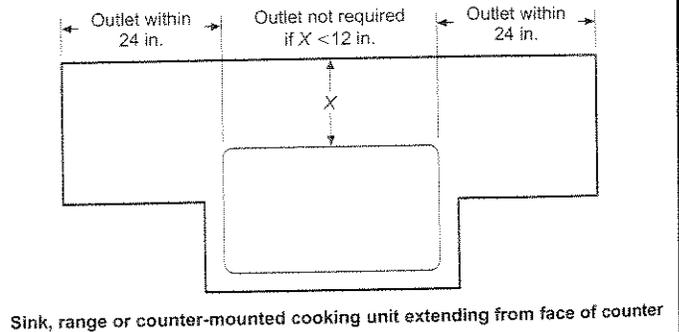
FIGURE E3901.4
COUNTERTOP RECEPTACLES

E3901.4.3 Peninsular countertop space. At least one receptacle outlet shall be installed at each peninsular countertop space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater. A peninsular countertop is measured from the connecting edge.

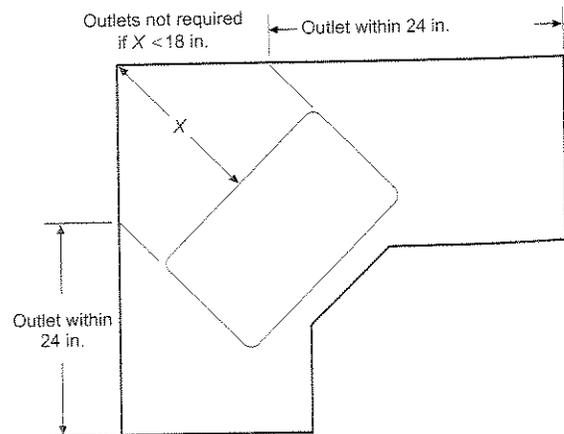
E3901.4.4 Separate spaces. Countertop spaces separated by range tops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of Sections E3901.4.1, E3901.4.2 and E3901.4.3.

E3901.4.5 Receptacle outlet location. Receptacle outlets shall be located not more than 20 inches (508 mm) above the countertop. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks or rangetops as addressed in the exception to Section E3901.4.1, or appliances occupying dedicated space shall not be considered as these required outlets.

Exception: Receptacle outlets shall be permitted to be mounted not more than 12 inches (305 mm) below the countertop in construction designed for the physically impaired and for island and peninsular countertops where the countertop is flat across its entire surface and there are no means to mount a receptacle within 20 inches (508 mm)



Sink, range or counter-mounted cooking unit extending from face of counter



Sink, range or counter-mounted cooking unit mounted in corner

For SI: 1 inch = 25.4 mm.

FIGURE E3901.4.1
DETERMINATION OF AREA BEHIND SINK OR RANGE

above the countertop, such as in an overhead cabinet. Receptacles mounted below the countertop in accordance with this exception shall not be located where the countertop extends more than 6 inches (152 mm) beyond its support base.

E3901.5 Appliance receptacle outlets. Appliance receptacle outlets installed for specific appliances, such as laundry equipment, shall be installed within 6 feet (1829 mm) of the intended location of the appliance.

E3901.6 Bathroom. At least one wall receptacle outlet shall be installed in bathrooms and such outlet shall be located within 36 inches (914 mm) of the outside edge of each lavatory basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the lavatory basin location, or installed on the side or face of the basin cabinet not more than 12 inches (305 mm) below the countertop.

Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops in a bathroom basin location.

E3901.7 Outdoor outlets. At least one receptacle outlet that is accessible while standing at grade level and located not more than 6 feet, 6 inches (1981 mm) above grade, shall be installed outdoors at the front and back of each dwelling unit having direct access to grade. Balconies, decks, and porches that are accessible from inside of the dwelling unit and that have a usable area of 20 square feet (1.86 m²) or greater shall have at least one receptacle outlet installed within the perimeter of the balcony, deck, or porch. The receptacle shall be located not more than 6 feet, 6 inches (1981 mm) above the balcony, deck, or porch surface.

E3901.8 Laundry areas. At least one receptacle outlet shall be installed to serve laundry appliances.

E3901.9 Basements and garages. At least one receptacle outlet, in addition to any provided for specific equipment, shall be installed in each basement and in each attached garage, and in each detached garage that is provided with electrical power. Where a portion of the basement is finished into one or more habitable room(s), each separate unfinished portion shall have a receptacle outlet installed in accordance with this section.

E3901.10 Hallways. Hallways of 10 feet (3048 mm) or more in length shall have at least one receptacle outlet. The hall length shall be considered the length measured along the centerline of the hall without passing through a doorway.

E3901.11 HVAC outlet. A 125-volt, single-phase, 15- or 20-ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air-conditioning and refrigeration equipment. The receptacle shall be located on the same level and within 25 feet (7620 mm) of the heating, air-conditioning and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the HVAC equipment disconnecting means.

Exception: A receptacle outlet shall not be required for the servicing of evaporative coolers.

SECTION E3902 GROUND-FAULT AND ARC-FAULT CIRCUIT-INTERRUPTER PROTECTION

E3902.1 Bathroom receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in bathrooms shall have ground-fault circuit-interrupter protection for personnel.

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

E3902.3 Outdoor receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles installed outdoors shall have ground-fault circuit-interrupter protection for personnel.

Exception: Receptacles as covered in Section E4101.7.

E3902.4 Crawl space receptacles. Where a crawl space is at or below grade level, all 125-volt, single-phase, 15- and 20-ampere receptacles installed in such spaces shall have ground-fault circuit-interrupter protection for personnel.

E3902.5 Unfinished basement receptacles. All 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 the like.

Exception: A receptacle supplying only a permanently installed fire alarm or burglar alarm system.

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

E3902.7 Laundry, utility, and bar sink receptacles. All 125-volt, single-phase, 15- and 20-ampere receptacles that are located within 6 feet (1829 mm) of the outside edge of a laundry, utility or wet bar sink shall have ground-fault circuit-interrupter protection for personnel. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops.

E3902.8 Boathouse receptacles. All 125-volt, single-phase, 15- or 20-ampere receptacles installed in boathouses shall have ground-fault circuit-interrupter protection for personnel.

E3902.9 Boat hoists. Ground-fault circuit-interrupter protection for personnel shall be provided for 240-volt and less outlets that supply boat hoists.

E3902.10 Electrically heated floors. Ground-fault circuit-interrupter protection for personnel shall be provided for electrically heated floors in bathrooms, and in hydromassage bathtub, spa and hot tub locations.

E3902.11 Arc-fault circuit-interrupter protection. All branch circuits that supply 120-volt, single-phase, 15- and 20-ampere outlets installed in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways and similar rooms or areas shall

1. Revise Section R602.3 as follows:

R602.3 Design and Construction. Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of this chapter and Figures R602.3(1) and R602.3(2) or in accordance with AF&PA's NDS. Components of exterior walls shall be fastened in accordance with Tables R602.3(1) through R602.3(4) and Section R602.3.7. Structural wall sheathing shall be fastened directly to structural framing members. Exterior wall coverings shall be capable of resisting the appropriate wind pressures listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3). Wood structural panel sheathing used for exterior walls shall conform to the requirements of Table R602.3(3).

Studs shall be continuous from a support at the sole plate to a support at the top plate to resist loads perpendicular to wall. The support shall be a foundation or floor, ceiling or roof diaphragm or shall be designed in accordance with accepted engineering practice.

Exception: Jack studs, trimmer studs and cripple studs at openings in walls that comply with Tables R502.5(1) and R502.5(2).

2. Revise Table R602.3(1) by adding the following row under "wall" connections as follows:

**TABLE R602.3(1)
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a,b,c}	SPACING OF FASTENERS
ROOF			
1	Blocking between joists or rafters to top plate, toe nail	3-8d (2 1/2" x 0.113")	--
2	Ceiling joists to plate, toe nail	3-8d (2 1/2" x 0.113")	--
3	Ceiling joist not attached to parallel rafter, laps over partitions, face nail	3-10d	--
4	Collar tie to rafter, face nail, or 1-1/4" x 20 gage ridge strap	3-10d (3" x 0.128")	--
5	Rafter to plate, toe nail	2-16d (3 1/2" x 0.135")	--
6	Roof rafters to ridge, valley or hip rafters: toe nail face nail	4-16d (3 1/2" x 0.135") 3-16d (3 1/2" x 0.135")	-- --
WALL			
7	Built-up corner studs – face nail	10-d (3" x 0.128")	24" o.c.
8	Abutting studs at intersecting wall corners, face nail	16-d (3 1/2" x 0.135")	12" oc

Remainder of table unchanged except change subsequent item numbers accordingly.

3. Move existing Section R602.10.1.2.1 to new Section R602.3.7 and revise as follows:

R602.3.7 R602.10.1.2.1 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 R602.3(1) where:
 - 1.1 The basic wind speed does not exceed 90 mph (40 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, or
 - 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 40 to 60 plf (57 to 86 N/mm) for each full wall above and 40 plf (57 N/mm) for each floor platform 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 a 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.
3. Wall sheathing Bracing and fasteners designed in accordance with accepted engineering practice to resist combined uplift and shear forces.

4. Delete footnote f in Table R802.11.

5. Revise Section R802.11 as follows:

R802.11 Roof tie-down.

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

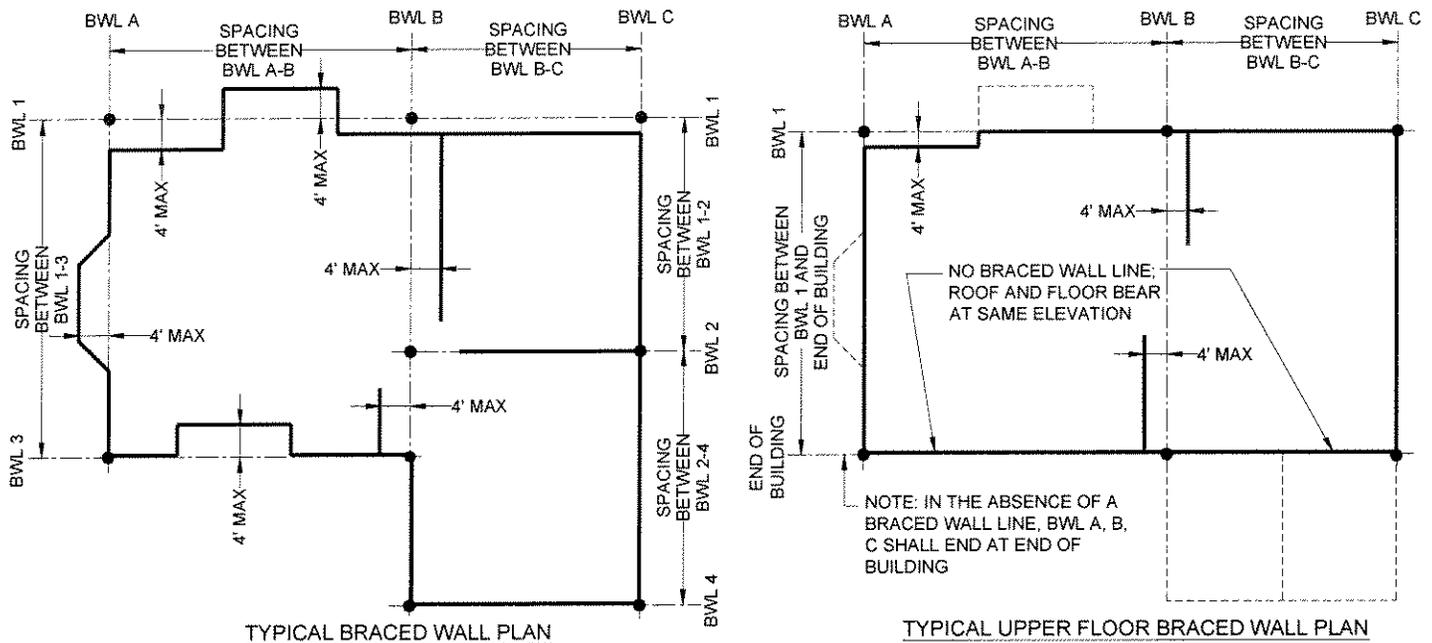
For wall framing connections to resist uplift load, refer to Section R602.3.7. A continuous load path shall be designed to transmit the uplift forces from the rafter or truss ties to the foundation.

