

# Churchill County Building Department Guidelines and Requirements

The information provided is to be used as a rudimentary synopsis for residential construction. More complex or commercial projects will require stamped engineering drawings and/or calculations or calculations and/or drawings with an architectural stamp to be approved for construction by this department.

Codes adopted for construction in Churchill County are as follows:

- 2017 National Electric Code ®
- 2018 International Building Code ®
- 2018 International Residential Code ®
- 2018 International Fire Code ®
- 2018 Uniform Mechanical Code ®
- 2018 Uniform Plumbing Code ®
- 2018 International Fuel Gas Code ®
- 2006 International Property Maintenance Code ®
- 2006 International Private Sewage Disposal Code ®
- 2018 International Energy Conservation Code ®

Copies of the applicable codes are available for purchase from the International Code Council ([shop.iccsafe.org](http://shop.iccsafe.org)), the National Fire Protection Agency ([catalog.nfpa.org](http://catalog.nfpa.org)) or from the International Association of Plumbing and Mechanical Officials ([publications.iapmo.org](http://publications.iapmo.org)). You may also review the code books in the Building Department. Please call (775) 428-0264 to schedule a time to review the code books.

## **EXCAVATION, FOUNDATION, SOILS**

**R401.4 Soil Tests.** Where quantifiable data created by accepted soil science methodologies indicate expansive soils, compressible soils, shifting soils or other questionable soil characteristics are likely to be present, the *building official* shall determine whether to require a soil test to determine the soil's characteristics at a particular location. This test shall be done by an *approved agency* using an *approved method*.

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

## **FOOTINGS**

**R402.2 Concrete.** Concrete shall have a minimum specified compressive strength according to Table R402.2:

- 2,500 psi for basement walls, foundations, and other concrete not exposed to the weather, basement slabs and interior slabs on grade, except garage floor slabs
- 3,000 psi for basement walls, foundation walls, exterior walls, and other vertical concrete work exposed to the weather; and
- 3,500 psi for porches, carport slabs, and steps exposed to the weather

**Footings.** County footing required for a regular one-story dwelling are a minimum of 8 inches deep by 16 inches wide; for a two-story dwelling, 10 inches deep by 18 inches wide.

**R403.1.2 Continuous Footing.** The braced wall panels at exterior walls of buildings shall be supported by continuous footings. All required interior braced wall panels in buildings with plan dimensions greater than 50 feet (15 240 mm) shall also be supported by continuous footings.

**Seismic Reinforcing.** Concrete footings shall have two No. 4 bars located in the middle third of the footing depth. Reinforcement shall be located a minimum of 3 inches (76 mm) clear from the bottom of the footing. Where a construction joint is created between a concrete footing and a stem wall, a minimum of one No. 4 bar shall be installed at not more than 4 feet (1219 mm) on center. The vertical bar shall extend to 3 inches (76 mm) clear of the bottom of the footing, have a standard hook and extend a minimum of 14 inches (357 mm) into the stem wall.

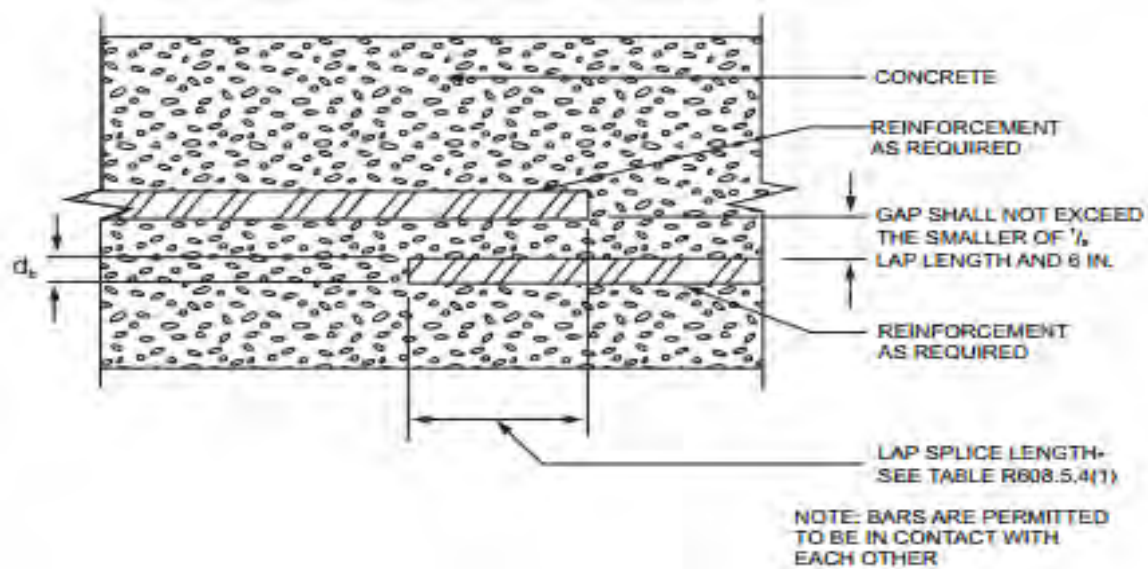
**R403.1.4.1 Frost Protection.** Except where otherwise protected from frost, footings, foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by extending below the frost line (18 inches below undisturbed earth).

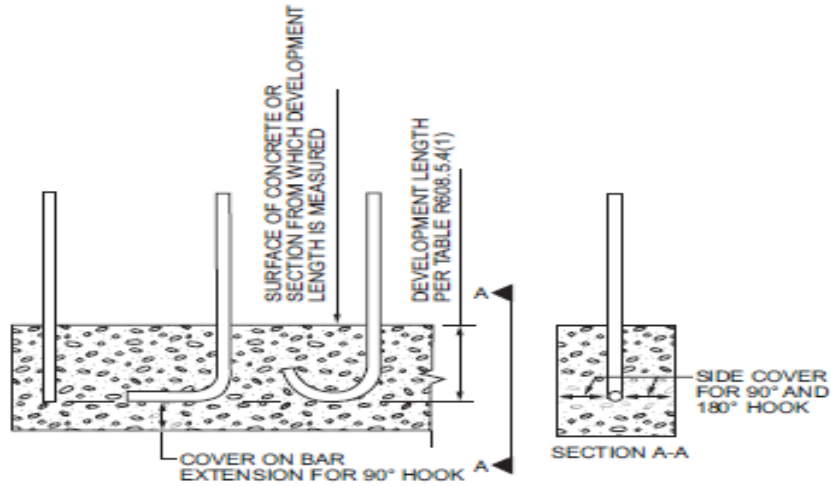
**R506.1 Concrete Slab.** Concrete slab-on-ground floors shall be a minimum 3.5 inches (89 mm) thick.

**R403.1.3.3 Slabs-on-Ground with Turned-Down Footings.** Slabs-on-ground with turned-down footings shall have not fewer than one No. 4 bar at the top and bottom of the footing. Provide two No. 4 bars for continuity of footing under garage door opening and at perimeter of breezeways, porches, and roofed-over decks requiring continuous footings.

**IECC402 Insulation.** The building thermal envelope shall meet the requirements of Table IECC R402.1.3 based on climate zone 5 in Table IECC301.1. (Minimum R-10 for under slab.)

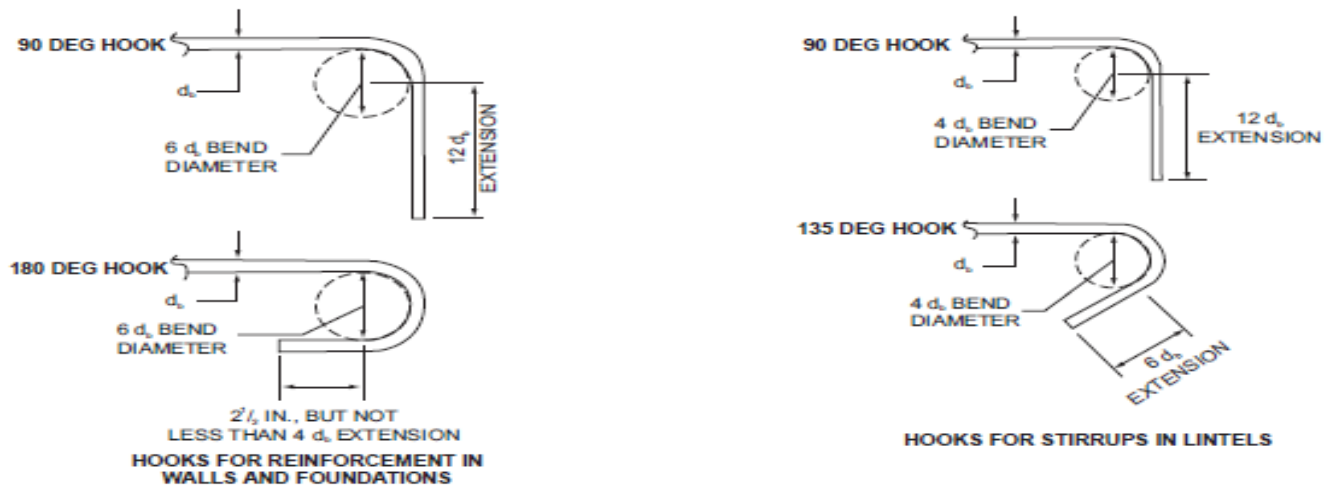
**Lap Splices.** Where lap splicing of vertical or horizontal reinforcing steel is necessary, the lap splice shall be a minimum of 40 bar diameters of the smaller bar.





