



# **PLAN REVIEW & CONSTRUCTION GUIDE**

**KEEP THIS GUIDEBOOK AND APPROVED PLANS ON SITE  
DURING CONSTRUCTION**

**THIS GUIDE BOOK IS PART OF YOUR APPROVED PLANS AS A REFERENCE ONLY ANY DEVIATION  
FROM APPROVED PLANS REQUIRES REVISION SUBMITTAL AND DEPARTMENT REVIEW**

**LABELS AND NOTES ON THE PLANS REFER TO THIS  
GUIDEBOOK**

**WHATCOM COUNTY  
PLANNING & DEVELOPMENT SERVICES**

Northwest Annex  
5280 Northwest Drive

**INTERNATIONAL RESIDENTIAL CODE 2021 REFERENCES**

**WHATCOM COUNTY PLANNING & DEVELOPMENT SERVICES  
5280 Northwest Drive \* Bellingham, WA 98226**

**APPLICANT'S RESIDENTIAL PLAN REVIEW &  
CONSTRUCTION GUIDE**

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**NOTE:**

- 1. "Job Copy" approved set of plans must be on site for all inspections.**
  - 2. Truss plans shall be on site for framing inspection.**
  - 3. Inspection card shall be on job site at all times.**
  - 4. Inspections are provided by calling the inspection request line or on our website.**
  - 5. Final inspection required prior to occupancy.**
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JOB ADDRESS \_\_\_\_\_

OWNER \_\_\_\_\_

CONTRACTOR \_\_\_\_\_ DATE \_\_\_\_\_

**NOTICE:** The item #'s noted on your plans are identified by the same item number in this guide and represent code minimums only. Minimum code requirements must be incorporated into construction.

This list of excerpts is condensed from various codes and only includes the most common errors and omissions. This list is not intended to be a complete code.

Approval of the plans, with any notes and/or this list attached, does not permit the violation of any building, mechanical, plumbing, fire or zoning code, or any other state or county regulations.

2021 INTERNATIONAL RESIDENTIAL CODE (IRC), INCLUDING MECHANICAL REQUIREMENTS

2021 UNIFORM PLUMBING CODE (UPC)

2021 WA STATE ENERGY CODE (WSEC)

SEISMIC DESIGN CATEGORY – D<sub>1</sub> (D<sub>0</sub> East of Kendal)

BASIC WIND SPEED 110 mph - Exposure per IRC Section R301.2.1.4 (Verify exposure rating with Building Services Division. Tax Parcel Number required.)

MINIMUM SNOW LOAD 25 lb./s.f. (see page # 4 )

MAXIMUM ASSUMED SOIL BEARING CAPACITY - 1500 p.s.f. (See IRC Section R401 & Table R401.4.1)

Special requirements \_\_\_\_\_

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**WHATCOM COUNTY Mark Personius, AICP**

Planning & Development Services Director  
5280 Northwest Drive  
Bellingham, WA 98226-9097  
360-778-5900, TTY 800-833-6384  
360-778-5901 Fax



**Erosion and Sediment Control (ESC) in Whatcom County**

Properly installed ESC measures help to protect Whatcom County’s valuable water resources. During clearing and constructions activities it is your responsibility to contain your soil on your job site. Soil leaving your job site and entering any surface water is a violation of applicable local and state regulations.

**If you are planning work in the Lake Whatcom, Lake Samish, Lake Padden, Drayton Harbor, or Birch Bay Watersheds there are extra requirements. Contact the Watersheds Staff for more information.**

County Wide Requirements:

WCC 20.80.634: Stormwater Special Districts

WCC 20.80.736: Land Clearing Permit approval and Inspection Process

Project Permit. When clearing activity is proposed as part of a development proposal, the submittal requirements contained in the Whatcom County Development Standards, including temporary and permanent erosion control measures, must be submitted by the permit applicant and approved by the county as part of a project permit application prior to any clearing. Under this condition, a separate clearing permit shall not be required. Erosion control inspections shall be required as a condition of the building permit at the time of footing inspection sign off. **(All permitted projects require ESC sign off at the time clearing activity occurs. Footing inspection will be denied until ESC is approved).**

A combination of the following may be required on your job site:

- Straw or bark mulch on all exposed soils after backfill of foundation and/or retaining wall(s).
- Filter fabric or plastic sheeting: covering all piles of excavated dirt.
- Construction access route of 4” quarry spalls as necessary to prevent soil transfer off-site.
- Silt fence properly installed along contours down slope of exposed soils.
- Sandbag check dams placed in ditches.
- Newly constructed stormwater swales should have sod buffer when installed during fall, winter or spring months; summertime installations shall be seeded.

Regular maintenance is required for all ESC measures. Additional ESC measures shall be installed as needed. Off-site damage or evidence of soil leaving your job site is subject to penalties, stop work orders, suspension of permit, and civil action.