6. Delete Section R602.10 and replace with the following:

R602.10 Wall bracing. Buildings shall be braced in accordance with this section or, when applicable, Section R602.12. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with Section R301.1.

R602.10.1 Braced wall lines. For the purpose of determining the amount and location of bracing required in each story level of a building, braced wall lines shall be designated as straight lines on the building plan placed in accordance with this section.

R602.10.1.1 Length of a braced wall line. The length of a braced wall line shall be the distance between its ends. The end of a braced wall line shall be the intersection with a perpendicular braced wall line or an angled braced wall line as permitted in Section R602.10.1.4. In the absence of an intersecting braced wall line, the end shall be the farthest exterior wall of the building as shown in Figure R602.10.1.1.



**FIGURE R602.10.1.1
BRACED WALL LINES**

R602.10.1.2 Offsets along a braced wall line. All exterior walls parallel to a braced wall line shall be permitted to offset up to 4 feet (1219 mm) from the designated braced wall line location as shown Figure R602.10.1.1. Interior walls used as bracing shall be permitted to offset up to 4 feet (1219 mm) from a braced wall line through the interior of the building as shown in Figure R602.10.1.1.

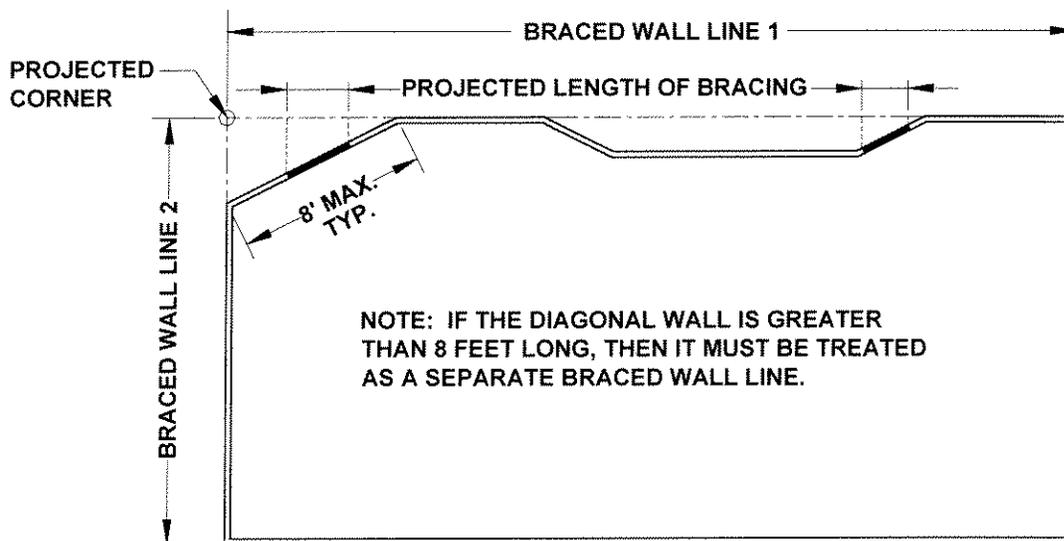
R602.10.1.3 Spacing of braced wall lines. There shall be a minimum of two braced wall lines in both the longitudinal and transverse direction as shown in Figure R602.10.1.1. Intermediate braced wall lines through the interior of the building shall be permitted. The spacing between parallel braced wall lines shall be in accordance with Table R602.10.1.3.

**TABLE R602.10.1.3
BRACED WALL LINE SPACING**

APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA	
			MAXIMUM SPACING	EXCEPTION TO MAXIMUM SPACING
Wind bracing	85 mph to <110 mph	Detached, townhouse	60 feet	None
Seismic bracing	SDC C	Townhouse only	35 feet	Up to 50 feet with adjustment of required length of bracing per Table R602.10.3(4)

For SI: 1 foot = 304.8 mm

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

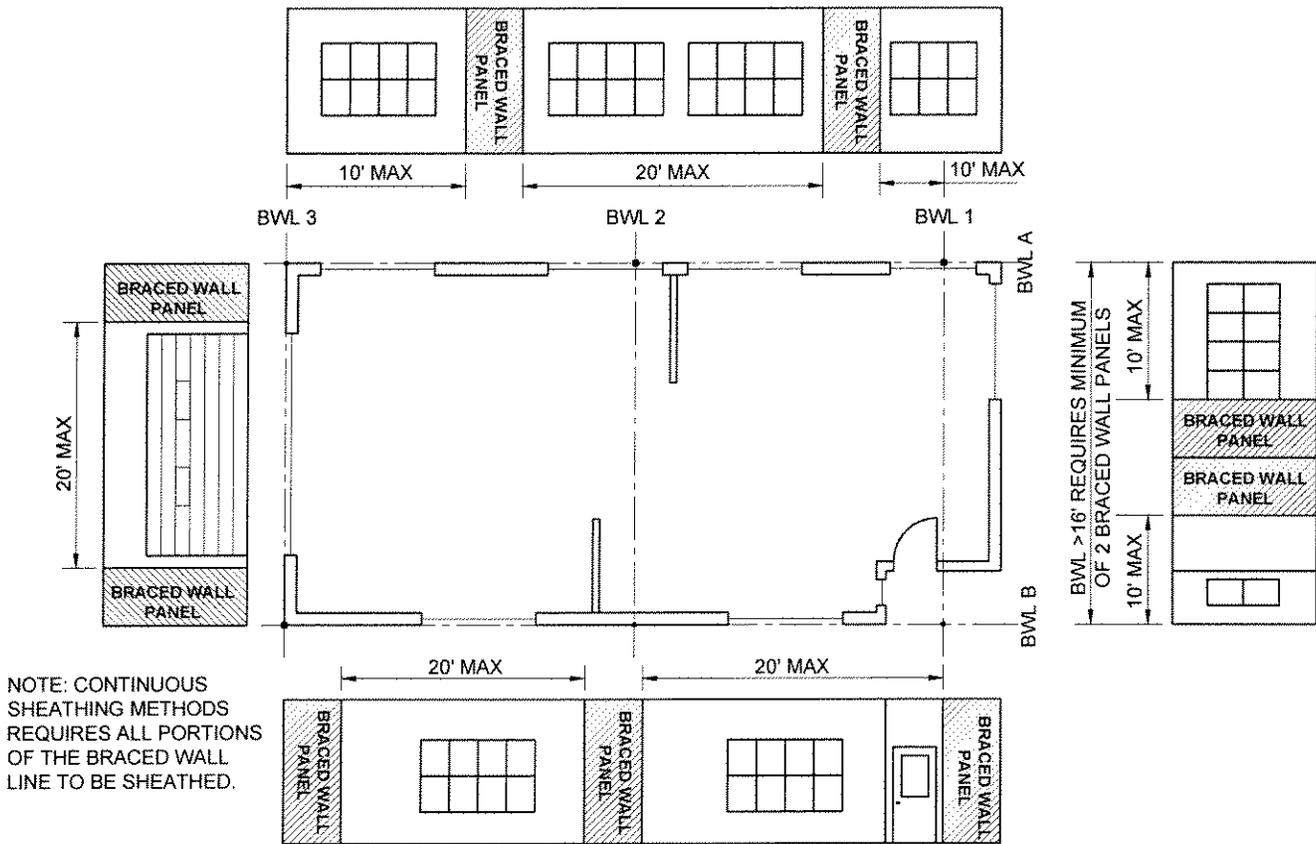


**FIGURE R602.10.1.4
ANGLED WALLS**

R602.10.2 Braced wall panels. Braced wall panels shall be full-height sections of wall that shall be continuous in the same plane. Braced wall panels shall be constructed and placed along a braced wall line in accordance with this section and the bracing methods specified in Section R602.10.4.

R602.10.2.1 Braced wall panel uplift load path. The bracing lengths in Table R602.10.3(1) apply only when uplift loads are resisted per Section R602.3.7.

R602.10.2.2 Locations of braced wall panels. Braced wall panels shall begin within 10 feet (3810 mm) from each end of a braced wall line as determined in Section R602.10.1.1. Braced wall panels shall be located within 20 feet (6096 mm) from another braced wall panel measured between adjacent edges as shown in Figure R602.10.2.2.



**FIGURE R602.10.2.2
LOCATION OF BRACED WALL PANELS**

R602.10.2.3 Minimum number of braced wall panels. Braced wall lines with a length of 16 feet (4877 mm) or less shall have a minimum of one braced wall panel. Braced wall lines greater than 16 feet (4877 mm) shall have a minimum of two braced wall panels.

R602.10.3 Required length of bracing. The required length of bracing along each braced wall line shall be determined as follows.

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).
2. Detached buildings in Seismic Design Category C shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).
3. Townhouses in Seismic Design Category C shall use the greater value determined from Table R602.10.3(1) or R602.10.3(3) and the applicable adjustment factors in Table R602.10.3(2) or R602.10.3(4) respectively.

Only braced wall panels parallel to the braced wall line shall contribute towards the required length of bracing of that braced wall line. Braced wall panels along an angled wall meeting the minimum length requirements of Tables R602.10.5 and R602.10.5.2 shall be permitted to contribute its projected length to the braced wall line as shown in Figure R602.10.1.4. Any braced wall panel on an angled wall at the end of a braced wall line shall contribute its projected length for only one of the braced wall lines at the projected corner. In no case shall the required length of bracing along a braced wall line after adjustments be less than 48 inches (1219 mm) total.

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

<ul style="list-style-type: none"> • EXPOSURE CATEGORY B • 30 FT MEAN ROOF HEIGHT • 10 FT EAVE TO RIDGE HEIGHT • 10 FT WALL HEIGHT • 2 BRACED WALL LINES 			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD LIB ^b	METHOD GB (cumulative length from all qualifying panels on each side of wall)	METHODS DWB, WSP, SFB, PBS, PCP, HPS	CS-WSP, CS-G, CS-PF, CS-SFB
≤ 85 MPH		10	3.5	7.0	2.0	1.5
		20	6.0	12.0	3.5	3.0

- EXPOSURE CATEGORY B
- 30 FT MEAN ROOF HEIGHT
- 10 FT EAVE TO RIDGE HEIGHT
- 10 FT WALL HEIGHT
- 2 BRACED WALL LINES

MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE

BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD LIB ^b	METHOD GB (cumulative length from all qualifying panels on each side of wall)	METHODS DWB, WSP, SFB, PBS, PCP, HPS	CS-WSP, CS-G, CS-PF, CS-SFB
		30	8.5	17.0	5.0	4.5
		40	11.5	23.0	6.5	5.5
		50	14.0	28.0	8.0	7.0
		60	16.5	33.0	9.5	8.0
		10	6.5	13.0	3.5	3.0
		20	11.5	23.0	6.5	5.5
		30	16.5	33.0	9.5	8.0
		40	21.5	43.0	12.5	10.5
		50	26.5	53.0	15.0	13.0
		60	31.5	63.0	18.0	15.5
		10	NP	18.0	5.5	4.5
		20	NP	34.0	10.0	8.5
		30	NP	49.0	14.0	12.0
		40	NP	64.0	18.0	15.5
		50	NP	78.0	22.5	19.0
60		NP	93.0	26.5	22.5	
≤ 90 MPH		10	3.5	7.0	2.0	2.0
		20	7.0	14.0	4.0	3.5
		30	9.5	19.0	5.5	5.0
		40	12.5	25.0	7.5	6.0
		50	15.5	31.0	9.0	7.5
		60	18.5	37.0	10.5	9.0
		10	7.0	14.0	4.0	3.5
		20	13.0	26.0	7.5	6.5
		30	18.5	37.0	10.5	9.0
		40	24.0	48.0	14.0	12.0
		50	29.5	59.0	17.0	14.5
		60	35.0	70.0	20.0	17.0
		10	NP	21.0	6.0	5.0
		20	NP	38.0	11.0	9.5
		30	NP	55.0	15.5	13.5
40		NP	72.0	20.5	17.5	
≤ 100 MPH		50	NP	88.0	25.0	21.5
		60	NP	104.0	30.0	25.5
		10	4.5	9.0	2.5	2.5
		20	8.5	17.0	5.0	4.0
		30	12.0	24.0	7.0	6.0
		40	15.5	31.0	9.0	7.5
		50	19.0	38.0	11.0	9.5
		60	22.5	43.0	13.0	11.0
		10	8.5	17.0	5.0	4.5
		20	16.0	39.0	9.0	8.0
		30	23.0	46.0	13.0	11.0
		40	29.5	59.0	17.0	14.5
		50	36.5	73.0	21.0	18.0
		60	43.5	87.0	25.0	21.0
		10	NP	25.0	7.5	6.0
20		NP	47.0	13.5	11.5	
	30	NP	68.0	19.5	16.5	
	40	NP	88.0	25.0	21.5	
	50	NP	108.0	31.0	26.5	
	60	NP	128.0	36.5	31.0	
< 110 MPH		10	5.5	11.0	3.0	3.0
		20	10.0	20.0	6.0	5.0
		30	14.5	29.0	8.5	7.0
		40	18.5	37.0	11.0	9.0
		50	23.0	46.0	13.0	11.5
		60	27.5	55.0	15.5	13.5
		10	10.5	21.0	6.0	5.0
		20	19.0	38.0	11.0	9.5
		30	27.5	55.0	16.0	13.5
		40	36.0	72.0	20.5	17.5