For SI: 1 degree = 0.0175 rad.

FIGURE R608.5.4(2)  
DEVELOPMENT LENGTH AND COVER FOR HOOKS AND BAR EXTENSION



For SI: 1 inch = 25.4 mm, 1 degree = 0.0175 rad.

## **STEMWALLS**

**Stemwall.** Stemwall thickness shall be a minimum of 6 inches (152 mm) for a one-story dwelling, 8 inches for a two-story dwelling.

### **R404.1.4 Seismic Design.**

#### **R404.1.4.1 Masonry foundation walls.**

In addition to the requirements of Table R404.1.1(1), plain masonry foundation walls shall comply with the following:

1. Wall height shall not exceed 8 feet (2438 mm).
2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).
3. Minimum nominal thickness for plain masonry foundation walls shall be 8 inches (203mm).
4. Masonry stem walls shall have a minimum vertical reinforcement of one No. 4 (No. 13) bar located not greater than 4 feet (1219 mm) on center in grouted cells.

Vertical reinforcement shall be tied to the horizontal reinforcement footings.

Foundation walls, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4). Masonry foundation walls shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.

#### **R404.1.4.2 Concrete Foundation Walls.**

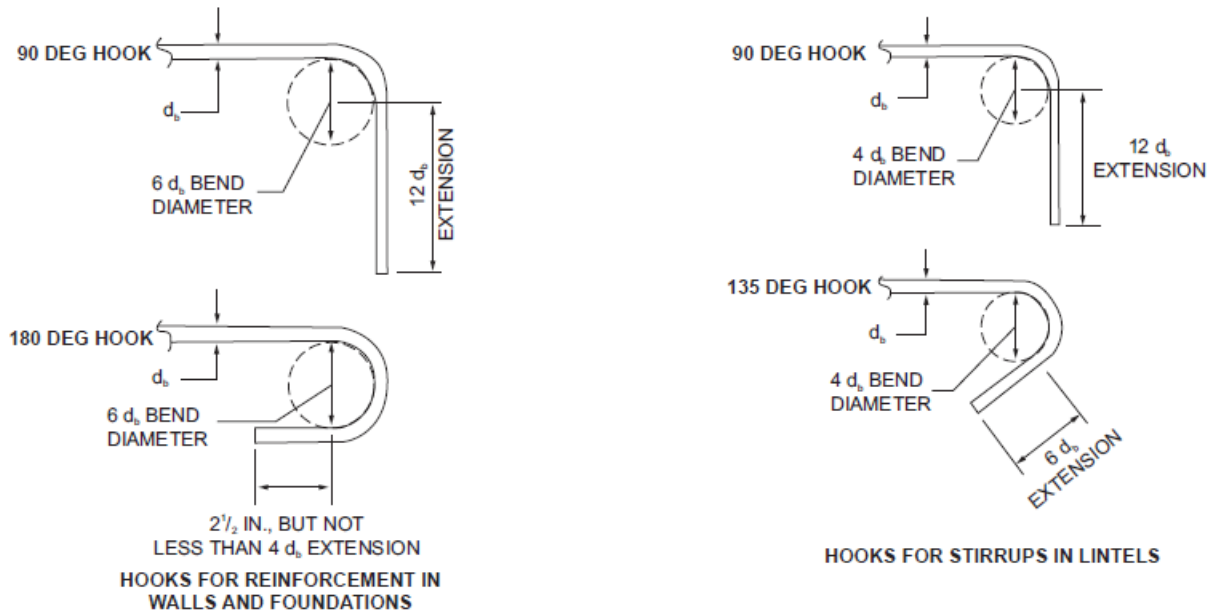
Concrete foundation walls that support light-frame walls shall comply with this section, and concrete foundation walls that support above-grade concrete walls shall comply with ACI 318, ACI 332 or PCA 100 (see Section R404.1.3) In addition to the horizontal reinforcement required by Table R404.1.2(1), plain concrete walls supporting light-frame walls shall comply with the following.

1. Wall height shall not exceed 8 feet (2438 mm).
2. Unbalanced backfill height shall not exceed 4 feet (1219 mm).
3. Minimum thickness for plain concrete foundation walls shall be 7.5 inches (191 mm). except that 6 inches (152 mm) is permitted where the maximum wall height is 4 feet, 6 inches (1372 mm)

Foundation walls less than 7.5 inches (191 mm) in thickness, supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be provided with horizontal reinforcement in accordance with Table R404.1.2(1), and vertical reinforcement in accordance with Table R404.1.2(2), R404.1.2(3), R404.1.2(4), R404.1.2(5), R404.1.2(6), R404.1.2(7) or R404.1.2(8). Where Tables R404.1.2(2) through R404.1.2(8) permit plain concrete walls, not less than No. 4 (No. 13) vertical bars at a spacing not exceeding 48 inches (1219 mm) shall be provided.

**R403.1.3.1 Foundations with Stemwalls.** Foundations with stem walls shall have installed a minimum of one No. 4 bar within 12 inches (305 mm) of the top of the wall.

**R608.5.4.5 Standard Hook.** Where reinforcement is required by this code to terminate with a standard hook, the hook shall comply with Figure R608.5.4(3).



For SI: 1 inch = 25.4 mm, 1 degree = 0.0175 rad.

**FIGURE R608.5.4(3)  
STANDARD HOOKS**

**IECC402 Insulation.** The building thermal envelope shall meet the requirements of Table IECC R402.1.2 based on the climate zone specified in Table IECC301.1. (Minimum R-15 on the stemwall.)

**R408.4 Access.** Access shall be provided to all under-floor spaces. Access openings through the floor shall be not smaller than 18 inches by 24 inches (457 mm by 610 mm). Openings through a perimeter wall shall be not less than 16 inches by 24 inches (407 mm by 610 mm). When any portion of the through-wall access is below grade, an areaway not less than 16 inches by 24 inches (407 mm by 610 mm) shall be provided. The bottom of the areaway shall be below the threshold of the access opening. Through wall access openings shall not be located under a door to the residence. See Section M1305.1.4 for access requirements where mechanical equipment is located under floors.

**IECC402.2.3 Access hatches and doors.** Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawlspaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood framed or equivalent baffle or retainer shall be installed to prevent the loose-fill insulation from spilling into the living space when the attic access is opened. The baffle or retainer shall provide permanent means of maintaining the installed R-value of the loose-fill insulation.

**R404.1.6 Height above Finished Grade.** Concrete and masonry foundation walls shall extend above the finished grade adjacent to the foundation at all points not less than 4 inches (102 mm) where masonry veneer is used and not less than 6 inches (152 mm) elsewhere.

**R317.1 Protection of wood and wood-based products against decay.** Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWWA U1

1. Wood joists or the bottom of a wood structural floor where closer than 18 inches (457 mm) or wood girders where closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches (203 mm) from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 0.5 inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.

**R403.1.6.1 Foundation Anchorage.** Foundation plates or sills shall be anchored to the foundation with anchor bolts spaced a maximum of 4 feet on center. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches (305 mm) or less than seven bolt diameters from each end of the plate section. Bolts shall be at least 5/8 inch in diameter and shall extend a minimum of 7 inches (178 mm) into masonry or concrete. Interior bearing wall plates shall be positively anchored with approved fasteners. Plate washers a minimum of 0.229 inch by 3 inches by 3 inches (5.8 mm by 76 mm by 76 mm) in size, shall be installed between the foundation sill plate and the nut for all anchor bolts.

## **FRAMING (wood)**

**R502.1.1 Identification.** Load-bearing dimension lumber for horizontal and vertical framing shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOCPS 20.