**Please call 360-778-5900 for more information & brochures.**

## SNOW LOAD REVISION

JANUARY 1997

<i>Whatcom County</i>	Approx. average elevation	Revised Ground Snow Load	Revised Roof Snow Load
Acme	310	22	25
Bellingham	100	15	25
Blaine	45	16	25
Deming	210	24	25
Diablo	910	100	100
Ferndale	60	20	25
Glacier	900	74	74
Lawrence	145	24	25
Lynden	103	24	25
Maple Falls	643	77	77
Mt. Baker Ski Area	4200	588	588
Newhalem	510	129	129
Nooksack	84	24	25
Sumas	36	24	25
Wickersham	310	28	28
Kendall	460		50
Paradise	460		50
Pt. Roberts	120		25

- Any proposal can challenge the above design load with engineer or architect stamped and signed calculations and criteria.
- Buildings where the roof snow load exceeds 50 PSF may require architect or engineer review.
- Buildings where the roof snow load exceeds 70 PSF will require engineering.
- Recommendations are valid for the recognized central area of each regional designation. Building Services reserves the right to adjust the roof snow load based on building location and/or criteria per the 2021 IBC and/or the Snow Load Analysis for Washington.
- These values are for the general areas identified. For more accurate site specific snow loads contact the Building Department (have your parcel number available)

### **INSPECTION REQUIREMENTS**

1. Every building or fire permit issued by the Building Official or Fire Marshal under the provisions of this code will expire by limitation and become null and void if the work authorized by such permit is not completed in accordance with the permitted requirements within two years of the date of issuance. Any permittee may apply, in writing, for a single one-year extension in order to complete the authorized work under the Permit. The fee for the extension shall be per the Unified Fee Schedule (UFS). The Building Official or Fire Marshal may grant the extension if the permittee demonstrates that circumstances beyond their control have prevented the authorized work from being completed. No permit may be extended more than once.

If at the end of the one-year extension period, the permittee, only needs to obtain a "Final" inspection to complete the permit, the permittee may apply, for a onetime 60-day extension to obtain a "Final"

inspection. If a special inspection is required to verify continued construction activity a fee of \$120.00 is required to be paid in advance of the inspection.

**Post** your **INSPECTION RECORD** card in a conspicuous place and protected from weather. When construction begins and leave it posted until all inspections have been satisfied. That inspection record is your proof that the required inspections have been done and it should be saved along with all the other important paperwork concerning the project.

Post the job address at the road so that the site can be found easily by the inspectors.

You are required to arrange for inspections in the following manner:

- 1) Request inspection at least 24 hours in advance of needed inspections. Inspection requests received prior to 6pm will be performed the following day except for the following locations.
  - Outlying areas such as Point Roberts, Glacier, Lummi Island, and Newhalem have regularly schedule inspection days during the week, call 360-778-5900 to find out what days we will be in those areas.
  - Eliza Island inspection are by appointment only
- 2) When calling or requesting online for inspections or inquiring about specific code requirements, **always** make reference to your **BUILDING SITE ADDRESS & PERMIT NUMBER!!** If you do not include this information you may not receive your desired inspection.
- 3) **Approved plans must be available on building site when the inspection is performed.**  
**\*NO WORK SHALL BE COVERED UNTIL REQUIRED INSPECTIONS ARE COMPLETED\***
- 4) Refer to the specific inspection you are calling for. Required inspections are as follows:
  - a) **Foundation Inspection:** To be made after building location and setbacks are identified, excavation or trenching is complete, concrete forms or concrete masonry units (CMU) and reinforcing steel is in place, and all foundation vents and block-outs are placed, prior to concrete or grout placement.
  - b) **Slab Insulation/Ground Plumbing:** To be made after slab insulation and all under-slab plumbing or radiant heat coils are installed, prior to concrete placement.
  - c) **Underfloor:** To be made prior to subfloor sheathing installation for floor frame systems over crawlspace areas. System design engineering and/or manufacturer's installation specifications must be on site when applicable.
  - d) **Exterior Shear Wall Nailing:** Shear wall nailing and roof or wall sheathing inspections may be required, as identified on the plans. (Special inspections/structural observations may be required on complex structures.)
  - e) **Rough Plumbing & Mechanical:** To be made at the same time as the Framing inspection, when all DWV and water piping, mechanical ducts, gas piping (pressure test to 12 psi), and chimneys are installed.
  - f) **Electrical:** Evidence of rough electrical inspection approval from Labor & Industries is required prior to cover. For Electrical permit requirements, contact L&I @ 647-7300.
  - g) **Exterior Continuous Insulation:** To be made after shear wall and prior to siding cover.
  - h) **Framing:** To be made after structure is enclosed, all roof, wall, and floor framing are installed (and visible), and fireblocking and bracing are in place, and all utilities are roughed-in.
  - i) **Insulation:** To be made when all insulation is placed, roofing and siding installation is complete and prior to cover. Certification of insulation by a licensed installer **may only** be accepted in lieu of inspection, **when approved by the Building Inspector.**
  - j) **Gypsum Wallboard/Lath:** When required by the Building Services Division, typically where part of an engineered wall or ceiling diaphragm. To be made after all lath or

gypsum wallboard is installed, before wallboard joints & fasteners are taped and covered.