<ul style="list-style-type: none"> EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES 			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE			
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD LIB ^b	METHOD GB (cumulative length from all qualifying panels on each side of wall)	METHODS DWB, WSP, SFB, PBS, PCP, HPS	CS-WSP, CS-G, CS-PF, CS-SFB
		50	44.0	88.0	25.5	21.5
		60	52.5	105.0	30.0	25.5
		10	NP	31.0	9.0	7.5
		20	NP	57.0	16.5	14.0
		30	NP	82.0	23.5	20.0
		40	NP	106.0	30.5	26.0
		50	NP	131.0	37.5	32.0
		60	NP	145.0	44.5	37.5

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.
Interpolation shall be permitted.

- a. Method LIB shall have gypsum board fastened to at least one side with nails or screws per Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches (203 mm).

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

ADJUSTMENT BASED ON	STORY/SUPPORTING	CONDITION	MULTIPLY LENGTH OF BRACING PER WALL LINE BY:	APPLICABLE METHODS
Exposure category	One story structure	B	1.00	All methods
		C	1.20	
		D	1.50	
	Two-story structure	B	1.00	
		C	1.30	
		D	1.60	
Three-story structure	B	1.00		
	C	1.40		
	D	1.70		
Roof eave-to-ridge height ^b	Roof only	≤5 ft	0.70	
		10 ft	1.00	
		15 ft	1.30	
		20 ft	1.60	
	Roof + 1 floor	≤5 ft	0.85	
		10 ft	1.00	
		15 ft	1.15	
		20 ft	1.30	
	Roof + 2 floors	≤5 ft	0.90	
		10 ft	1.00	
		15 ft	1.10	
		20 ft	Not permitted	
Wall height adjustment ^b	Any story	8 ft	0.90	
		9 ft	0.95	
		10 ft	1.00	
		11 ft	1.05	
		12 ft	1.10	
Number of braced wall lines (per plan direction)	Any story	3	1.30	
		4	1.45	
		≥5	1.60	
Additional 800 lb hold-down device	Top story only	Fastened to the end studs of each braced wall panel and to the foundation or framing below	0.80	DWB, WSP, SFB, PBS, PCP, HPS
			1.80	LIB
Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.40	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
			0.7	GB
Gypsum board fastening	Any story	4 in. on center at panel edges, including top and bottom plates, and all horizontal joints blocked	0.7	GB

For SI: 1 foot = 305 mm, 1 lb = 4.48 N.

- a. The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
b. Interpolation shall be permitted.

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

•SOIL CLASS D ^a •WALL HEIGHT = 10 FT •10 PSF FLOOR DEAD LOAD •15 PSF ROOF/CEILING DEAD LOAD •BRACED WALL LINE SPACING ≤ 25 FT			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE				
SEISMIC DESIGN CATEGORY	STORY LOCATION ^b	BRACED WALL LINE LENGTH (ft)	METHOD LIB	METHOD GB (cumulative length from all qualifying panels on each side of wall)	METHODS DWB, SFB, GB, PBS, PCP, HPS	METHOD WSP	CS-WSP, CS-G, CS-PF, CS-SFB
C (townhouses only)		10	2.5	5.0	2.5	1.6	1.4
		20	5.0	10.0	5.0	3.2	2.7
		30	7.5	15.0	7.5	4.8	4.1
		40	10.0	20.0	10.0	6.4	5.4
		50	12.5	25.0	12.5	8.0	6.8
		10	NP	9.0	4.5	3.0	2.6
		20	NP	18.0	9.0	6.0	5.1
		30	NP	26.0	13.5	9.0	7.7
		40	NP	36.0	18.0	12.0	10.2
		50	NP	45.0	22.5	15.0	12.8
		10	NP	12.0	6.0	4.5	3.8
		20	NP	24.0	12.0	9.0	7.7
		30	NP	36.0	18.0	13.5	11.5
		40	NP	48.0	24.0	18.0	15.3
		50	NP	60.0	30.0	22.5	19.1

For SI: 1 foot 305 mm

- Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{ds} values associated with Seismic Design Category C shall be permitted when a site-specific S_{ds} value is determined in accordance with Section 1613.5 of the International Building Code.
- Foundation cripple wall panels shall be braced in accordance with Section R602.10.11.

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

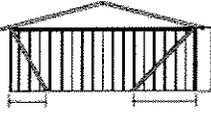
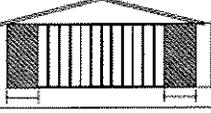
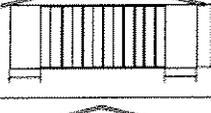
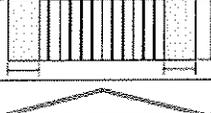
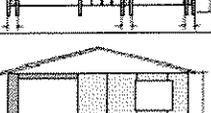
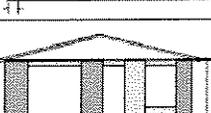
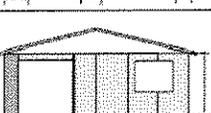
ADJUSTMENT BASED ON:	STORY/SUPPORTING	CONDITION	MULTIPLY LENGTH OF BRACING PER WALL LINE BY:	APPLICABLE METHODS
Story height ^b (Section 301.3)	Any story	≤10 ft	1.0	All methods
		>10 ft ≤ 12 ft	1.2	
Braced wall line spacing ^{b,c}	Any story	≤35 ft	1.0	
		>35 ft ≤ 50 ft	1.43	
Wall dead load	Any story	> 8 ft < 15 ft	1.0	
		<8 psf	0.85	
Roof/ceiling dead load for wall supporting ^b	Roof only or roof plus one story	<15 psf	1.0	
	Roof only	>15 psf ≤ 25 psf	1.1	
	Roof plus one story	>15 psf ≤ 25 psf	1.2	
Walls with stone or masonry veneer	Any story	See Section R703.7		
Cripple walls	Supporting bottom story	See Section R602.10.11		
Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels	1.5	LIB, DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB

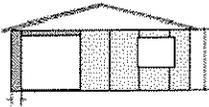
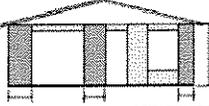
For SI: 1 psf = 47.8 N/m².

- The total length of bracing required for a given wall line is the product of all applicable adjustment factors.
- Linear interpolation shall be permitted.
- Cripple walls shall also comply with Section R602.10.11.

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

TABLE R602.10.4 BRACING METHODS^a

	METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA	
				FASTENERS	SPACING
Intermittent Bracing methods	LIB Let-in-bracing	1x4 (No. 1 grade) wood or approved metal straps at 45° to 60° angles for maximum 16" stud spacing		Wood: 2-8d common nails or 3-8d (2 1/2" x 0.113") nails Metal strap: per manufacturer	Wood: per stud and top and bottom plates Metal: per manufacturer
	DWB Diagonal wood boards	3/4"(1" nominal) for maximum 24" stud spacing		2-8d (2 1/2" x 0.113") nails or 2 - 1 3/4" staples	Per stud
	WSP Wood structural panel (See Section R604)	3/8"		Exterior sheathing per Table R602.3(3) Interior sheathing per Table R602.3(1) or R602.3(2)	6" edges 12" field Varies by fastener
	SFB Structural fiberboard sheathing	1/2" or 25/32" for maximum 16" stud spacing		1 1/2" long x 0.12" dia. galvanized roofing nails or 8d common (2 1/2"x0.131) nails	3" edges 6" field
	GB Gypsum board	1/2"		Nails or screws per Table R602.3(1) for exterior locations Nails or screws per Table R702.3.5 for interior locations	For all braced wall panel locations: 7" edges (including top and bottom plates) 7" field
	PBS Particleboard sheathing (See Section R605)	3/8" or 1/2" for maximum 16" stud spacing		For 3/8", 6d common (2"x0.113) nails For 1/2", 8d common (2 1/2"x0.131) nails	3" edges 6" field
	PCP Portland cement plaster	See Section R703.6 For maximum 16" stud spacing		1 1/2", 11 gage, 7/16" head nails or 7/16", 16 gage staples	6" o.c. on all framing members
	HPS Hardboard panel siding	7/16" for maximum 16" stud spacing		0.092" dia., 0.225" head nails with length to accommodate 1 1/2" penetration into studs	4" edges 8" field
	ABW Alternate braced wall	See Section R602.10.6.1		See Section R602.10.6.1	See Section R602.10.6.1
	PFH Portal frame with hold-downs	See Section R602.10.6.2		See Section R602.10.6.2	See Section R602.10.6.2
	PFG Portal frame at garage	See Section R602.10.6.3		See Section R602.10.6.3	See Section R602.10.6.3
	Continuous Sheathing Methods	CS-WSP Wood structural panel	3/8"		Exterior sheathing per Table R602.3(3) Interior sheathing per Table R602.3(1) or R602.3(2)
CS-G Wood structural panel adjacent to garage openings ^{b,c}		3/8"		See Method CS-WSP	See Method CS-WSP

	CS-PF Continuously sheathed portal frame	See Section R602.10.6.4		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB^d Structural fiberboard	1/2" or 25/32" for maximum 16" stud spacing		1 1/2" long x 0.12" dia. galvanized roofing nails or 8d common (2 1/2"x0.131) nails	3" edges 6" field

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

- Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C.
- Applies to panels next to garage door opening on one side of a garage when supporting roof load only.
- Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R502.5(1). A full height clear opening shall not be permitted adjacent to a Method CS-G panel.
- Method CS-SFB is limited to dwellings located in Seismic Design Categories A and B, detached one- and two-family dwellings located in Seismic Category C, and dwellings located where the basic wind speed does not exceed 100 mph.

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

- Mixing intermittent bracing and continuous sheathing methods from story to story shall be permitted.
- Mixing intermittent bracing methods from braced wall line to braced wall line within a story shall be permitted. Within Seismic Design Categories A, B and C or in regions where the basic wind speed is less than or equal to 100 mph, mixing of intermittent bracing and continuous sheathing methods from braced wall line to braced wall line within a story shall be permitted.
- Mixing intermittent bracing methods along a braced wall line shall be permitted in Seismic Design Categories A and B, and detached dwellings in Seismic Design Category C provided the length of required bracing in accordance with Table R602.10.3(1) or R602.10.3(3) is the highest value of all intermittent bracing methods used.
- Mixing of continuous sheathing methods CS-WSP, CS-G and CS-PF along a braced wall line shall be permitted.
- In Seismic Design Categories A and B, and for detached one- and two-family dwellings in Seismic Design Category C, mixing of intermittent bracing methods along the interior portion of a braced wall line with continuous sheathing methods CS-WSP, CS-G and CS-PF along the exterior portion of the same braced wall line shall be permitted. The length of required bracing shall be the highest value of all intermittent bracing methods used in accordance with Table R602.10.3(1) or R602.10.3(3). The requirements of Section R602.10.7 shall apply to each end of the continuously-sheathed portion of the braced wall line.