**Allowable Spans.** Allowable spans for framing material shall be per tables in the IRC, Chapters 5 through 9.

## **FLOORS**

**R503.1 Lumber Sheathing.** Maximum allowable spans for lumber used as floor sheathing shall conform to Tables R503.1, R503.2.1.1(1) and R503.2.1.1(2).

**R502.4 Joists under Bearing Partitions.** Joists under parallel bearing partitions shall be of adequate size to support the load. Double joists, sized to adequately support the load, that are separated to permit the installation of piping or vents shall be full depth solid blocked with lumber not less than 2 inches (51 mm) in nominal thickness spaced not more than 4 feet (1219 mm) on center. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load.

**IECC402 Insulation.** The building thermal envelope shall meet the requirements of Table IECC R402.1.2 based on climate zone 5 in Table IECC301.1. (Minimum R-30 under floor and R-10 for under slab.)

**R408.1 Ventilation.** The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a basement) shall have ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 m<sup>2</sup>) for each 150 square feet (14 m<sup>2</sup>) of under-floor space area, unless the ground surface is covered by a Class 1 vapor retarder material. Where a Class 1 vapor retarder material is used, the minimum net area of ventilation openings shall be not less than 1 square foot (0.0929 sq m) for each 1,500 square feet (140 sq m) of under-floor space area. One such ventilation opening shall be within 3 feet (914 mm) of each corner of the building.



**WALLS**

**R602.7 Headers.** For header spans see Tables R602.7(1) and R602.7(2) Use Table R602.7(1) 30lb Snow Load for correct header size.

**R602.10.11 Bracing in Seismic Design Category D1.** Structures located in Seismic Design Category D1 shall have exterior and interior braced wall lines.

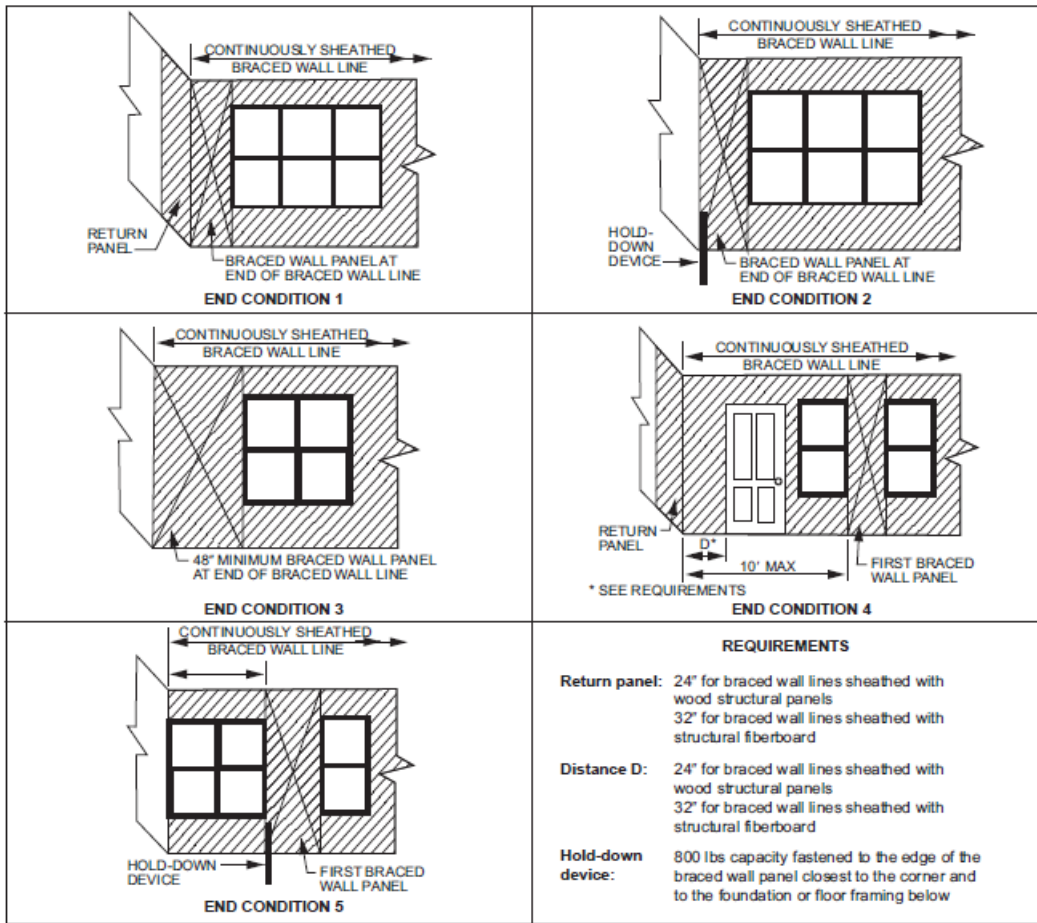
**R602.10.1.3 Spacing of braced wall lines.** The spacing between parallel braced wall lines shall be in accordance with Table R602.10.1.3. Intermediate braced wall lines through the interior of the building shall be permitted.

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

APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA	
			Maximum Spacing	Exception to Maximum Spacing
Wind bracing	Ultimate design wind speed 100 mph to < 140 mph	Detached, townhouse	60 feet	None
Seismic bracing	SDC A – C	Detached	Use wind bracing	
	SDC A – B	Townhouse	Use wind bracing	
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).
	SDC D <sub>0</sub> , D <sub>1</sub> , D <sub>2</sub>	Detached, townhouses, one- and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines shall not exceed 25 feet.
	SDC D <sub>0</sub> , D <sub>1</sub> , D <sub>2</sub>	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).

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

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



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.45 N.

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

**R602.10.1 Braced Wall Lines.** Braced wall lines shall consist of braced wall panel construction in accordance with one of the following:

- Wood boards of 3/4 inch net minimum thickness applied diagonally on studs spaced a maximum of 24 inches (610 mm). Diagonal boards shall be attached to studs in accordance with Table R602.3(1).
- Wood structural panel sheathing with a thickness not less than 3/8 inch for 16-inch (406 mm) stud spacing and not less than 7/16 inch for 24-inch (610 mm) stud spacing. Wood structural panels shall be installed in accordance with Table R602.3(3).
- One-half-inch (13 mm) or 25/32-inch (20 mm) thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches (406 mm) on center. Structural fiberboard sheathing shall be installed in accordance with Table R602.3(1).
- Gypsum board with minimum 1/2-inch (13 mm) thickness placed on studs spaced a maximum of 24 inches (610 mm) on center and fastened at 7 inches (178 mm) on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.
- Particleboard wall sheathing panels installed in accordance with Table R602.3(4).
- Portland cement plaster on studs spaced a maximum of 16 inches (406 mm) on center and installed in accordance with Section R703.6.
- Hardboard panel siding with minimum 7/16" thickness installed on studs a maximum of 16" on center.

**R703.2 Water-Resistive Barrier.** One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No. 15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other approved materials shall be installed in accordance with the water-resistive barrier manufacturer's installation instructions. The No. 15 asphalt felt or other approved water-resistive barrier material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

**IECC402 Insulation.** The building thermal envelope shall meet the requirements of Table IECC402.1.1 based on climate zone 5 in Table IECC301.1. (Minimum R-20 in the walls or R-13 in the cavity with continuous R-5 exterior insulation.)

## **ROOF FRAMING**

**R802.4.2 Framing Details.** Rafters shall be framed not more than 1.5 inches (38 mm) offset from each other to a ridge board or directly opposite from each other with a collar tie, gusset plate or ridge strap in accordance with Table R602.3(1). Rafters shall be nailed to the top wall plates in accordance with Table R602.3(1) unless the roof assembly is required to comply with the uplift requirements of Section R802.11.

**R802.6 Bearing.** The ends of each rafter or ceiling joist shall have not less than 1-1/2 inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2-inch (51 mm) minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing area of 48 square inches.

**R802.8.1 Blocking.** Rafters and ceiling joists shall be supported laterally at the ends by solid blocking.

**R802.10.5 Truss to Wall Connection.** Trusses shall be connected to wall plates by the use of approved connectors having a resistance to uplift of not less than 175 pounds (779 N) and shall be installed in accordance with the manufacturer's specifications.

**R803.1 Lumber Sheathing.** Allowable spans for lumber used as roof sheathing shall conform to Table R803.1. Spaced lumber sheathing is not allowed.

**R905.1 Roof Covering Application.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

**R905.8 Wood Shakes.** Number 3 shakes are not approved for roofing.

**IECC402 Insulation.** The building thermal envelope shall meet the requirements of Table IECC402.1.1 based on climate zone 5 in Table IECC301.1. (Minimum R-49 in ceiling.)