- k) **Other Inspections:** When additional project related inspections are required, such as Critical Areas, Environmental Health, Flood, Encroachment, Shorelines, etc. to be made prior to final inspection when all conditions/requirements are installed and accessible for inspection.
- l) **FINAL:** To be made when building is completed and is ready for occupancy. All previously required inspections must be completed prior to requesting a Final inspection. Duplexes, apartment buildings and all Commercial projects require a Certificate of Occupancy (two weeks prior notice is required).

In addition to the above standard inspections, the applicant is encouraged to call the Building Services Division whenever a complication arises or whenever any alterations are made to the submitted plans.

**\*PURSUANT TO THE CURRENT INTERNATIONAL RESIDENTIAL CODE, INSPECTIONS ARE MANDATORY\***

## **ADDRESSING**

### **IRC Section R319, IFC Section 505: Address and Premises Identification**

Buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be Arabic numbers or alphabetical letters. Numbers shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of 0.5 inch (12.7 mm).

NOTE: Address assignments are made by Whatcom County Public Works, Engineering Division.

Streets and roads shall be identified with approved signs. Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles. Signs shall be of an approved size, weather resistant and be maintained until replaced by permanent signs.

### **FOUNDATIONS**

#### **1. Abbreviated Table R403.1(1): The Following Minimum Foundation Shall Be Provided (See Table 403.1(1) for all types and conditions):**

	A	B	C	D
Floors	Foundation Wall	Footing Width	Footing Height	Depth Below Grade
1	6 inches (153mm)	13 inches (306mm)	6 inches (153mm)	18 inches (458mm)
2	8 inches (204mm)	17 inches (382mm)	6 inches (178mm)	18 inches (458mm)
3	10 inches (255mm)	23 inches (585mm)	6 inches (204mm)	24 inches (611mm)

#### **Details for accepted practice in Whatcom County see Illustrations 1a and 1b**

Specified concrete compressive strength for all basement walls, foundation and other vertical concrete work exposed to the weather shall be per IRC Table R402.2. (2500 psi Range 4 and West. 3000 psi East of Range 4)

**Note:** per IBC 1803.5.8 Where shallow foundations will bear on compacted fill material more than 12 inches (305mm) in depth, special inspections will be required.

**2. IRC Section R403.1.1: Footings, minimum size (Illustration 1a)**

Minimum sizes for concrete and masonry footings shall be as set forth in Table R403.1(1) and Figure R403.1(1). The footing width, W, shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Spread footings shall be at least 6 inches (152 mm) thick. Footing projections, P, shall be at least 2 inches (51 mm) and shall not exceed the thickness of the footing. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1.

Abnormal soils, fill, retaining walls, flood areas etc. require an engineered design.

**3. Concrete Footing and Wall Reinforcement - Whatcom County Accepted Practice**

Assuming normal soil conditions and in lieu of footing design and foundation plan by a registered professional engineer, a minimum of one ½ inch reinforcing bar horizontal at top of all foundation walls within 12 inches of top of wall is recommended. Grade beam footings supporting structures shall also be provided with a minimum of two ½ inch reinforcing bars. All rebar corners and splices shall lap a minimum 32 bar diameters or 16 inches for ½ inch bar. (ACI 318)

<u>HEIGHT</u>	<u>VERTICAL REINFORCEMENT</u>	<u>HORIZONTAL REINFORCEMENT</u>
	None if mono and 24" high or less	2 ea. - #4 rebar continuous
0 - 4 feet	#4 rebar 48 inches on center	#4 rebar 24 inches on center
4 - 6 feet	#4 rebar 18 inches on center	#4 rebar 18 inches on center
6 - 8 feet	#4 rebar 12 inches on center	#4 rebar 12 inches on center
8 feet and higher	Must be engineered	Must be engineered

**3a. IRC Section R404.4 Retaining Walls**

Retaining walls that are not laterally supported at the top and that retain in excess of 48 inches (1219 mm) of unbalanced fill, or retaining walls exceeding 24 inches (610 mm) in height that resist lateral loads in addition to soil, shall be designed in accordance with accepted engineering practice to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning. This section shall not apply to foundation walls supporting buildings.

**4. IRC Figure R403.1.7.1: Distance from Slopes (see illustration #5)**

**5a. IRC Section R403.1.6: Foundation Anchorage**

Foundation plates shall be bolted to the foundation wall with not less than ½ inch (13mm) steel anchor bolts embedded 7 inches (179mm) minimum into concrete or masonry and shall be spaced not more than 6 feet (1829mm) apart up to two stories, not more than 4 feet (1219mm) apart more than two stories with at least two bolts per piece, and within 1 foot (305mm) of ends. Plate washers a minimum of 3" X 3" X ¼" thick (76mm X 76mm X 7mm) are required between the wood and the nut. (IRC Section R602.11.1). Diagonally slotted holes are permitted.