R602.10.4.2 Continuous sheathing methods. Continuous sheathing methods require structural panel sheathing to be used on all sheathable surfaces on one side of a braced wall line including areas above and below openings and gable end walls and shall meet the requirements of Section R602.10.7.

R602.10.4.3 Braced wall panel interior finish material. Braced wall panels shall have gypsum wall board installed on the side of the wall opposite the bracing material. Gypsum wall board shall be not less than 1/2 inch (12.7 mm) in thickness and be fastened with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum wall board. Spacing of fasteners at panel edges for gypsum wall board opposite Method LIB bracing shall not exceed 8 inches (203 mm).

Exceptions:

- Interior finish material is not required opposite wall panels that are braced in accordance with Method GB, ABW, PFH, PFG and CS-PF, unless otherwise required by Section R309.2.
- Unless otherwise required by Section R309.2, an approved interior finish material with an in-plane shear resistance equivalent to gypsum board shall be permitted to be installed.
- Unless otherwise required by Section R309.2, gypsum wall board is permitted to be omitted provided the required length of bracing in Tables R602.10.3(1) and R602.10.3(3) is multiplied by the appropriate adjustment factor in Tables R602.10.3(2) and R602.10.3(4) respectively.

R602.10.5 Minimum length of braced wall panels. The minimum length of braced wall panels shall comply with Table R602.10.5. For Methods DWB, WSP, SFB, PBS, PCP and HPS each braced wall panel shall cover a minimum of three stud spaces where studs are spaced 16 inches (406 mm) on center and a minimum of two stud spaces where studs are spaced 24 inches (610 mm) on center.

For Methods CS-WSP and CS-SFB, the minimum panel length shall be based on the adjacent clear opening height in accordance with Table R602.10.5 and Figure R602.10.5. When a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length.

R602.10.5.1 Contributing length. For purposes of computing the required length of bracing in Table R602.10.3(1) and R602.10.3(3), the contributing length of each braced wall panel shall be as specified in Table R602.10.5.

**TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS**

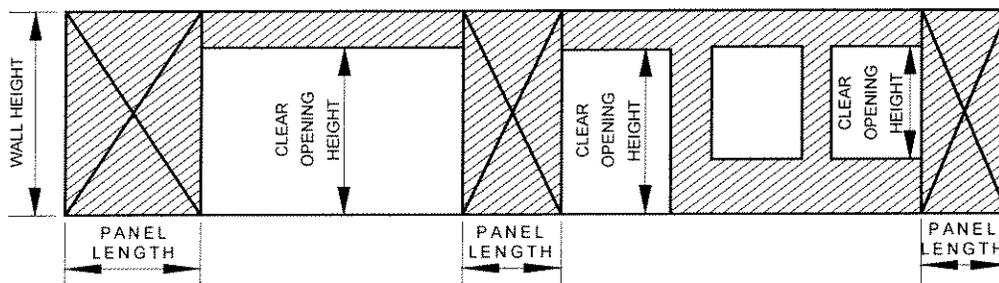
METHOD	MINIMUM LENGTH					CONTRIBUTING LENGTH	
	WALL HEIGHT						
	8'	9'	10'	11'	12'		
DWG, WSP, SFB, PBS, PCP, HPS, GB	48"	48"	48"	53"	58"	Actual ^a	
ABW	SDC A, B and C, wind speed < 110 mph	28"	32"	34"	38"	42"	48"
	SDC D ₀ , D ₁ and D ₂ , wind speed < 110 mph	32"	32"	34"	NP	NP	
PFH	Supporting roof only	16"	16"	16"	18"	20"	48"
	Supporting one story and roof	24"	24"	24"	27"	29"	48"
PFG		24"	27"	30"	NP	NP	1.5 x Actual ^a
CS-WSP, CS-SFB	Adjacent clear opening height						Actual ^a
	≤ 64"	24"	27"	30"	33"	36"	
	68"	26"	27"	30"	33"	36"	
	72"	27"	27"	30"	33"	36"	
	76"	30"	29"	30"	33"	36"	
	80"	32"	30"	30"	33"	36"	
	84"	35"	32"	32"	33"	36"	
	88"	38"	35"	33"	33"	36"	
	92"	43"	37"	35"	35"	36"	
	96"	48"	41"	38"	36"	36"	
	100"		44"	40"	38"	38"	
	104"		49"	43"	40"	39"	
	108"		54"	46"	43"	41"	
	112"			50"	45"	43"	
	116"			55"	48"	45"	
	120"			60"	52"	48"	
	124"				56"	51"	
128"				61"	54"		
132"				66"	58"		
136"					62"		
140"					66"		
144"					72"		
CS-G		24"	27"	30"	33"	36"	Actual ^a
CS-PF		16"	18"	20"	22" ^b	24" ^b	Actual ^a

For SI: 1 inch = 25.4 mm

NP = Not permitted

a. Actual length when greater than or equal to the minimum length.

b. Maximum opening height shall be in accordance with Figure R602.10.6.4.



**FIGURE R602.10.5
BRACED WALL PANELS WITH CONTINUOUS SHEATHING**

R602.10.5.2 Partial credit. For Methods DWB, WSP, SFB, PBS, PCP and HPS, panels between 36 inches and 48 inches in length shall be considered a braced wall panel and shall be permitted to partially contribute towards the required length of bracing in Table R602.10.3(1) and R602.10.3(3), and the contributing length shall be determined from Table R602.10.5.2.

TABLE R602.10.5.2
PARTIAL CREDIT FOR BRACE WALL PANELS LESS THAN 48 INCHES IN ACTUAL LENGTH^a

Actual Length of Braced Wall Panel (inches)	Contributing Length of Braced Wall Panel (inches)	
	8-foot Wall Height	9-foot Wall Height
48	48	48
42	36	36
36	27	N/A

For SI: 1 inch = 25.4mm
^a Interpolation shall be permitted.

R602.10.6 Construction of Methods ABW, PFH, PFG and CS-PF. Methods ABW, PFH, PFG and CS-PF shall be constructed as specified in Sections R602.10.6.1 through R602.10.6.4.

R602.10.6.1 Method ABW: Alternate braced wall panels. Method ABW braced wall panels shall be constructed in accordance with Figure R602.10.6. The maximum height and minimum length of each panel shall be in accordance with Table R602.10.5 and the hold-down force shall be in accordance with Table R602.10.6.1

TABLE R602.10.6.1
MINIMUM HOLD-DOWN FORCES FOR METHOD ABW BRACED WALL PANELS

SUPPORTING/STORY	HEIGHT OF BRACED WALL PANEL				
	8 ft.	9 ft.	10 ft.	11 ft.	12 ft.
One story	1800	1800	1800	2000	2200
First of two story	3000	3000	3000	3300	3600

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 lb = 4.45 N

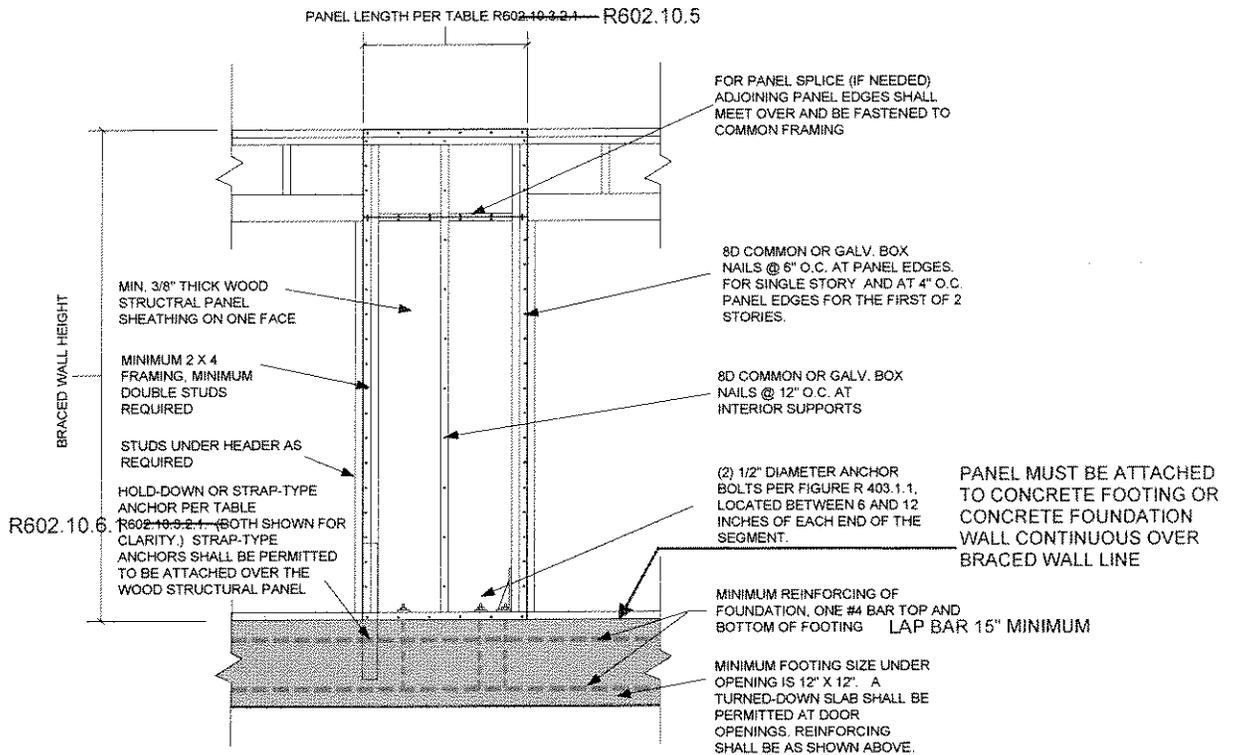
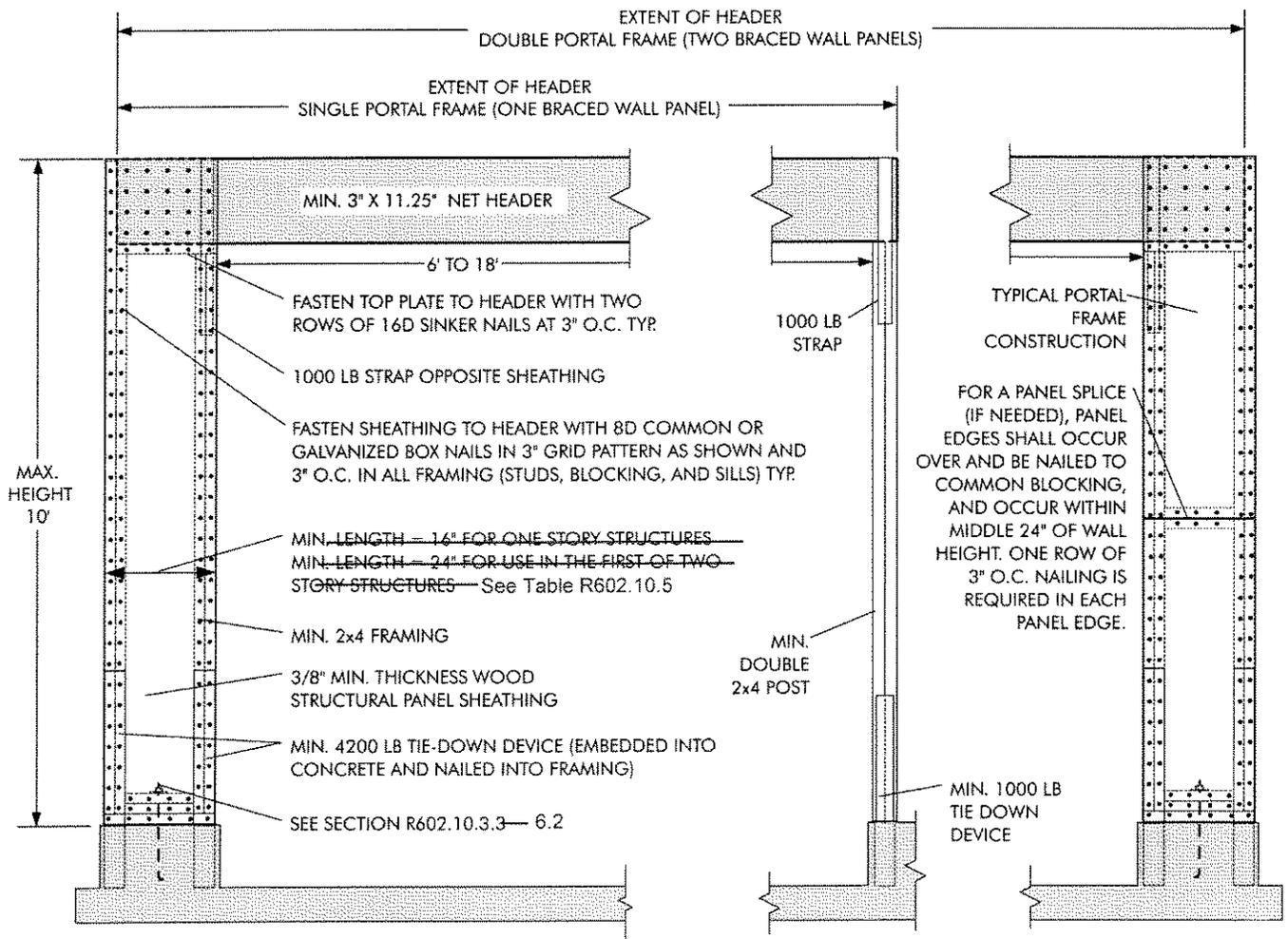