**R806.1 Ventilation Required.** Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilating openings shall have a least dimension of 1/16 inch minimum and ¼ inch maximum. Ventilation openings having a least dimension larger than ¼ inch shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of 1/16 inch minimum and ¼ inch maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air and shall be protected to prevent the entry of birds, rodents, snakes and other similar creatures.

**R806.2 Minimum Vent Area.** The minimum net free ventilation area shall be 1/150 of the area of the vented space.

**R807.1 Attic Access.** Buildings with combustible ceiling or roof construction shall have an attic access opening to attic areas that have a vertical height of 30 inches or greater over an area of not less than 30 square feet. The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members. The rough-framed openings shall be not less than 22 inches by 30 inches and shall be located in a hallway or other location with ready access. Where located in a wall, the opening shall be not less than 22 inches wide by 30 inches high. Where the access is located in a ceiling, minimum unobstructed head-room in the attic space shall be 30 inches at some point above the access measured vertically from the bottom of ceiling framing members.

**IECC402.2.3 Access hatches and doors.** Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawlspaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the of the loose fill insulation.

## **PLUMBING**

**P2705.1.5 Installation.** The centerline of water closets or bidets shall not be less than 15 inches (381 mm) from adjacent walls or partitions or not less than 15 inches (381 mm) from the centerline of a bidet to the outermost rim of an adjacent water closet. There shall be at least 21 inches (533 mm) clearance in front of the water closet, bidet or lavatory to any wall, fixture or door.

**P2717.1 Protection of Water Supply.** The water supply to a dishwasher shall be protected against backflow by an air gap or backflow preventer.

**P3005.2.3 Building Drain and Building Sewer Junction.** The junction of the building drain and the building sewer shall be served by a cleanout that is located at the junction or within 10 feet developed length of piping upstream of the junction. For the requirements of this section, removal of a water closet shall not be required to provide cleanout access.

**P2801.7 Water Heaters Installed in Garages.** Water heaters having an ignition source shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the garage floor.

**P2801.8 Water Heater Seismic Bracing.** Water heaters shall be anchored or strapped in the upper one-third and in the lower one-third of the appliance to resist a horizontal force equal to one-third of the operating weight of the water heater, acting in any horizontal direction.

**P2804.1 Relief Valves Required.** Appliances and equipment used for heating water or storing hot water shall be protected by:

1. A separate pressure-relief valve and a separate temperature-relief valve; or
2. A combination pressure and temperature-relief valve.

**P2804.6.1 Requirements for Discharge Pipe.** The discharge piping serving a pressure-relief valve, temperature relief valve or combination valve shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the pan serving the water heater or storage tank, to a waste receptor or to the outdoors
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed to flow by gravity.
10. Terminate not more than 6 inches and not less than two times the discharge pipe diameter above the floor or waste receptor flood level rim.
11. Not have a threaded connection at the end of the piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials indicated in Section P2906.5 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.
14. Be one nominal size larger than the size of the relief-valve outlet, where the relief-valve discharge piping is installed with insert fittings. The outlet end of such tubing shall be fastened in place.

**P2503.5.2 Finished Plumbing.** After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas tight and/or water tight.

**P2503.6 Water-Supply System Testing.** Upon completion of the water-supply system or a section of it, the system or portion completed shall be tested and proved tight under a water pressure of not less than the working pressure of the system or, for piping systems other than plastic, by an air test of not less than 50 psi (345 kPa). This pressure shall be held for not less than 15 minutes. The water used for tests shall be obtained from a potable water source.

## **HEATING/AIR CONDITIONING**

**M1305.1.1 Appliances in Rooms.** Appliances installed in a compartment, alcove, basement or similar space shall be accessed by an opening or door and an unobstructed passageway measuring not less than 24 inches (610 mm) wide and large enough to allow removal of the largest appliance in the space, provided there is a level service space of not less than 30 inches (762 mm) deep and the height of the appliance, but not less than 30 inches (762 mm), at the front or service side of the appliance with the door open.

**M1306.1 Appliance Clearance.** Appliances shall be installed with the clearances from unprotected combustible materials as indicated on the appliance label and in the manufacturer's installation instructions.

**M1307.3 Elevation of Ignition Source.** Appliances having an ignition source shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor in garages.

**M1307.3.1 Protection from Impact.** Appliances shall not be installed in a location subject to vehicle damage except where protected by approved barriers.

**G2406.2 Prohibited Locations.** Gas fired appliances shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces.

**IFC6103.2.1.1 Use in Basement, Pit or Similar Location.** LP-gas containers shall not be used in a basement, pit or similar location where heavier-than-air gas might collect. LP-gas containers shall not be used in an above-grade underfloor space or basement unless such location is provided with an approved means of ventilation.

**IMC918.2 Minimum Duct Sizes.** The minimum unobstructed total area of the outdoor and return air ducts or openings to a forced-air warm-air furnace shall be not less than 2 square inches per 1,000 Btu/h (4402 mm<sup>2</sup>/kW) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions.

**M1602.2 Return air openings.** Return air openings for heating, ventilation or air-conditioning systems shall not be taken from the following locations:

- Closer than 10 feet (3048 mm) to an appliance vent outlet, vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outside air inlet.
- A closet, bathroom, toilet room, kitchen, garage, mechanical room, furnace room or other dwelling unit.
- See other prohibited locations section M1602.2

**G2407.1 Combustion, Ventilation and Dilution Air.** Air for combustion, ventilation and dilution of flue gases for appliances installed in buildings shall be provided by application of one of the methods prescribed in Sections G2407.5 through G2407.9.

**G2407.6 Outdoor combustion air.** Outdoor combustion air shall be provided through opening(s) to the outdoors in accordance with Section G2407.6.1 or G2407.6.2. The minimum dimension of air openings shall not be less than 3 inches.

**G2407.6.1 Two-permanent-openings method.** Two permanent openings, one commencing within 12 inches of the top and one commencing 12 inches of the bottom of the enclosure, shall be provided. The openings shall communicate directly or by ducts with the outdoors or spaces that freely communicate with the outdoors.

**R303.6 Outside Opening Protection.** Air exhaust and intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles having an opening size of not less than ¼ inch and a maximum opening of size ½ inch, in any dimension. Openings shall be protected against local weather conditions. Outdoor air exhaust and intake opening shall meet the provisions for exterior wall opening protectives in accordance with this code.

**Chimneys and Fireplaces.** Chimneys and fireplaces shall comply with IRC Chapter 10.

## **HABITABLE SPACE**

**R304.1 Minimum Area.** Habitable rooms shall have a floor area of not less than 70 square feet.

**Exception:** Kitchens.

**R304.2 Minimum Dimensions.** Habitable rooms shall not be less than 7 feet (2134 mm) in any horizontal dimension.

**Exception:** Kitchens.

**R304.3 Height Effect on Room Area.** Portions of a room with a sloping ceiling measuring less than 5 feet (1524 mm) or a furred ceiling measuring less than 7 feet (2134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.

**R305.1 Minimum Height.** Habitable space, hallways, portions of basements containing these spaces shall have a ceiling height of not less than 7 feet. Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches.

**Exceptions:**

1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet.
2. The ceiling height above bathroom and toilet room fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a ceiling height of not less than 6 feet 8 inches above an area of not less than 30 inches by 30 inches at the showerhead.
3. Beams, girders, ducts or other obstruction in basements containing habitable space shall be permitted to project to within 6 feet 4 inches of the finished floor.

**R303.1 Habitable Rooms Light and Ventilation.** All habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural ventilation shall be through windows, doors, louvers or other approved openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.



**R303.3 Bathroom Light and Ventilation.** Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m<sup>2</sup>), one-half of which must be operable.

Exception: The glazed areas shall not be required where artificial light and a local exhaust system are provided. The minimum local exhaust rates shall be determined in accordance with Section M1505. Exhaust air from the space shall be exhausted directly to the outdoors.

## **FIRE PREVENTION AND SAFETY**

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

**R310.2.1 Minimum Opening Area.** Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches and the net clear width shall be not less than 20 inches.

**R308.4 Hazardous Locations.** The locations specified in Sections R308.4.1 through R308.4.7 shall be considered to be specific hazardous locations for the purpose of glazing.

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

1. Where the glazing is within 24 inches of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall less than 180 degrees from the plane of the door in a closed position and within 24 inches of the hinge side of an in-swinging door.