**5b. IRC Section R316.5.4, R408, M1305.1.3: Crawl Space**

Under-floor clearance shall be at least 18 inches (457mm) and a minimum of 12 inches (305mm) to the bottom of girders. Under-floor area shall be provided with a minimum of 18" X 24" (457mm X 610mm) access crawl opening unobstructed by pipes, ducts and similar construction, through floors, and 16" by 24" through foundation perimeter walls. All under-floor access openings shall be effectively screened or covered. Where an electrical or natural gas furnace is installed in a crawl space, the access shall have sufficient width and height to permit removal of the furnace, but in no case less than 30" X 30" (762mm X 762mm) or more than 20 feet (6m) from the passage way access. Pipes, ducts and other construction shall not interfere with accessibility. Locate all under-floor clean-outs within 20 feet (6m) of access opening.

**5c. IRC Section R408.1, R408.2: Under-floor Ventilation** (see WA State amendments)

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. A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped six inches minimum at the joints and shall extend to the foundation wall.

The minimum net area of ventilation openings shall not be less than 1 square foot for each 300 square feet of under-floor area. Required openings shall be evenly placed to provide cross ventilation of the space except one side of the building shall be permitted to have no ventilation openings.

**5d. WSEC Section R408.1: Crawl space walls: Vapor Barriers**

In an unheated crawl space, a minimum Class 1 vapor retarder (6 mil black plastic) shall be laid over the soil, lapped at least 6 inches (305mm) and taped at seams and extended upward onto the foundation wall, in accordance with requirements of the WA State Energy Code, Residential provisions.

**5e. IRC Section R408.3 Unvented crawl space** (see WA State amendments)

Ventilation openings in under-floor spaces specified in Section R408.2 shall not be required where

1. Exposed earth is covered with a continuous Class 1 Vapor retarder. Joints of the vapor retarder shall overlap by 6 inches and shall be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches up the stem wall and shall be attached and sealed to the stem wall; and a radon system shall be installed that meets the requirements of Appendix F (Radon) of the IRC.

2. Continuously operated mechanical exhaust ventilation is provided at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet of crawlspace floor area. Exhaust ventilation shall terminate to the exterior.

**6. IRC Section R406: Foundation Waterproofing & Damp Proofing**

Waterproofing & damp proofing of foundation walls shall be in accordance with the above code section. (Includes all stem walls and footings) (May list approved types).

**7. WSEC Section 402.2.7: Foundation Insulation** See Illustration #4

**R402.2.8 Below-grade walls.** Minimum R-value of 10/15/21 int +5TB. "10/15/21 +5TB" means R-10 continuous insulation on the exterior of the wall, or R-15 continuous insulation on the interior of the wall, or R-21 cavity insulation plus a thermal break between the slab and the basement wall at the interior of the basement wall. "10/15/21 +5TB" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the wall. "5TB" means R-5 thermal break between floor slab and basement wall.

Below-grade exterior wall insulation used on the exterior (cold) side of the wall shall extend from the top of the below-grade wall to the top of the footing and shall be approved for below-grade use. Above grade insulation shall be protected. Insulation on the interior (warm) side of the wall shall extend from the top of the below-grade wall to the below-grade floor level and shall include R-5 rigid board providing a thermal break between the concrete wall and the slab

**R402.2.9.9 Slab-on-grade floors.** The minimum R-value is R-10 with a depth of 4'. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance of 4' or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for 4'. A two-inch by two-inch (maximum) pressure treated nailer may be placed at the finished floor elevation for attachment of interior finish materials. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches of soil.

R-7.5 continuous insulation installed over an existing slab is deemed to be equivalent to the required perimeter slab insulation when applied to existing slabs complying with Section R503.1.1. If foam plastic is used, it shall meet the requirements for thermal barriers protecting foam plastics.

**R402.2.9.1 Heated slab-on-grade floors.** The entire area of a heated slab-on-grade floor shall be thermally isolated from the soil with a minimum of R-10 insulation.

**8. IRC Section R401.3 & R405. & Whatcom County Ordinance Section 15.04.140: Foundation Drainage**

The following provisions shall be made to prevent standing water under and around buildings or structures prior to final inspection. Roof downspouts shall be tightlined and directed away from the building to an approved drainage area. Perimeter footing drains shall be independent of downspout tightlines, and be directed to an approved drainage area. See illustration #1 for details.

The finished grade and elevation under the building shall be above the ground drainage flow of the land around the building to prevent surface or subsurface water from draining to the space under the building, provided that alternates, such as drain tile, exterior drainage of the building or an approved sump pump system, may be used if shown on the building plans and approved by the Building Official. Approved sump pump systems shall in no way be connected to the sanitary sewer system.

The grade away from foundation walls shall fall a minimum of 6 inches (152mm) within the first 10 feet (3048mm), a 5% gradient. Drains or swales shall be provided to ensure drainage where physical barriers prohibit such gradient.

**9. IRC Section R317.1: Wood in Contact with Concrete or Masonry**

All wood in contact with concrete or masonry shall be a naturally durable wood or preservative treated in accordance with AWPA U1. 90# felt or other approved moisture barrier is permitted under posts located in crawl spaces.

Wood girders entering masonry or concrete shall be provided with ½ inch (13mm) air space on sides, tops and ends unless treated wood is used.