FIGURE R602.10.6.1
METHOD ABW: ALTERNATE BRACED WALL PANEL

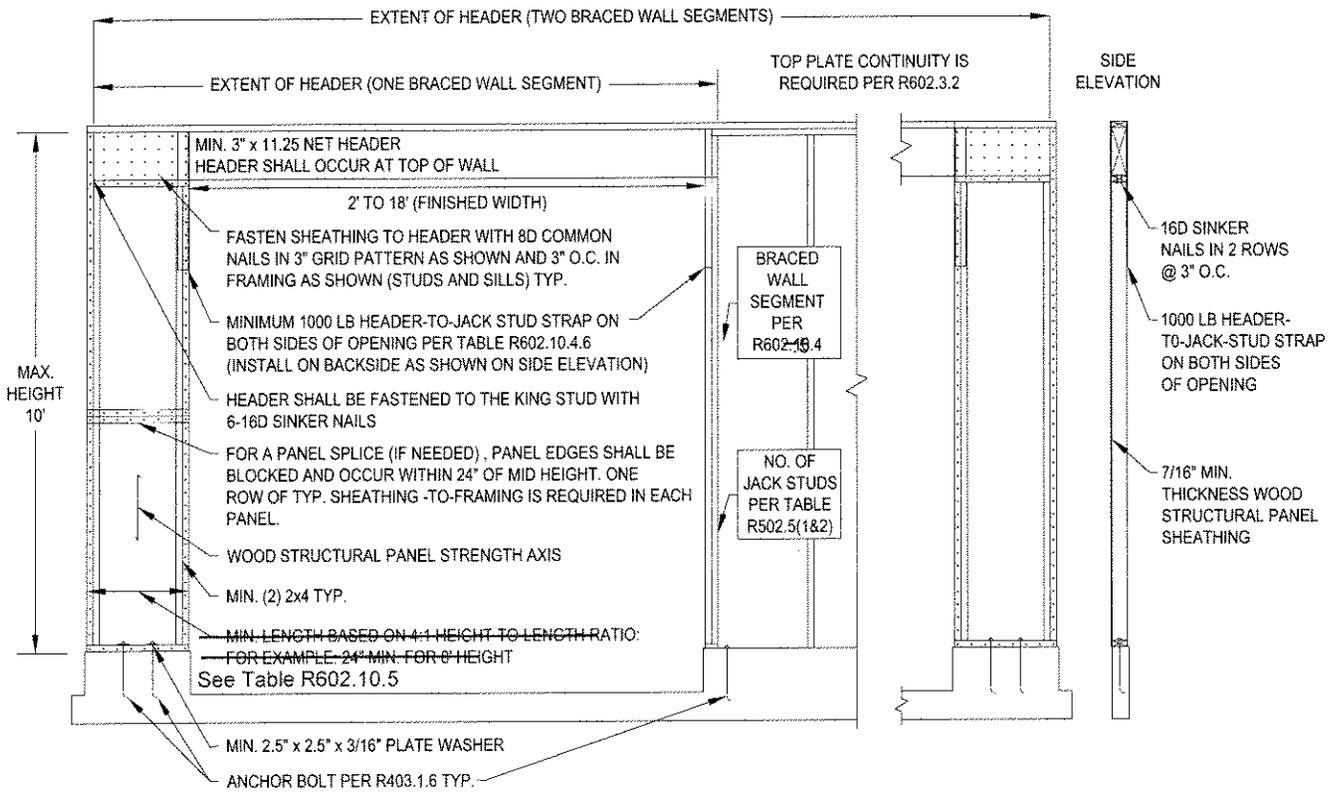
R602.10.6.2 Method PFH: Portal frame with hold-downs. Method PFH braced wall panels shall be constructed in accordance with Figure R602.10.6.2.



For SI: 1 inch = 25.4 mm, 1 foot = 305 mm

FIGURE R602.10.6.2
METHOD PFH: PORTAL FRAME WITH HOLD-DOWNS

R602.10.6.3 Method PFG: Portal frame at garage door openings. Where supporting a roof or one story and a roof, a Method PFG braced wall panel constructed in accordance with Figure R602.10.6.3 is permitted on either side of garage door openings.



FOR WIND EXPOSURE CATEGORIES C AND D, ADDITIONAL JACK STUDS MAY BE REQUIRED PER TABLE R602.10.6.4

FIGURE R602.10.6.3
METHOD PFG: PORTAL FRAME AT GARAGE DOOR OPENINGS

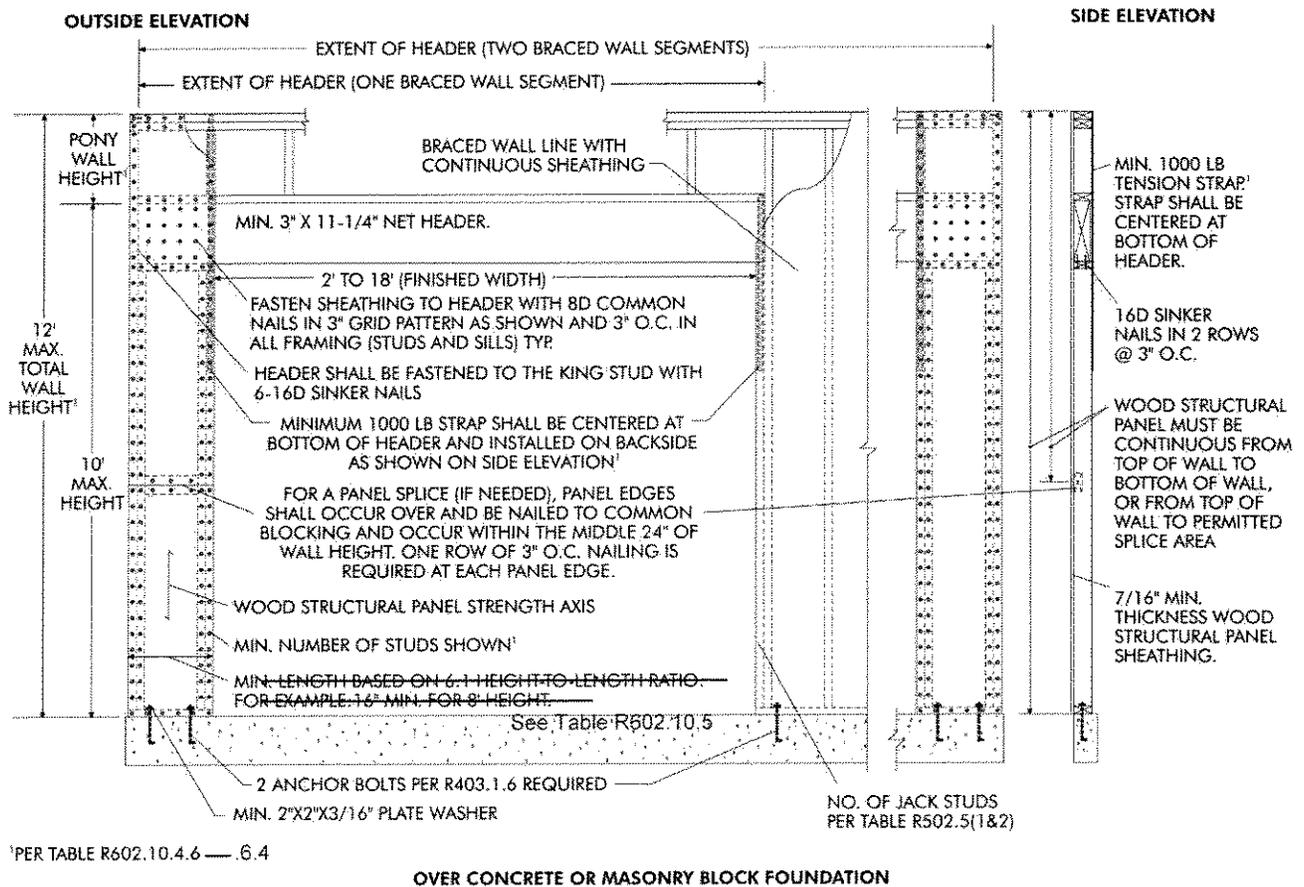
R602.10.6.4 Method CS-PF: Continuously sheathed portal frame. Continuously sheathed portal frame braced wall panels shall be constructed in accordance with Figure R602.10.6.4 and Table R602.10.6.4. The number of continuously sheathed portal frame panels in a single braced wall line shall not exceed four.

TABLE R602.10.6.4
TENSION STRAP CAPACITY REQUIRED FOR RESISTING WIND PRESSURES PERPENDICULAR TO METHOD PFG AND CS-PF BRACED WALL PANELS^{a,b}

MINIMUM WALL STUD FRAMING NOMINAL SIZE AND GRADE	MAXIMUM PONY WALL HEIGHT (FT)	MAXIMUM TOTAL WALL HEIGHT (FT)	MAXIMUM OPENING WIDTH (FT)	BASIC WIND SPEED (MPH)								
				85			90			100		
				EXPOSURE B			EXPOSURE C					
				TENSION STRAP CAPACITY REQUIRED (LBF) ^{a, b}								
2x4 No. 2 Grade	0	10	18	1000	1000	1000	1000	1000	1000	1000		
			9	1000	1000	1000	1000	1000	1275			
	1	10	16	1000	1000	1750	1800	2325	3500			
			18	1000	1200	2100	2175	2725	DR			
			9	1000	1000	1025	1075	1550	2500			
	2	10	16	1525	2025	3125	3200	3900	DR			
			18	1875	2400	3575	3700	DR	DR			
			9	1000	1200	2075	2125	2750	4000			
	2	12	16	2600	3200	DR	DR	DR	DR			
			18	3175	3850	DR	DR	DR	DR			
			9	1775	2350	500	3550	DR	DR			
	4	12	16	4175	DR	DR	DR	DR	DR			
9			1000	1000	1325	1375	1750	2550				
16			1650	2050	2925	3000	3550	DR				
2x6 Stud Grade	2	12	18	2025	2450	3425	3500	4100	DR			
			9	1125	1500	2225	2275	2775	3800			
	4	12	16	2650	3150	DR	DR	DR	DR			
			18	3125	3675	DR	DR	DR	DR			