**R308.4.5 Glazing and Wet Surfaces.** Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

**R308.4.7 Glazing Adjacent to the Bottom Stair Landing.** Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches above the landing and within a 60 inch horizontal are less than 180 degrees from the bottom tread nosing shall be considered to be a hazardous location.

See section R308.4 for other hazardous locations where safety glass is required.

**R307.2 Bathtub and Shower Spaces.** Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a

nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet (1829 mm) above the floor.

**R702.3.7 Water-Resistant Gypsum Backing Board.** Gypsum board used as the base or backer for adhesive application of ceramic tile or other required nonabsorbent finish material shall conform to ASTM C 630 C 1178, or C 1396. Use of water-resistant gypsum backing board shall be permitted on ceilings. Water-resistant gypsum board shall not be installed over Class I or Class II vapor retarder in a shower or tub compartment. Cut or exposed edges, including those at wall intersections, shall be sealed as recommended by the manufacturer.

**R702.3.7.1 Limitations.** Water resistant gypsum backing board shall not be used where there will be direct exposure to water, or in areas subject to continuous high humidity.

**R302.12 Draftstopping Required.** In combustible construction where there is usable space both above and below the concealed space of a floor-ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m<sup>2</sup>). Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below draftstopping shall be provided in floor-ceiling assemblies under the following circumstances:

1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members.

**R302.11 Fireblocking Required.** In combustible construction, fireblocking shall be provided to cut off both vertical and horizontal concealed draft openings and to form an effective fire barrier between stories, and between a top story and the roof space.

Fireblocking shall be provided in wood-framed construction in the following locations:

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs; as follows:
  - 1.1. Vertically at the ceiling and floor levels.
  - 1.2. Horizontally at intervals not exceeding 10 feet (3048 mm).
2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R302.7
4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.

**R311.6 Hallways.** The minimum width of a hallway shall be not less than 3 feet (914 mm).

**R311.2 Egress Door.** Not less than one egress door shall be provided for each dwelling unit. The egress door shall be a side-hinged, and shall provide a clear width of not less than 32 inches where measured between the face of the door and the stop, with the door open 90 degrees. The clear height of the door opening shall be not less than 78 inches 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.

**R311.7.1 Stairway Width.** Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall not be less than 31 ½ inches where a handrail is installed on one side and 27 inches where handrails are installed on both sides.

**R311.7.2 Stairway Headroom.** The headroom in stairways shall be not less than 6 feet 8 inches (2036 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

**R311.7.5.1 Risers.** The riser height shall be not more than 7-3/4 inches (196 mm).

**R311.7.5.2 Treads.** The tread depth shall be not less than 10 inches (254 mm).

**R311.7.8 Handrails.** Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

**R311.7.8.1 Height.** Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

**R311.7.8.2 Handrail projection.** Handrails shall not project more than 4 ½ inches on either side of the stairway.

**R312.1.1 Guards.** Guards shall be provided for those portions of open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches measured vertically to the floor or grade below at any point within 36 inches horizontally to the edge of the open side. Insect screening shall not be considered as a guard.

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

**TABLE R302.6  
DWELLING- GARAGE SEPARATION**

SEPARATION	MATERIAL
From the residence and attics	Not less than 5/8 - inch gypsum board or equivalent applied to the garage side
From habitable rooms above the garage	Not less than 5/8 - inch Type X gypsum board or equivalent
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than ½ - inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than ½ - inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

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

## **MISCELLANEOUS**

**R703.2 Water-Resistive Barrier.** One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D 226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No. 15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other approved materials shall be installed in accordance with the water-resistive barrier manufacturer's installation instructions. The No. 15 asphalt felt or other approved water-resistive barrier material shall be continuous to the top of walls and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

**R703.7.2.1 Weep Screeds.** A minimum 0.019-inch (0.5 mm) (No. 26 galvanized sheet gage), corrosion-resistant weep screed or plastic weep screed, with a minimum vertical attachment flange of 3-1/2 inches (89 mm) shall be provided at or below the foundation plate line on exterior stud walls in accordance with ASTM C 926. The weep screed shall be placed a not less than 4 inches (102 mm) above the earth or 2 inches (51 mm) above paved areas and shall be of a type that will allow trapped water to drain to the exterior of the building. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

**R319.1 Address Identification.** Buildings shall be provided with approved address identification. The address identification shall be legible and placed in a position that is visible from the street or road fronting the property.

**IECC R402.1.4 U-factor Alternative.** An assembly with a *U*-factor equal to or less than that specified in Table IECC R402.1.4 shall be permitted to as an alternative to the *R*-value in Table IECC R402.1.2.

## **RESIDENTIAL WIRING REQUIREMENTS**

The following list of wiring requirements presents the most often overlooked items in residential wiring. It must be used only as a guideline and is not intended as a technical document of the total code requirements. To determine proper wire size and type, proper electrical equipment, and proper wiring methods, you are advised to consult with a licensed electrical engineer, a licensed electrician, and/or your codebook.

**Electric Panels.** Shall not be located in any hazardous locations, including clothes closets, and shall provide access and working space as required by NEC Article 110.

**A Disconnect** shall be required on the exterior of all residential, commercial, and industrial buildings.

**Laundry Circuit.**All 125-Volt, single-phase, 15- and 20- ampere receptacles installed shall have ground-fault circuit-interrupter protection. (NEC 210.8(A)(10))

**Kitchen and Dining Area Circuit.** 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 NEC 210.11 (C)(1) shall serve all wall and floor receptacle outlets covered by 210.52(A), all countertop outlets covered by 210.52(C) and receptacle outlets for refrigeration equipment (NEC 210.52)

**E3703.1 Branch Circuits for Heating.** Central heating equipment other than fixed electric space heating shall be supplied by an individual branch circuit. Permanently connected air-conditioning equipment, and auxiliary equipment directly associated with the central heating equipment such as pumps, motorized valves, humidifiers and electrostatic air cleaners, shall not be prohibited from connecting to the same branch circuit as the central heating equipment.

**Bathroom Branch Circuits.** A minimum of one 120-volt, 20-ampere branch circuit shall be provided to supply bathroom receptacle outlet(s). Such circuits shall have no other outlets. (NEC 210.11(C)(3))

**Receptacle Outlets.** In every kitchen, family room, dining room, living room, parlor, library, den, sunroom, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in NEC 210.52(A) through (A)(4)

**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.

**Arc-Fault Circuit-Interrupter Protection.** All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected. See Section NEC 210.12 for specifications.

## **Kitchen**

**Wall Counter Space.** A receptacle outlet shall be installed at each wall counter 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. (NEC 201.52(C)(1))

**Island Counter Spaces.** At least one receptacle outlet shall be installed at each island counter space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater. (NEC 201.52(C)(2))

**Peninsular Countertop Space** Not less than one receptacle outlet shall be installed at each peninsular counter space with a long dimension of 24 inches (610 mm) or greater and a short dimension of 12 inches (305 mm) or greater. (NEC 201.52(C)(3))

## **Bathrooms**

**Basin Receptacle.** At least one receptacle outlet shall be installed within 900mm (3 ft) of the outside edge of each basin. The receptacle outlet shall be located on a wall or partition that is adjacent to the basin countertop, located on the countertop, or installed on the side or face of the basin cabinet. In no case shall the receptacle be located more than 300 mm (12in) below the top of the basin or basin countertop. Receptacle outlet assemblies listed for use in countertops shall be installed in the countertop. (NEC 210.52(5)(D))

**Bathroom Receptacles.** All 125-volt, single-phase, 15- and 20-ampere receptacles installed in bathrooms shall have ground-fault circuit-interrupter protection for personnel. (NEC 210.8)

## **Basement, Outdoor, and Garage Outlets**

**Outdoor Outlets.** At least one receptacle outlet accessible at grade level and 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. (NEC 210.52(5)(E))

**Outdoor Receptacles.** All 125-volt, single-phase, 15- and 20-ampere receptacles installed outdoors shall have ground-fault circuit-interrupter protection for personnel. (NEC 210.8)

**Basements and Garages.** At least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage that is provided with electric power. (NEC 210.52(5)(G))

**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. (NEC 210.8)

**Garage and Accessory Building Receptacles.** All 125-volt, single-phase, 15- or 20-ampere receptacles installed shall have ground-fault circuit-interrupter protection. (NEC 210.8(A)(2)). In each attached and detached garage with electric power, at least one receptacle outlet shall be installed in each vehicle bay and not more than 1.7 m (5 ½ ft) above the floor. (NEC 210.52(G)(1))

**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. (NEC 210.8)

## **Lighting (NEC 210.70)**

**Habitable Rooms.** At least one wall switch-controlled lighting outlet shall be installed in every habitable room and bathroom.