**10. IRC Section R317.1.4: Columns and Posts**

Columns and posts located on concrete floors exposed to weather or water splash or in basements and which support permanent structures shall be supported by concrete piers or metal pedestals projecting above floors, unless approved wood of natural resistance to decay or treated wood is used. The pedestals shall project at least 6 inches (152mm) above exposed earth and at least 1inch (25.4mm) above such floors.

**11. IRC Table R602.7(1) & R602.7(2): Girders and Headers**

Girders shall be designed to support the loads specified in this guide. Girder end joints shall occur over supports. When a girder is spliced over a support, an adequate tie shall be provided. The end of beams or girders supported on masonry or concrete shall have no less than 3 inches (76mm) of bearing.

**12. IRC Sections 407.3, 502.9 & 801.2: Positive Connections**

Where post and beam or girder construction is used, a positive connection shall be provided to insure against uplift and lateral displacement.

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**F R A M I N G**

See Fastener Schedule for Structural Members [Table R602.3(1)] attached, Illustration 6a, 6b, 6c and 6d.

**13a. IRC Section R302.11: Fire Blocking**

Fire blocks shall be provided to cut off all concealed draft openings, both vertical and horizontal, and form an effective barrier between stories, between a top story and roof space.

**13b. IRC Section 302.11: Fire Blocks Are Required**

1. In concealed spaces of stud walls and partitions, including furred spaces, at the ceiling and floor levels and at 10-foot (3048mm) horizontal intervals.
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 have walls, under-stair surface and any soffits protected on the enclosed side with ½ inch (13mm) gypsum board (IRC Section R302.7).
4. At openings around vents, pipes, and ducts at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.
5. Fire blocking of chimneys and fireplaces per IRC Section R1003.19.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

**14. IRC Section R302.12: Draftstopping**

When 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 1000 sq.ft. (93m<sup>2</sup>).

**15. IRC Section R502.7 & R802.8: Lateral Support**

Solid blocking is required at all bearing points of floor, ceiling and roof systems to prevent rotation (racking) and each intermediate support.

**16. IRC Section R502.4: Joist Bearing Partitions**

Bearing partitions perpendicular to joists shall not be offset from supporting walls or partitions more than the joist depth. Joists under and parallel to bearing partitions shall be sufficient size to bear additional loads.

**17. IRC Section R602.9: Cripple Walls**

Foundation cripple walls shall be framed of studs not less in size than the framing above. When exceeding 4 feet (1219mm) in height such cripple or pony walls shall be of studs having the size required for an additional story.

Solid blocking or wood structural panel sheathing shall be used to brace cripple walls having a stud height of 14 inches (356mm) or less.

**18. IRC Section R602.3.2: Top Plates**

Bearing and exterior wall studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with other partitions. End joints in double top plates shall be offset at least 24 inches (610mm).

**19. Typical Regional Braced Wall Framing Construction Methods.**

Typical braced wall framing constructed in our region consist mainly of **Continuously Sheathed Wood Structural Panels** [CS-WSP] (Per section R602.10.4) and **Wood Structural Panels** [WSP] (Per section R604). The following sections and tables reference these construction types. **If other prescriptive methods are used the designer shall provide calculations and section numbers to justify design. Alternate methods of bracing are allowed per IRC R602.10 but are not included in this Guide.**

**20. BLANK**

Blank.

**21. IRC Table R602.10.4, Section R602.10: Bracing of Continuously Sheathed Walls (CS)**

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. Braced wall panels shall be constructed in accordance with one of the methods listed in Table 602.10.4 (See Illustration 7a and 7b)

**22. IRC Section R604: Wall Bracing: Wood Structural Panels (WSP)**

- a. For exterior sheathing see IRC Table R602.3(3), For interior sheathing see IRC Table 702.3.5 or 602.10.4.3
- b. Any braced wall panel required by Section R604 may be replaced by any alternate braced wall panel constructed in accordance with the following.

- c. Alternate braced wall panels constructed in accordance with one of the following provisions are also permitted to replace each 4 feet (1219mm) of braced wall panel
- d. Alternate braced wall panel (ABW), R602.10.6.1 see Illustration 8 for construction detail.**
- e. For wall panel lengths see #8, with a wall height of not more than 10 feet (3048mm). Each panel shall be sheathed on one face with 3/8 inch (9.5mm) minimum thickness plywood sheathing nailed with 8d common or galvanized box nails, 6 inches (152mm) at edges and 12 inches (305mm) in the field. All edges shall be blocked. Two anchor bolts installed in accordance per figure R403.1.1 IRC, shall be provided in each panel. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an approved uplift capacity of not less than 1,800 pounds (816.5kg).
- f. In the first story of two-story buildings, each braced wall panel shall be in accordance with item #1, except that the plywood sheathing be nailed at 4" on center, and tie-down device uplift capacity shall not be less than 3,000 pounds (1360.8kg).
- g. Portal Frame with Holdowns (PFH) R602.10.6.2 see Illustration 9 for construction detail.**
- h. Panel length for one story structure = 16", for first story of two story structure length shall be 24".