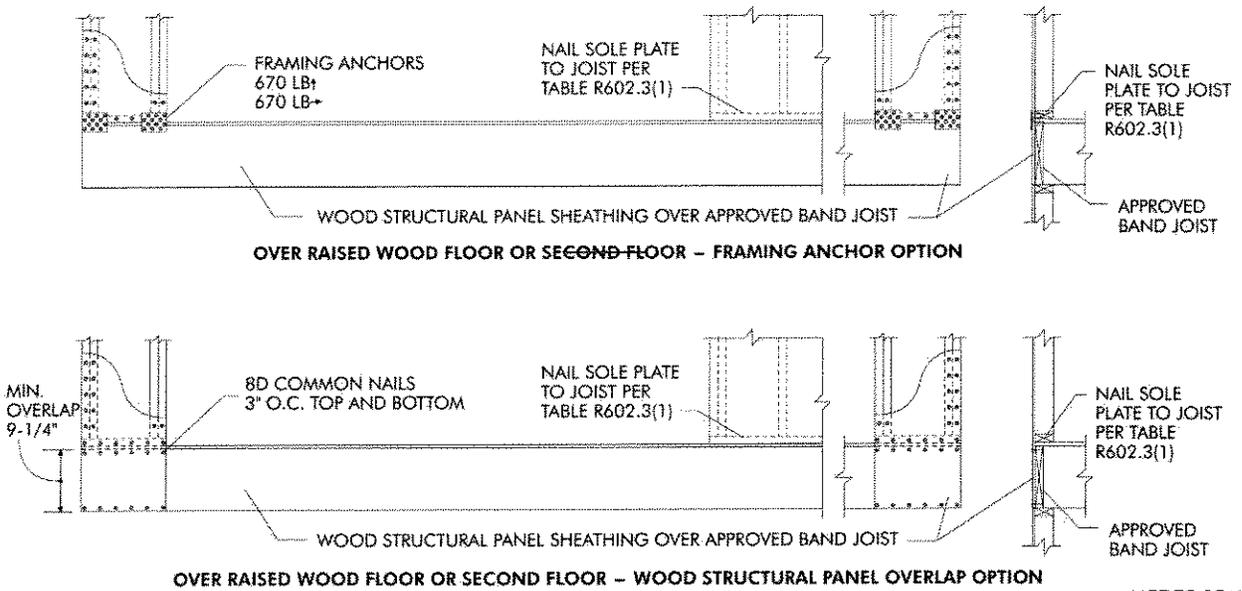
a. DR = design required

b. Strap shall be installed in accordance with manufacturer's recommendations.



¹PER TABLE R602.10.4.6 — 6.4

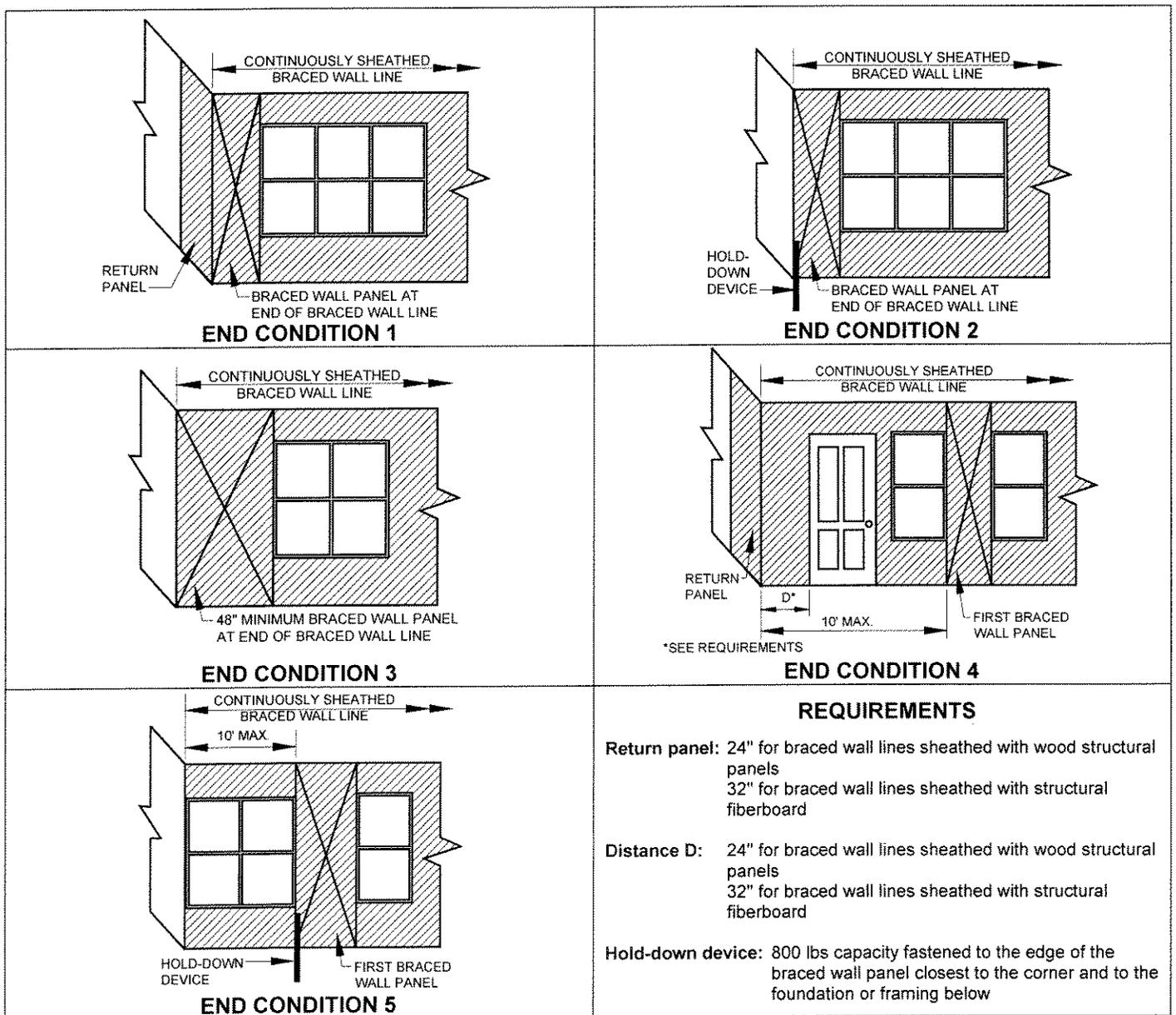
OVER CONCRETE OR MASONRY BLOCK FOUNDATION



NOT TO SCALE

FIGURE R602.10.6.4
METHOD CS-PF: CONTINUOUSLY SHEATHED PORTAL FRAME PANEL CONSTRUCTION

R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a braced wall line with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.



**FIGURE R602.10.7
END CONDITIONS FOR BRACED WALL LINES WITH CONTINUOUS SHEATHING**

R602.10.8 Braced wall panel connections. Braced wall panels shall be connected to floor framing or foundations as follows:

1. Where joists are perpendicular to a braced wall panel above or below, a rim joist, band joist or blocking shall be provided along the entire length of the braced wall panel in accordance with Figure R602.10.8(1). Fastening of top and bottom wall plates to framing, rim joist, band joist and/or blocking shall be in accordance with Table R602.3(1).
2. Where joists are parallel to a braced wall panel above or below, a rim joist, end joist or other parallel framing member shall be provided directly above and below the braced wall panel in accordance with Figure R602.10.8(2). Where a parallel framing member cannot be located directly above and below the panel, full-depth blocking at 16 inch (406 mm) spacing shall be provided between the parallel framing members to each side of the braced wall panel in accordance with Figure R602.10.8(2). Fastening of blocking and wall plates shall be in accordance with Table R602.3(1) and Figure R602.10.8(2).
3. Connections of braced wall panels to concrete or masonry shall be in accordance with Section R403.1.6.

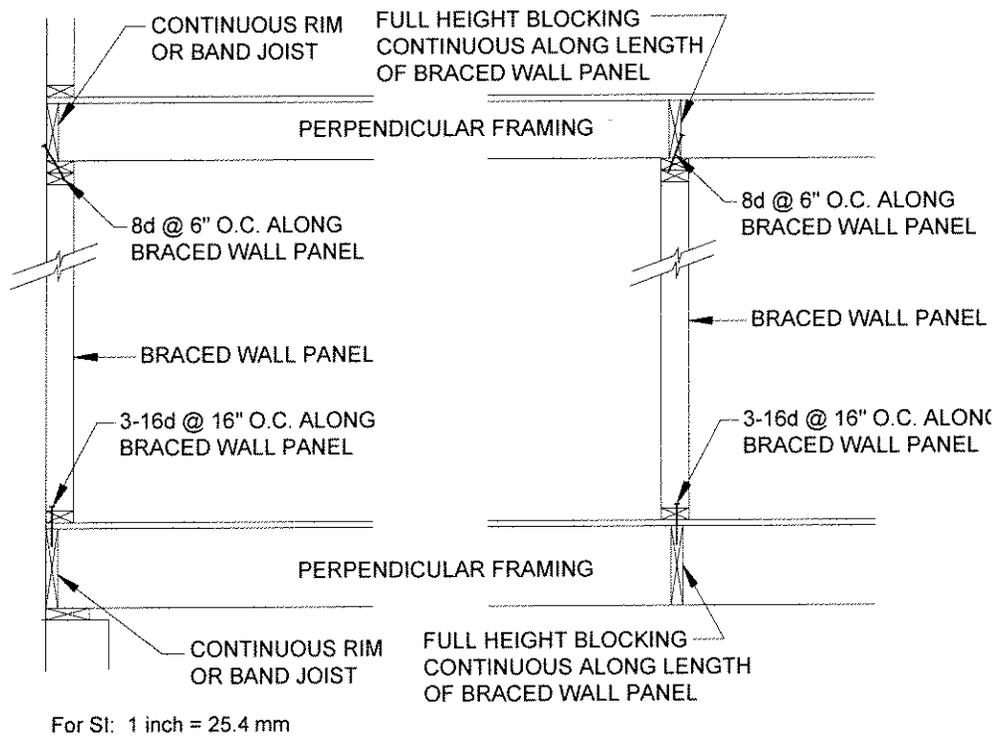


FIGURE R602.10.8(1)
BRACED WALL PANEL CONNECTION WHEN
PERPENDICULAR TO FLOOR/CEILING FRAMING

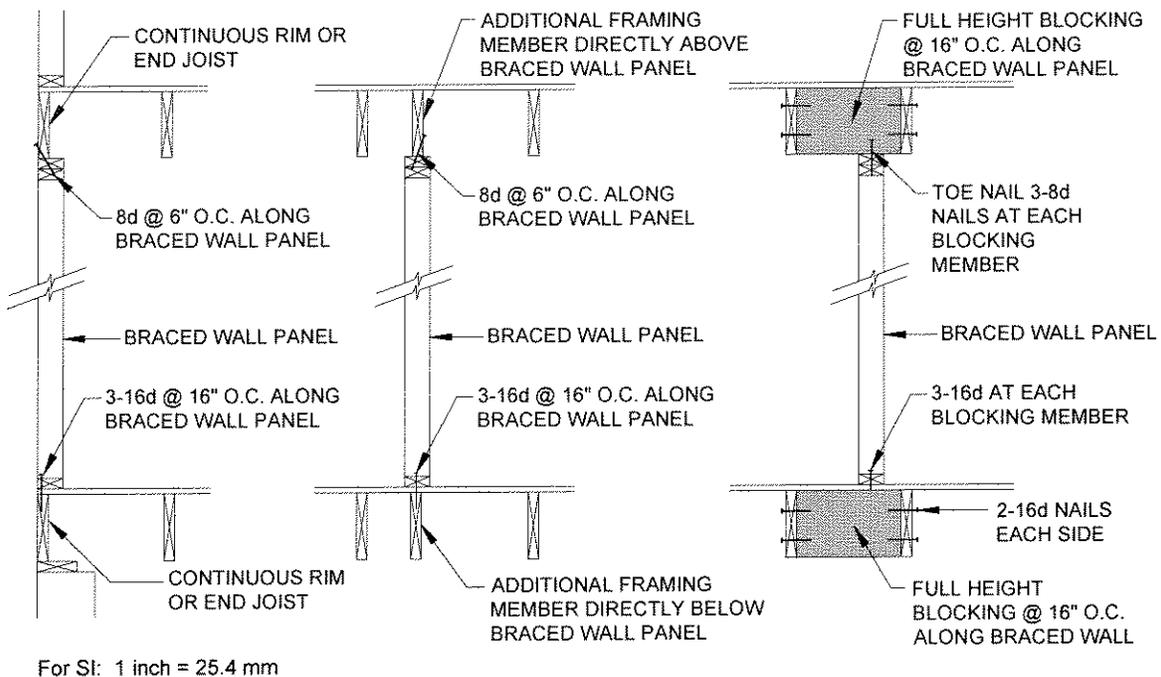


FIGURE R602.10.8(2)
BRACED WALL PANEL CONNECTION WHEN
PARALLEL TO FLOOR/CEILING FRAMING

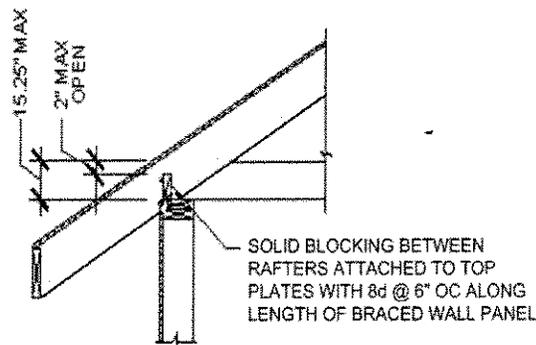
R602.10.8.1 Connections to roof framing. Exterior braced wall panels shall be connected to roof framing as follows.