Exceptions:

1. In other than kitchens and bathrooms, one or more receptacles controlled by a wall switch shall be considered equivalent to the required lighting outlet.  
(NEC 210.70 (A)(1))

**Additional Locations.**

- (a) At least one wall-switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages, and detached garages with electric power.
- (b) At least one wall-switch-controlled lighting outlet shall be installed to provide illumination on the exterior side of each outdoor egress door having grade level access, including outdoor egress doors for attached garages and detached garages with electric power. A vehicle door in a garage shall not be considered as an outdoor egress door.
- (c) Where one or more lighting outlets are installed for interior stairways, there shall be a wall switch at each floor level and landing level that includes an entryway to control the lighting outlets where the stairway between floor levels has six or more risers. (NEC 210.70 (A)(2))

**Storage or Equipment Spaces.** For attics, under-floor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed where these spaces are used for storage or contain equipment requiring servicing. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing. (NEC 210.70 (A)(3))

**Bathtub and Shower Areas.** No parts of cord-connected luminaires (fixtures), chain-, cable-, or cord-suspended-luminaires (fixtures), lighting track, pendants, and ceiling-suspended (paddle) fans shall be located within a zone measured 3 feet (900 mm) horizontally and 8 feet (2.5 m) vertically from the top of a bathtub rim or shower stall threshold. This zone is all encompassing and includes the space directly over the tub or shower. Luminaires (lighting fixtures) located in this zone shall be listed for damp locations, or listed for wet locations where subject to shower spray. (NEC 410.10(D))

**IECC404.1 Lighting Equipment.** Not less than 90 percent of the permanently installed lighting fixtures shall be high-efficacy lamps (e.g., LED, CFL).

**R313.3 Smoke Alarm 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 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.

**R313.3 Smoke Alarm Power Source.** In new construction, the required 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.

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

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.

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

**R315.2 Carbon Monoxide Power Source** Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source and, where primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

When more than one carbon monoxide 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.

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

### **Pools, Spas, Hot Tubs, and Hydromassage Bathtubs (NEC 680)**

Wiring methods used in conjunction with swimming, wading, therapeutic, and decorative pools; fountains; hot tubs; spas; and hydromassage bathtubs shall be installed in accordance with NEC Article 680.

**NEC 680.22(3) Other Receptacles, Location.** Other receptacles shall be not less than 1.83 m (6 ft) from the inside walls of a pool.

**NEC 680.22(1) Required Receptacle Location.** Where a permanently installed pool is installed, no fewer than one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located not less than 1.83 m (6 ft) from, and not more than 6.0 m (20 .ft) from, the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6 ft 6 in.) above the floor, platform, or grade level serving the pool.

**NEC 680.22(4) GFCI Protection.** All 15- and 20-ampere, single-phase 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool shall be protected by a ground-fault circuit interrupter.



**NEC 680.22(B)(1) New Outdoor Installation Clearances.** In outdoor pool areas, luminaires (lighting fixtures), lighting outlets, and ceiling-suspended (paddle) fans installed above the pool or the area extending 1.5 m (5 ft) horizontally from the inside walls of the pool shall be installed at a height not less than 3.7 m (12 ft) above the maximum water level of the pool.

**NEC 680.22(B) (2) Indoor Clearances.** For installations in indoor pool areas, the clearances shall be the same as for outdoor areas unless modified as provided in this paragraph. If the branch circuit supplying the equipment is protected by a ground-fault circuit interrupter, the following equipment shall be permitted at a height not less than 2.3 m (7 ft 6 in.) above the maximum pool water level:

- (1) Totally enclosed luminaires (fixtures)
- (2) Ceiling-suspended (paddle) fans identified for use beneath ceiling structures such as provided on porches or patios

**NEC 680.22(B)(4) GFCI Protection in Adjacent Areas.** Luminaires (lighting fixtures), lighting outlets, and ceiling-suspended (paddle) fans installed in the area extending between 1.5 m (5 ft) and 3.0 m (10 ft) horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter unless installed not less than 1.5 m (5 ft) above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool.

**NEC 680.22(C) Switching Devices.** Switching devices shall be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall or other permanent barrier. Alternatively, a switch that is listed as being acceptable for use within 1.5 m (5 ft) shall be permitted.

**NEC680.26(B)(1) Metallic Structural Components.** All metallic parts of the pool structure, including the reinforcing metal of the pool shell, coping stones, and deck, shall be bonded.

## **POOL AND SPA FENCING AND COVERS**

**AG305.2 Outdoor swimming pool.** Outdoor pools and spas and indoor swimming pools shall be surrounded by a barrier that complies with Sections 305.2.1 through 305.7.

### **305.2.1 Barrier Height and Clearances.**

1. The top of the barrier shall be at least 48 inches (1219 mm) above grade measured on the side of the barrier which faces away from the pool or spa. Such height shall exist around the entire perimeter of the barrier and for a distance of 3 feet (914 mm) measured horizontally from the outside of the required barrier.
2. The vertical clearance between grade and the bottom of the barrier shall not exceed 2 inches (51 mm) for grade surfaces that are not solid, such as grass or gravel, where measured on the side of the barrier that faces away from the pool or spa.
3. The vertical clearance between a surface below the barrier to a solid surface, such as concrete, and the bottom of the required barrier shall not exceed 4 inches (102 mm) where measured on the side of the required barrier that faces away from the pool or spa.
4. Where the top of the pool or spa structure is above grade, the barrier shall be installed on grade or shall be mounted on top of the pool or spa structure. Where the barrier is mounted on the top of the pool or spa, the vertical clearance between the top of the pool or spa and the bottom of the barrier shall not exceed 4 inches (102 mm).

**305.2.2 Openings.** Opening in the barrier shall not allow the passage of a 4-inch-diameter (102 mm) sphere

**305.2.2 Solid Barrier Surfaces.** Solid barriers that do not have openings shall not contain indentations or protrusions that form handholds and footholds, except for normal construction tolerances and tooled masonry joints.

**305.2.4 Mesh Fence as a Barrier.** Mesh fences, other than chain link fences in accordance with Section 305.2.7 shall be installed in accordance with the manufacturer's instructions and shall comply with the following:

1. The bottom of the mesh fence shall be not more than 1 inch (25 mm) above the deck or installed surface or grade.
2. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not permit the fence to be lifted more than 4 inches (102 mm) from grade or decking.
3. The fence shall be designed and constructed so that it does not allow passage of a 4-inch (102 mm) sphere under any mesh panel. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall be not greater than 4 inches (102 mm) from grade or decking.
4. An attachment device shall attach each barrier section at a height not lower than 45 inches (1143 mm) above grade. Common attachment devices include but are not limited to, devices that provide the security equal to or greater than that of a hook-and-eye-type latch incorporating a spring-actuated retaining lever such as a safety gate hook.
5. Where a hinged gate is used with a mesh fence, the gate shall comply with Section 305.3
6. Patio deck sleeves such as vertical post receptacles that are placed inside the patio surface shall be of a nonconductive material.
7. Mesh fences shall not be installed on top of onground residential pools.

**305.2.5 Closely Spaced Horizontal Members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm), the horizontal members shall be located on the pool or spa side of the fence. Spacing between vertical members shall not exceed 1 ¾ inches (44) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1 ¾ inches (44 mm) in width

**305.2.6 Widely Spaced Horizontal Members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, spacing between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1 ¾ inches (44 mm) in width.

**305.2.7 Chain Link Dimensions.** The maximum opening formed by a chain link fence shall be not more than 1 ¾ inches (44 mm). Where the fence is provided with slats fastened at the top and bottom that reduce the openings, such opening shall be not greater than 1 ¾ inches (44 mm).

**305.2.8 Diagonal Members.** Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be not greater than 1 ¾ inches (44 mm). The angle of diagonal members shall be not greater than 45 degrees from vertical.

**305.3 Gates.** Access gates shall comply with the requirements of Sections 305.3.1 through 305.3.3 and shall be equipped to accommodate a locking devise. Pedestrian access gates shall open outward away from the pool or spa, shall be self-closing and shall have a self-latching devise.

**305.3.1 Utility or Service Gates.** Gates not intended for pedestrian use, such as utility or service gates, shall remain locked when not in use.