**23. IRC Section R802.10: Pre-Engineered Wood Trusses**

Trusses shall be designed by a licensed WA State professional Engineer. Design and manufacturer of wood trusses must comply with ANSI/TP1 in plant inspections as required by IBC section 2303.4.6 & IRC section R802.10.2 Truss engineering plans shall be on site for framing inspection. All trusses that have openings in the web configuration of 24" horizontal and 42" vertically or larger, shall be engineered with a minimum of 20psf live load on the bottom chord. NOTE: Trusses for tile roofs shall be engineered for the extra weight of the tiles.

**24. IRC Section R802.10.3: Solid Blocking and Bracing of Trusses**

Roof trusses shall be braced to prevent rotation and provide lateral stability in accordance with specifications in the building construction documents, the individual truss design drawings or in accordance with ANSI/TPI 1-1995/HIB Standard. Engineer design and/or review of the permanent truss bracing system may be required. Provide solid blocking at bearing points, as applicable.

**25. IRC Section R502.3: Allowable Floor Joist Spans**

Size of floor joists shall be in accordance with Table R502.3.1(1) for sleeping areas and attic joists (Illustration 11a and 11b), and Table R502.3.1(2) for all other floor joists. See Illustration 12a and 12b.

**26. IRC Section R802.4: Allowable Ceiling Joist Spans**

Size of ceiling joists shall be in accordance with Tables R802.4(1) & R802.4(2).

**27. IRC Section R802.5: Allowable Rafter Spans**

Spans for rafters shall be in accordance with Tables R802.5(1) through R802.5.1(8). See Illustration 12c and 12d.

**28. IRC Section R502.8: Drilling & Notching Structural Floor Members See**

Illustration #15 regarding conventional sawn lumber.

**29. IRC Section R602.6: Drilling & Notching Studs & Size, Height & Spacing of Wood Studs See Illustration 16a and 16b.**

### 30. **IRC Section R802: Roof Framing System**

**R802.4.2 Framing Details.** Rafters shall be framed not more than 1 1/2-inch (38mm) offset from each other to ridge board or directly opposite from each other with a gusset plate as a tie. Ridge board shall be not less than 1-inch (25mm) nominal thickness and not less in depth than the cut end of the rafter. At valleys and hips there shall be a valley or hip rafter not less than 2-inch (51mm) nominal thickness and not less in depth than the cut end of the rafter.

**R802.4.4 Hips and Valleys.** Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point. Where the roof pitch is less than three units vertical in 12 units horizontal (25-percent slope), structural members that support rafters and ceiling joists, such as ridge beams, hips and valleys, shall be designed as beams.

**R802.5.2 Ceiling joist and rafter connections.** Ceiling joists and rafters shall be nailed to each other in accordance with Table R802.5.1(9), and the rafter shall be nailed to the top wall plate in accordance with Table R602.3(1). Ceiling joists shall be continuous or securely joined in accordance with Table R802.5.1(9) where they meet over interior partitions and are nailed to adjacent rafters to provide a continuous tie across the building when such joists are parallel to the rafters.

Where ceiling joists are not connected to the rafters at the top wall plate, joists connected higher in the attic shall be installed as rafter ties, or rafter ties shall be installed to provide a continuous tie. Where ceiling joists are not parallel to rafters, rafter ties shall be installed. Rafter ties shall be a minimum of 2-inch by 4-inch (51 mm by 102 mm) (nominal), installed in accordance with the connection requirements in Table R802.5.1(9), or connections of equivalent capacities shall be provided. Where ceiling joists or rafter ties are not provided, the ridge formed by these rafters shall be supported by a wall or girder designed in accordance with accepted engineering practice.

Collar ties or ridge straps to resist wind uplift shall be connected in the upper third of the attic space in accordance with Table R602.3(1).

Collar ties shall be a minimum of 1-inch by 4-inch (25 mm by 102 mm) (nominal), spaced not more than 4 feet (1219 mm) on center.

**R802.5.2.1 Ceiling joists lapped.** Ends of ceiling joists shall be lapped a minimum of 3 inches (76 mm) or butted over bearing partitions or beams and toenailed to the bearing member. When ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table R602.3(1) and butted joists shall be tied together in a manner to resist such thrust.

### 31. **IRC Section 802.11 Roof tie-down**

**R802.11.1 Uplift resistance.** Roof assemblies shall have uplift resistance in accordance with Sections R802.11.1.2 and R802.11.1.3.

Where the uplift force does not exceed 200 pounds, rafters and trusses spaced not more than 24 inches (610mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table R602.3(1).

Where the basic wind speed does not exceed 115 mph, the wind exposure category is B, the roof pitch is 5:12 or greater, and the roof span is 32 feet (9754mm) or less, rafters and trusses spaced not more than 24 inches (610mm) on center shall be permitted to be attached to their supporting wall assemblies in accordance with Table 602.3(1).

**R802.11.1.1 Truss uplift resistance.** Trusses shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as specified on the Truss Design Drawings for the ultimate design wind speed as determined by Figure R301.2(4)A and listed in Table R301.2(1) or as shown on the construction documents. Uplift forces shall be

permitted to be determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice.

**R802.11.1.2 Rafter uplift resistance.** Individual rafters shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as determined by Table 802.11 or as determined by accepted engineering practice. Connections for beams used in a roof system shall be designed in accordance with accepted engineering practice.