1. Parallel rafters or roof trusses shall be attached to the top plates of braced wall panels in accordance with Table R602.3(1).
2. For Seismic Design Categories A, B and C and wind speeds less than 100 mph, where the distance from the top of the rafters or roof trusses and perpendicular top plates is 9.25 inches or less, the

rafters or roof trusses shall be connected to the top plates of braced wall lines in accordance with Table R602.3(1) and blocking need not be installed. Where the distance from the top of the rafters and perpendicular top plates is between 9.25 inches and 15.25 inches the rafters shall be connected to the top plates of braced wall panels with blocking in accordance with Figure R602.10.6.2(1) and attached in accordance with Table R602.3(1). Where the distance from the top of the roof trusses and perpendicular top plates is between 9.25 inches and 15.25 inches the roof trusses shall be connected to the top plates of braced wall panels with blocking in accordance with Table R602.3(1).

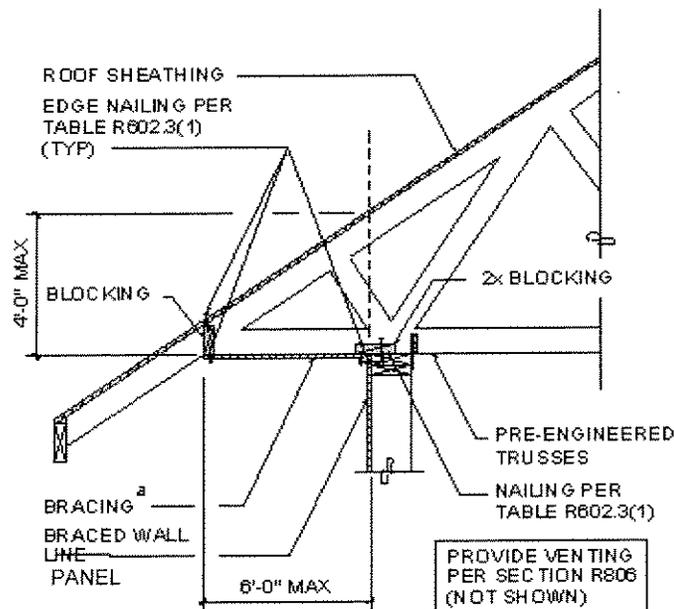
3. For wind speeds of 100 mph or greater, where the distance between the top of rafters or roof trusses and perpendicular top plates is 15.25 inches or less. Rafters or roof trusses shall be connected to the top plates of braced wall panels with blocking in accordance with Figure R602.10.8.1(1) and attached in accordance with Table R602.3(1).
4. For all Seismic Design Categories and wind speeds, where the distance between the top of rafters or roof trusses and perpendicular top plates exceeds 15.25 inches, perpendicular rafters or roof trusses shall be connected to the top plates of braced wall panels in accordance with one of the following methods
 1. In accordance with Figure R602.10.8.1(2),
 2. In accordance with Figure R602.10.8.1(3),
 3. With full height engineered blocking panels designed for values listed in American Forest and Paper Association (AF&PA) Wood Frame Construction Manual for One- and Two-Family Dwellings (WFCM). Both the roof and floor sheathing shall be attached to the blocking panels in accordance with Table R602.3(1).
 4. Designed in accordance with accepted engineering methods.

Lateral support for the rafters and ceiling joists shall be provided in accordance with Section R802.8. Lateral support for trusses shall be provided in accordance with Section R802.10.3. Ventilation shall be provided in accordance with R806.1.



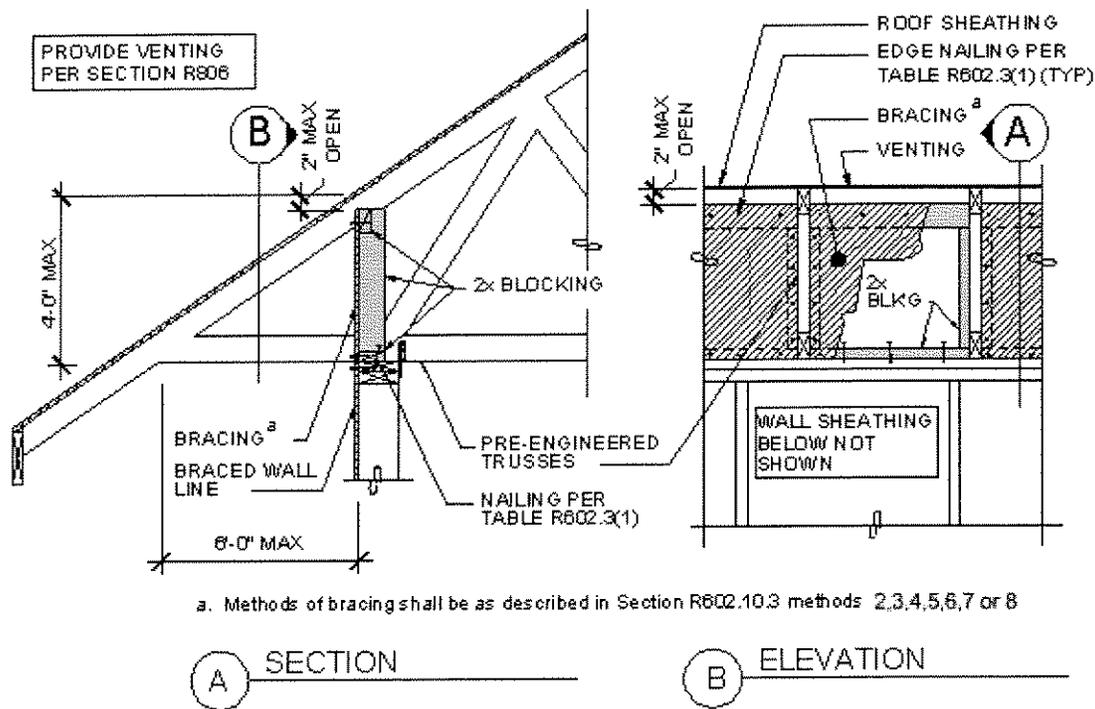
For SI: 1 inch = 25.4 mm

FIGURE R602.10.8.1(1)
BRACED WALL PANEL CONNECTION TO PERPENDICULAR RAFTERS



a. Methods of bracing shall be as described in Section R602.10.2 method DWB, WSP, SFB, GB, PBS, PCP OR HPS
For SI: 1 inch = 25.4 mm

FIGURE R602.10.8.1(2)
BRACED WALL PANEL CONNECTION OPTION TO PERPENDICULAR RAFTERS OR ROOF TRUSSES

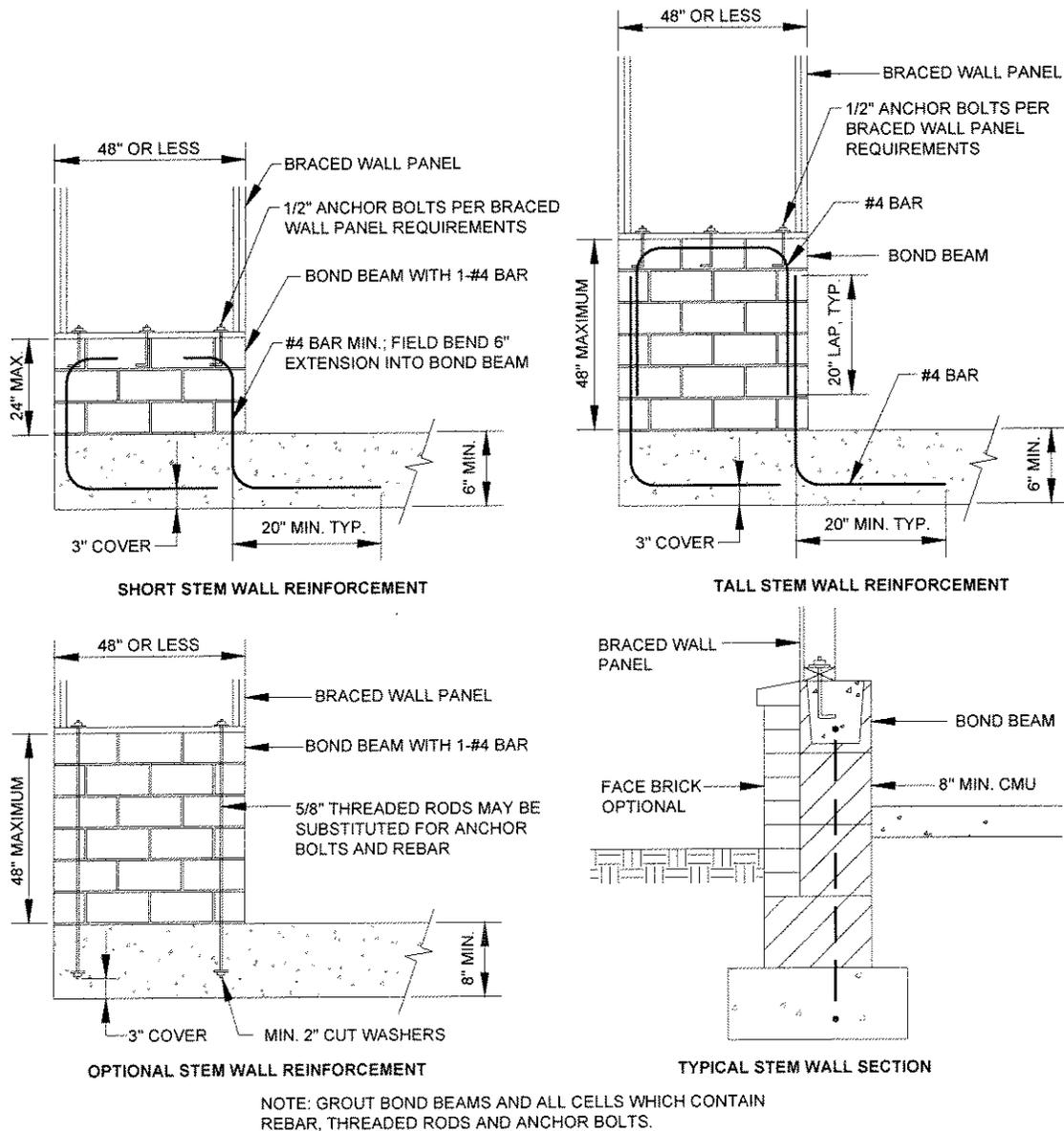


a. Methods of bracing shall be as described in Section R602.10.3 methods 2,3,4,5,6,7 or 8

FIGURE R602.10.8.1(3)
BRACED WALL PANEL CONNECTION OPTION TO PERPENDICULAR RAFTERS OR ROOF TRUSSES

R602.10.9 Braced wall panel support. Braced wall panel support shall be provided as follows:

1. Cantilevered floor joists complying with Section R502.3.3 shall be permitted to support braced wall panels.
2. Elevated post or pier foundations supporting braced wall panels shall be designed in accordance with accepted engineering practice.
3. Masonry stem walls with a length of 48 inches (1220 mm) or less supporting braced wall panels shall be reinforced in accordance with Figure R602.10.9. Masonry stem walls with a length greater than 48 inches (1220 mm) supporting braced wall panels shall be constructed in accordance with Section R403.1 Methods ABW and PFH shall not be permitted to attach to masonry stem walls.