**305.3 .2 Double or Multiple Gates.** Double gates or multiple gates shall have not fewer than one leaf secured in place and the adjacent leaf shall be secured with a self-latching device. The gate and barrier shall not have opening slarger than ½ inch (12.7 mm) within 18 inches (457 mm) of the latch release mechanism. The self-latching device shall comply with the requirements of Section 305.3.3

**305.3.3 Latches.** Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from grade, the release mechanism shall be located on the pool or spa side of the gate not less than 3 inches (76 mm) below the top of the gate, and the gate and barrier shall not have openings greater than ½ inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

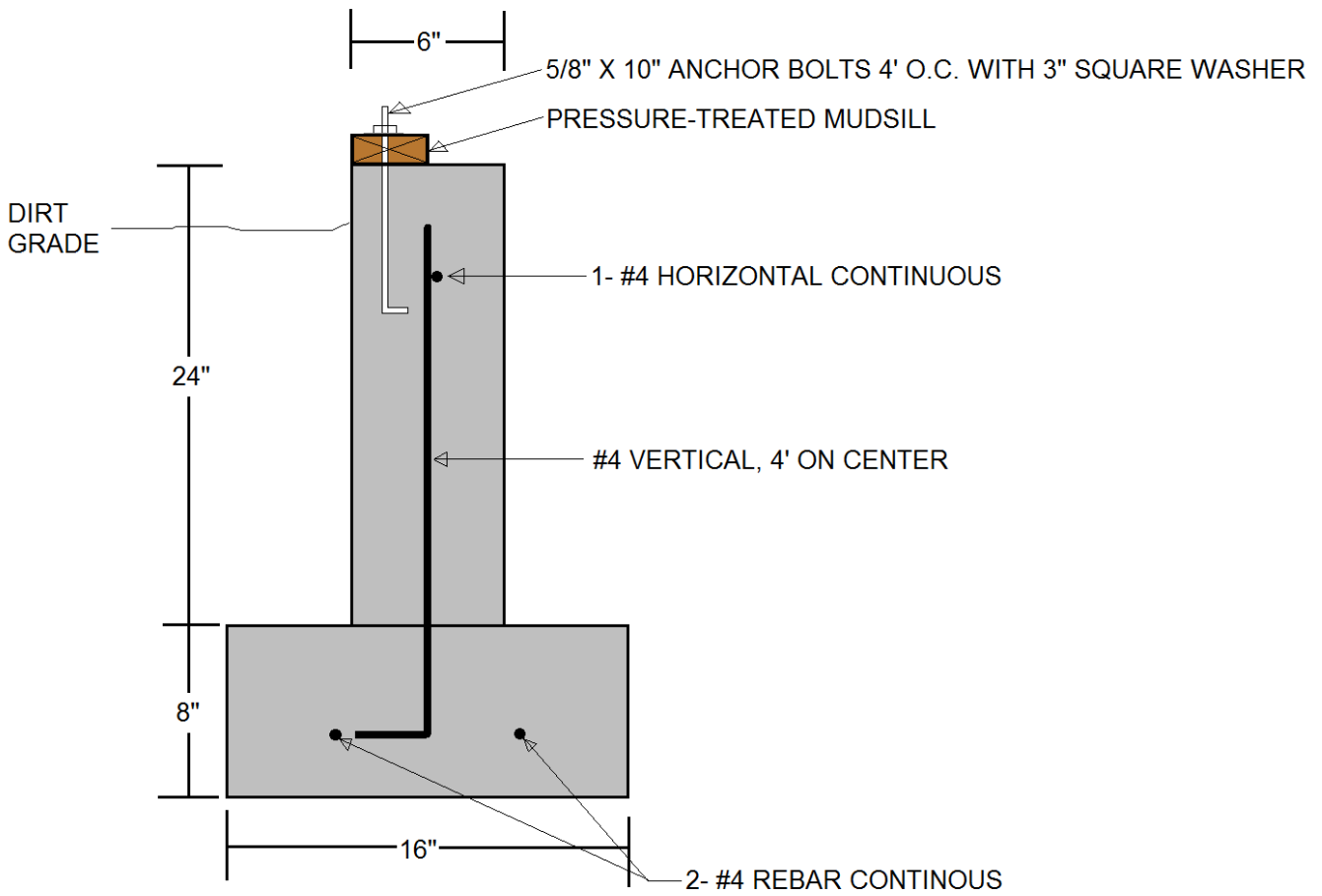
**305.4 Structure Wall as a Barrier.** Where a wall of a dwelling or structure serves as part of the barrier and where doors or windows provide direct access to the pool or spa through that wall, one of the following shall be required.

1. Operable windows having a sill height of less than 48 inches (1219 mm) above the indoor finished floor and doors shall have an alarm that produces an audible warning when the window, door or their screens are opened. The alarm shall be listed and labeled as a water hazard entrance alarm in accordance with UL 2017. In dwellings or structures not required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located 54 inches or more above the finished floor. In dwellings or structures required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation units shall be located not less than 48 inches above the finished floor.
2. A safety cover that is listed and labeled in accordance with ASTM F 1346 is installed for the pools and spas.
3. An approved means of protection, such as self-closing doors with self-latching devices, is provided. Such mean of protection shall provide a degree of protection that is not less than the protection afforded by Item 1 or 2.

**305.5 Onground Residential Pool Structure as a Barrier.** An onground residential pool wall structure or a barrier mounted on top of an onground residential pool wall structure shall serve as a barrier where all of the following conditions are present:

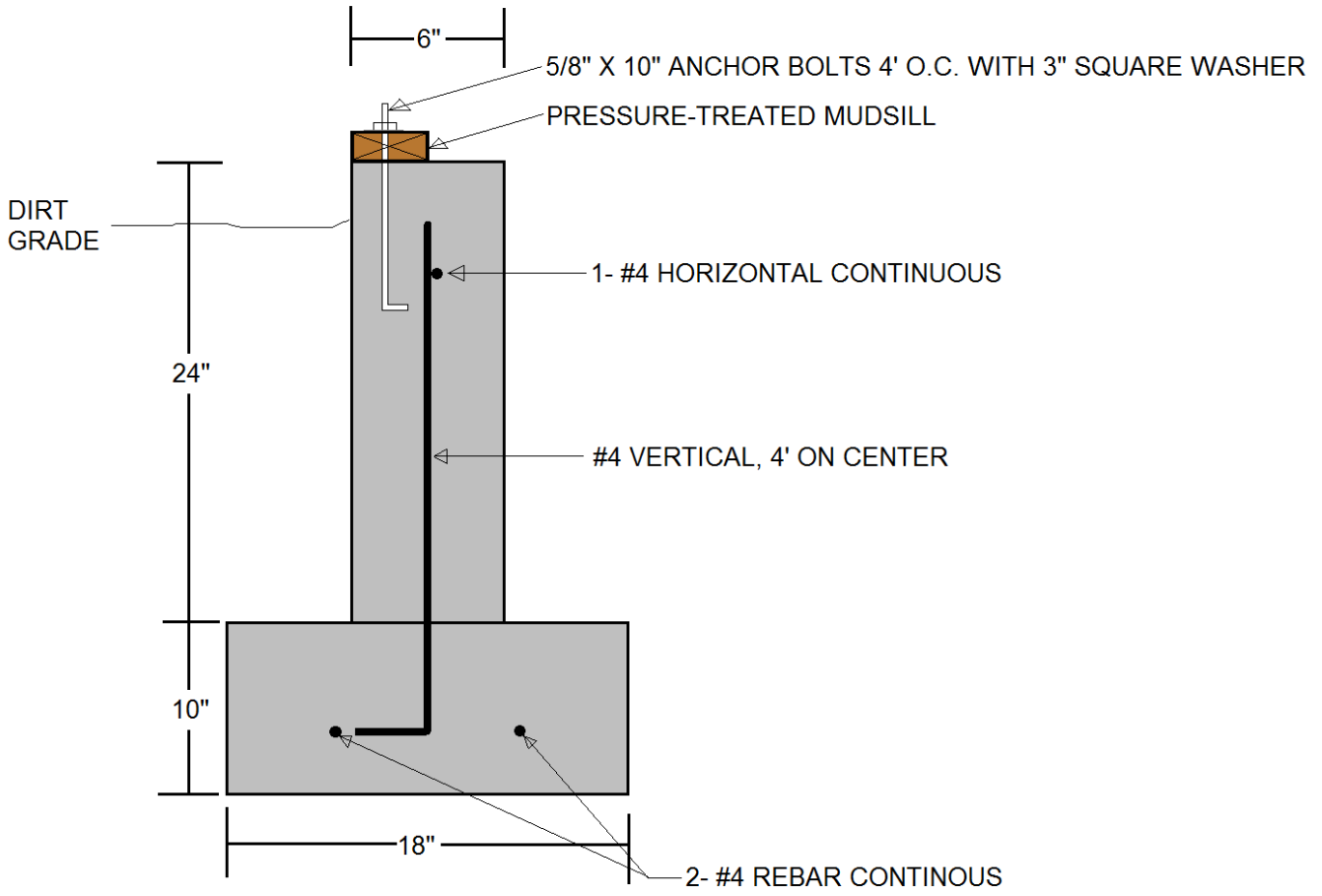
1. Where only the pool wall serves as the barrier, the bottom of the wall is on grade, the top of the wall is not less than 48 inches above grade for the entire perimeter of the pool, the wall complies with requirements of Section 305.2 and the pool manufacturer allows the wall to serve as a barrier.
2. Where a barrier is mounted on top of the pool wall, the top of the barrier is not less than 48 inches above grade for the entire perimeter of the pool, and the wall and the barrier on top of the wall comply with the requirements of Section 305.2.
3. Ladders or steps used as means of access to the pool are capable of being secured, locked or removed to prevent access except where the ladder or steps are surrounded by a barrier that meets the requirements of Section 305.
4. Openings created by the securing, locking or removal of ladders and steps do not allow the passage of a 4 inch diameter sphere.
5. Barriers that are mounted on top of onground residential pool walls are installed in accordance with the pools manufacturer's instructions.