### **32. IRC Section R905: Roof Coverings**

Composition shingles shall be applied to solid roofs covered with 15 lb. felt, minimum 4 in 12 pitch required. Slopes as low as 2 in 12 per Section R905.2.2. Shake roofs require 18 inch (457mm) 30 lb. felt between each course. See Section R905.8.

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## **GENERAL REQUIREMENTS**

### **33. IRC Section R302.6: Separation from House to Attached Garage**

An attached garage, shop or similar area shall be separated from the residence and its attic area by not less than ½ inch (12.7mm) gypsum board applied to the garage side. Habitable rooms above the garage shall be separated by not less than 5/8 inch (15.9mm) Type X gypsum board or equal, and structural members supporting the floor/ceiling assembly shall be protected by not less than ½ inch (12.7mm) gypsum board.

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<sup>3</sup>/<sub>8</sub> inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1<sup>3</sup>/<sub>8</sub> inches (35 mm) thick, or 20-minute fire-rated doors. Doors shall be self-latching and equipped with a self-closing or automatic-closing device. (Section R302.5.1)

A heat detector or heat alarm rated for the ambient outdoor temperatures and humidity shall be installed in new garages that are attached to or located under new and existing *dwelling*s. Heat detectors and heat alarms shall be installed in a central location and in accordance with the manufacturer's instructions. (Section R 314.2.3)

### **34. IRC Section R807: Attic Access**

A 22 inch x 30 inch (559mm X 762mm) weather stripped attic access opening shall be provided with a minimum headroom clearance of 30 inches (762mm) and shall be in a readily accessible location. Where a furnace is installed in an attic area, the access shall have sufficient width and height to permit removal of the furnace, but in no case less than 30 inches x 30 inches (762mm X 762mm). When blown-in insulation is used a 12 inch (305mm) box around opening is required. When installed in garage, access cover must be secured.

### **35. IRC Section R806: Roof Ventilation**

Cross attic or enclosed rafter space ventilation is required at 1/150 of the attic area unless vented both high (ridge or gable) and low (bird blocks or soffit vents) then ventilation is required at 1/300 of attic area. Openings shall be covered with corrosion-resistant metal mesh with mesh openings of 1/8 inch (3.2mm) to ¼ inch (6.4mm) in dimension. A minimum 1 inch (25.4mm) air space shall be provided between insulation and roof sheathing.

### **36. IRC Section R311.2: Egress Door**

At least one side-hinged egress door shall be provided in each dwelling unit not less than 3 feet (914mm) in width and not less than 6 feet 8 inches (2032mm) in height. The door shall be mounted so that the clear width of the exit way is not less than 32 inches (813mm).

### **37. IRC Section R311.3: Landings**

There shall be a floor or landings on each side of all doors (see exceptions). The floor or landing shall be level with or not more than 1½ inches (38mm) lower than the top of the threshold. However, in private dwellings a door may open on the top of a flight of stairs or on an exterior landing, provided the door does

not swing over that top step or exterior landing (except that screen doors and storm doors may) and the landing is not more than 7¾ inches (196mm) below the floor level. The width of the landing shall be not less than the door served and have a minimum dimension of 36 inches (914mm) in the direction of travel. Exterior landings may have slope not to exceed ¼ inch (6.4mm) per foot.

**38. IRC Sections R317 & Table R502.3.1(2): Exterior Decks and Porches**

Approved wood of natural resistance to decay or treated wood shall be used for those portions of wood members which form the structural support of buildings, balconies, porches, stairs, or similar permanent building components when such members are exposed to the weather without adequate protection from a roof, eave, overhang or cover. Galvanized fasteners are required in weather exposed areas. Preservative and fire-retardant treated wood require hot-dipped galvanized steel, stainless steel, silicon bronze or silicon copper fasteners. Joists shall be sized per IRC Section R502.3 & Table R502.3.1(2). Girders and beams shall be sized to resist the forces specified in IBC Chapter 16.

**39. IRC Section R312, IBC Section 1607.7: Guards (Guardrails)**

All open and glazed sides of landings, decks and porches which are more than 30 inches (762mm) above grade or floor below, shall have a guardrail not less than 36 inches (914mm) in height. Open guardrails and stair railings shall have intermediate rails or an ornamental pattern such that a sphere 4 inches (102mm) in diameter cannot pass through, and shall be able to withstand a 200 lb. (91kg) concentrated load at any point along the top and 50 lb. (23kg) per sq.ft. over the entire area, per IBC Section 1607.7. The triangular openings formed by the riser, tread and bottom element of a guardrail at the open side of a stairway may be of such size that a 6 inch (152mm) sphere cannot pass through. Guard openings on the sides of stair treads shall not allow a sphere 4 3/8 inches (107mm) to pass through.