For SI: 1 in=305 mm

**FIGURE R602.10.7
MASONRY STEM WALLS SUPPORTING BRACED WALL PANELS**

R602.10.10 Panel joints. All vertical joints of panel sheathing shall occur over, and be fastened to common studs. Horizontal joints in braced wall panels shall occur over, and be fastened to common blocking of a minimum 1-1/2 inch (38 mm) thickness.

Exceptions:

1. Blocking at horizontal joints shall not be required in wall segments that are not counted as braced wall panels.
2. Where the length of bracing provided is at least twice the required length of bracing from Tables R602.10.3(1) and R602.10.3(3) blocking at horizontal joints shall not be required in braced wall panels constructed using Methods WSP, SFB, GB, PBS or HPS.
3. When Method GB panels are installed horizontally, blocking of horizontal joints is not required.

R602.10.11 Cripple wall bracing. Cripple walls shall be braced with a length and type of bracing as required for the wall above in accordance with Tables R602.10.3(1) and R602.10.3(3) with the following modifications for cripple wall bracing:

1. The length of bracing as determined from Tables R602.10.3(1) and R602.10.3(3) shall be multiplied by a factor of 1.15, and
2. The wall panel spacing shall be decreased to 18 feet (5486 mm) instead of 25 feet (7620 mm).

R602.10.11.1 Redesignation of cripple walls. Cripple walls shall be permitted to be redesignated as the first story walls for purposes of determining wall bracing requirements. If the cripple walls are redesignated, the stories above the redesignated story shall be counted as the second and third stories respectively.

7. *Insert new Section R602.12 and renumber subsequent sections:*

R602.12 Simplified wall bracing. Buildings meeting all of the conditions listed below shall be permitted to be braced in accordance with this section as an alternate to the requirements of Section R602.10.

1. A rectangle circumscribing the entire enclosed building, as shown in Figure R602.12.3, shall have no side longer than 60 feet (18 288 mm), and the ratio between the long side and short side shall be a maximum of 3:1.
2. There shall be no more than two stories above the top of a concrete or masonry foundation or basement wall. Permanent wood foundations shall not be permitted.
3. Floors shall not cantilever more than 24 inches (607 mm) beyond the foundation or bearing wall below.
4. Wall height shall not be greater than 10 feet (2743 mm).
5. Interior walls shall not contribute toward bracing required in this section.
6. The building shall have a roof eave-to-ridge height of 15 feet (4572 mm) or less.
7. All exterior walls shall have gypsum board with a minimum thickness of $\frac{1}{2}$ inches (12.7 mm) installed on the interior side fastened in accordance with Table R702.3.5.
8. The structure shall be located where the basic wind speed is less than or equal to 90 mph (40 m/s), and the Exposure Category is A, B or C.
9. The structure shall be located in Seismic Design Category of A, B or C for detached one- and two-family dwellings or Seismic Design Category A or B for townhouses.
10. Cripple walls shall not be permitted in two-story buildings.

When the bracing described in this section is used, the use of other bracing provisions of R602.10, except as specified herein, shall not be permitted.

R602.12.1 Sheathing materials. The following sheathing materials installed on the exterior side of exterior walls shall be used to construct a bracing unit as defined in Section R602.12.2. Mixing of materials is prohibited.

1. Wood structural panels with a minimum thickness of $\frac{3}{8}$ inch (9.5 mm) fastened in accordance with Table R602.3(3).
2. Structural fiberboard sheathing with a minimum thickness of $\frac{1}{2}$ inch (12.7 mm) fastened in accordance with Table R602.3(1).

R602.12.2 Bracing unit. A bracing unit shall be a full-height sheathed segment of the exterior wall with no openings and a minimum length as specified below.

1. When all framed portions of all exterior walls are sheathed, including areas between bracing units, above and below openings and on gable end walls, the minimum length of a bracing unit shall be 3 feet (914 mm).
2. When framed portions of wall between bracing units are infilled with other materials, the minimum length of a bracing unit shall be 4 feet (1219 mm).

R602.12.2.1 Multiple bracing units. Segments of wall compliant with Section R602.12.2 and longer than the minimum bracing unit length shall be considered as multiple bracing units. The number of bracing units shall be determined by dividing the wall segment length by the minimum bracing unit length. The number of bracing units provided by one or more compliant wall segments shall be added together and rounded down to the nearest whole number. Full-height sheathed segments of wall shorter than the minimum bracing unit length shall not contribute toward a bracing unit except as specified in Section R602.12.6.1.

R602.12.3 Number of bracing units. The number of bracing units required on each side of a building shall be determined by circumscribing a rectangle around the entire enclosed building for each story level as shown in Figure R602.12.3. Each side of the rectangle shall have, at a minimum, the number of bracing units per Table R602.12.3 placed on the parallel exterior walls facing the side of the rectangle. Bracing units shall then be placed using the distribution requirements specified in Section R602.12.4.

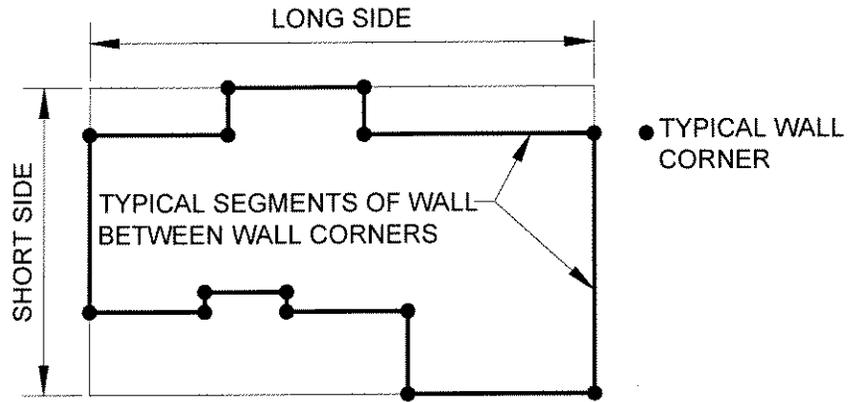


FIGURE R602.12.3 RECTANGLE CIRCUMSCRIBING AN ENCLOSED BUILDING

TABLE R602.12.3 MINIMUM NUMBER OF BRACING UNITS ON EACH SIDE OF A CIRCUMSCRIBED RECTANGLE^{1,2}

Story Level		Eave-to-ridge height (feet)	Minimum number of bracing units on each long side						Minimum number of bracing units on each short side					
			Length of short side (feet) ³						Length of long side (feet) ³					
			10	20	30	40	50	60	10	20	30	40	50	60
 One-story house or second floor of a two-story	10	1	2	2	2	3	3	1	2	2	2	3	3	
		 First floor of a two-story house	2	3	3	4	5	6	2	3	3	4	5	6
 One-story house or second floor of a two-story	15	1	2	3	3	4	4	1	2	3	3	4	4	
		 First floor of a two-story house	2	3	4	5	6	7	2	3	4	5	6	7

For SI: 1 ft = 304.8 mm

¹ Interpolation shall not be permitted.

² Cripple walls or wood-framed basement walls in a walk-out condition of a one-story structure shall be designed as the first floor of a two-story house.

³ Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using this table.

R602.12.4 Distribution of bracing units. The placement of bracing units on exterior walls shall meet all of the following requirements as shown in Figure R602.12.4.

1. A bracing unit shall begin no more than 12 feet (3658 mm) from any wall corner.
2. A bracing unit shall begin no more than 20 feet (6096 mm) from another bracing unit measured between adjacent edges.
3. Segments of wall greater than 8 feet (2438 mm) shall have a minimum of one bracing unit.

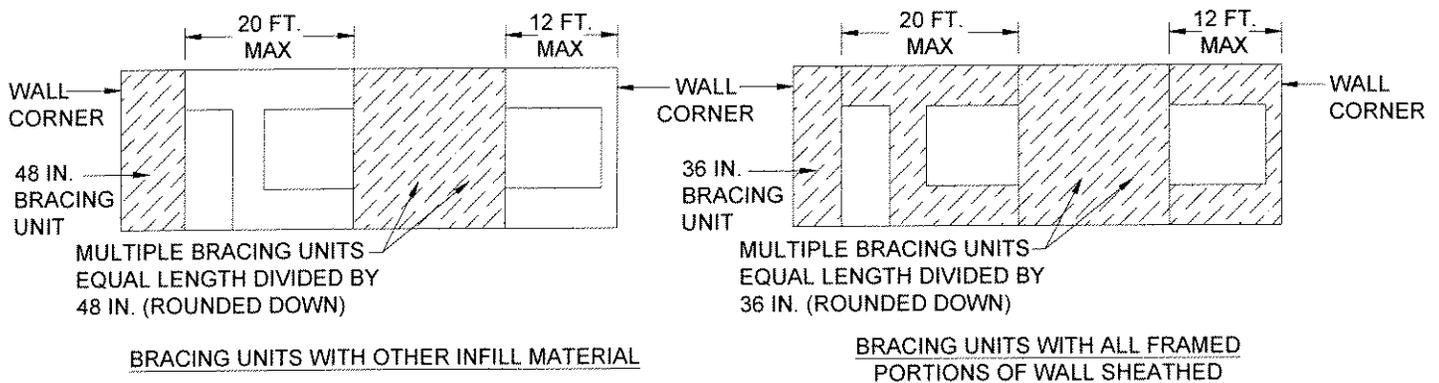


FIGURE R602.12.4 BRACING UNIT DISTRIBUTION

R602.12.5 Narrow panels. The bracing methods referenced in Section R602.10 and specified in Sections R602.12.6.1 through R602.12.6.3 shall be permitted when using simplified wall bracing.

R602.12.5.1 Method CS-G. Braced wall panels constructed as Method CS-G in accordance with Tables R602.10.4.1, and R602.10.4.2 shall be permitted when all framed portions of all exterior walls are sheathed with wood structural panels. Each CS-G panel shall be equivalent to $\frac{1}{2}$ of a bracing unit. Segments of wall which include a Method CS-G panel shall meet the requirements of Section R602.10.4.4.

R602.12.5.2 Method CS-PF. Braced wall panels constructed as Method CS-PF in accordance with Section R602.10.4.1.1 shall be permitted when all framed portions of all exterior walls are sheathed with wood structural panels. Each CS-PF panel shall equal 0.5 bracing units. A maximum of four CS-PF panels shall be permitted on all the segments of walls parallel to each side of the circumscribed rectangle. Segments of wall which include a Method CS-PF panel shall meet the requirements of Section R602.10.4.4.

R602.12.5.3 Methods PFH and PFG. Braced wall panels constructed as Method PFH and PFG shall be permitted when bracing units are constructed using wood structural panels. Each PFH and panel shall equal one bracing unit, and each PFG shall be equal to 0.75 bracing units.

R602.12.6 Lateral support. For bracing units located along the eaves, the vertical distance from the outside edge of the top wall plate to the roof sheathing above shall not exceed 9.25 inches (235 mm) at the location of a bracing unit unless lateral support is provided in accordance with Section R602.10.6.2.

R602.12.7 Masonry stem walls. Masonry stem walls with a height and length of 48 inches (1219 mm) or less supporting a bracing unit or a Method CS-G, CS-PF or PFG braced wall panel shall be constructed in accordance with Figure R602.10.7.