Typical Foundation Detail, One-Story Dwelling<sup>1</sup>



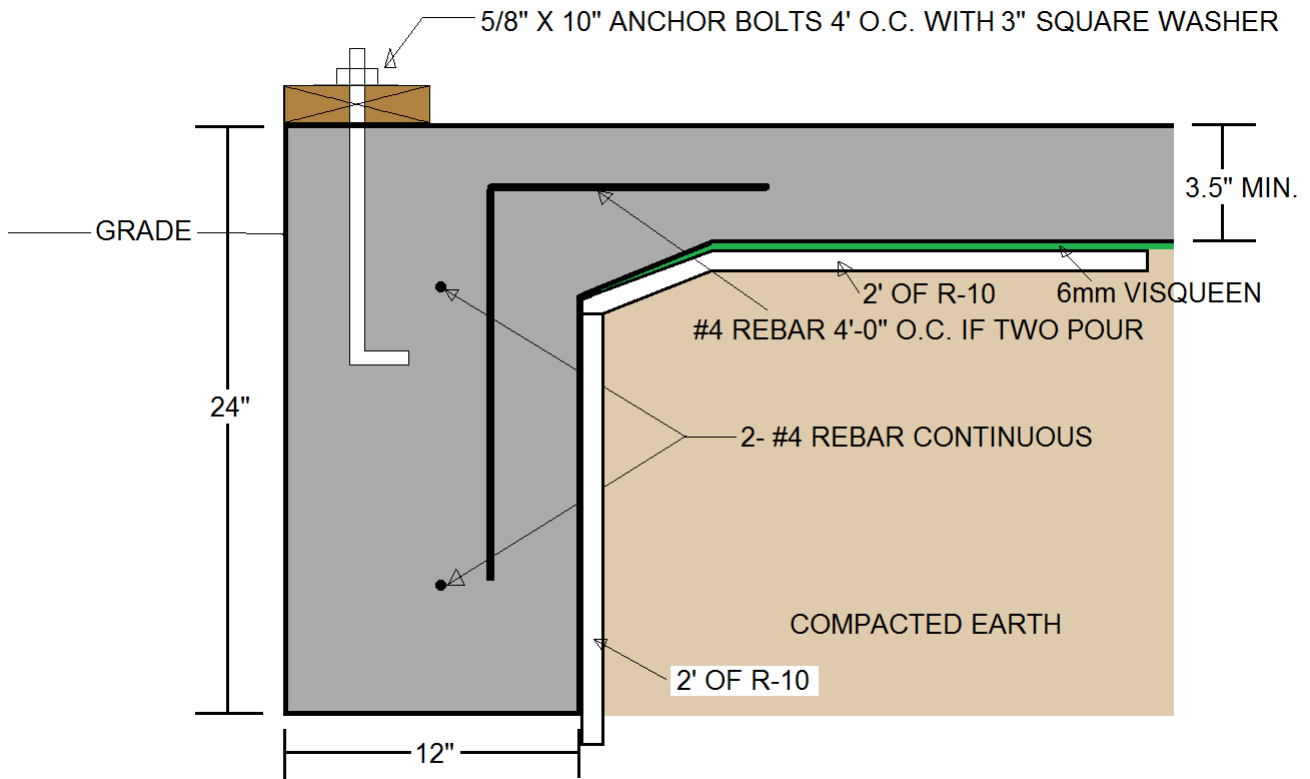
<sup>1</sup> Not to scale

Typical Foundation Detail, Two-Story Dwelling<sup>2</sup>



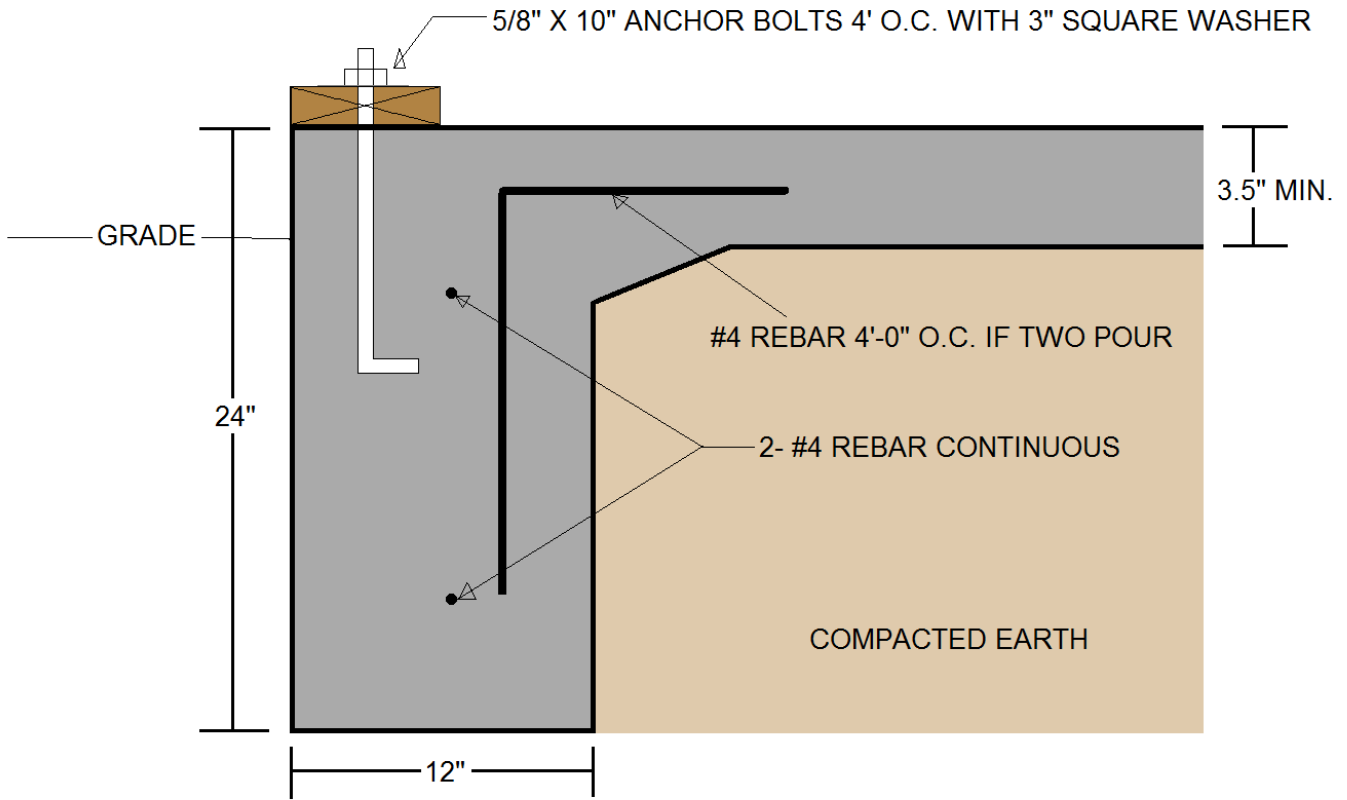
<sup>2</sup> Not to scale

Monolithic Footing/Slab Detail – Habitable Building<sup>3</sup>



<sup>3</sup> Not to scale

Monolithic Footing/Slab Detail – Non-Habitable Building<sup>4</sup>



<sup>4</sup> Not to scale