**40a. IRC Section R311.7: Stairways and Handrails- see Illustration #19 & #20**

Stairways shall be a minimum of 36 inch (914mm) net finished width at all points above the handrail height and below the headroom height. Handrails shall not project more than 4½ inches (114mm) on either side of the stairway. The minimum clear width of the stairway at and below the handrail height shall not be less than 31½ inches (787mm) where a handrail is installed on one side and 27 inches (698mm) where installed on both sides. Handrails shall be continuous for the full length of the stairway. Handrails ends shall be returned or shall terminate in newel posts or safety terminals. Guardrails shall be installed on all open sides of stairways. Top of handrails shall be placed not less than 34 inches (864mm) or more than 38 inches (965mm) above the nosing of treads and landings. Handrail shapes shall be constructed in accordance with Illustration #20. The width of landings shall not be less than the stairway served with a minimum dimension of 36 inches (914mm) measured in the direction of travel. All interior and exterior stairways shall be provided with a means of illumination (Section R303.6).

**40b. IRC Section R311.7.2, R311.7.5.1: Rise & Run, Headroom, Space under Stairs - see Illustration #19**

The rise of steps in a stairway shall not exceed 7¾ inches (196mm) and the run shall not be less than 10 inches (254mm) measured horizontally between the foremost projection of adjacent treads and at a right angle to the tread's leading edge.

The enclosed usable space under stairways shall have walls, under stair surface and any soffits protected on the enclosed side with ½ inch (12.7mm) gypsum board.

Every stairway shall have headroom clearance of not less than 6 feet 8 inches (2032 mm) measured vertically from the tread nosing to the nearest soffit above at all points, for the full required width.

**40c. IRC Section R311.7.5.2.1: Winding Stairways**

Winding stairways shall have no width of run less than 6 inches (152mm) and a minimum run of 10 inches ((254mm) at a point 12 inches (305mm) out from the narrow side. See illustration #21a.

**40d. IRC Section R311.7.10.1: Spiral Stairways**

Spiral stairways are permitted, provided that the clear width at and below the handrail is not less than 26 inches (660mm) and the walkline radius is not greater than 24 ½ inches (622mm). Each tread shall have a depth of not less than 6 3/3 inches (171mm) at the walkline. All treads shall be identical, and the rise shall be not more than 9 ½ inches (241mm). Headroom shall be not less than 6 feet 6 inches (1982mm).

**41. IRC Figure R307.1: Toilet Compartments**

The water closet stool shall be located in a clear space not less than 30 inches (762 mm) in width. The clear space in front of the water closet stool shall be not less than 21 inches (534mm).

**42. IRC Section R307.2, UPC Section 411.6 & 411.7: Shower Areas**

All shower and tub/shower areas shall be finished with an approved nonabsorbent surface to a height of 72 inches (1829mm) above the shower or tub/shower floor. Shower stalls shall be a minimum of 1024 square inches (6606cm<sup>2</sup>) and capable of encompassing a 30 inch (762mm) diameter circle. Shower doors need a clear opening of a minimum 22 inches (559mm). Fire blocking is required per IRC Section R602.8.

**43. IRC Section R310, R612.5: Emergency Escape/Rescue Openings, see Illustration #22**

Basements, habitable attics, and every sleeping room shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The emergency door or window shall be operable from the inside to provide a full, clear opening without the use of separate tools.

Escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet (0.53m<sup>2</sup>). See grade floor exception in Section R310.11. The minimum net clear openable height dimension shall be 24 inches (610 mm). The minimum net clear openable width dimension shall be 20 inches (508 mm). When windows are provided as a means of escape or rescue, they shall have a finished sill height not more than 44 inches (1118 mm) measured from the floor to the clear opening.

Escape and rescue windows with a finished sill height below the adjacent ground elevation shall have a window well. For window well requirements see illustration #22.

**44. IRC Section R303: Natural Light**

All habitable rooms within a dwelling shall be provided with natural light by means of exterior glazed openings with an area not less than 8 percent of the floor area of such rooms. The minimum openable area shall be 4 percent of the floor area.

**45. Mechanical Ventilation 303: (See Illustration 28)**

Where the air infiltration rate of a dwelling unit is less than 5 air changes per hour when tested with a blower door at a pressure of 0.2 inch w.c. (50 Pa) in accordance with Section N1102,4,1,2, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3.

All bathrooms, toilet compartments, laundry rooms, closets containing laundry facilities, and kitchens shall be provided with ventilation by means of a mechanical fan ventilation system connected directly to the outside.

**46. IRC Section R305: Ceiling Heights**

Habitable space (which includes kitchens, IRC Section R202, Definitions), hallways, bathrooms, toilet rooms, laundry rooms and portions of basements containing these spaces shall have a ceiling height of not less than 7 feet (2134mm) measured from finish floor to the lowest projection.

Where exposed ceiling members are spaced not less than 4 feet (1219mm) on center they may project not less than 6 inches (152mm) below the required height.

Ceilings, beams, girders, ducts and other obstructions in non-habitable basements may project to within not less than 6 feet 8 inches (2032mm) measured from the finished floor.

**47. IRC Section R304: Floor/Room Area**

Every dwelling unit shall have at least one room which shall have not less than 120 square feet (11.15m<sup>2</sup>) of floor area. Other habitable rooms except kitchens shall have an area of not less than 70 square feet (6.5m<sup>2</sup>). No habitable room other than a kitchen shall be less than 7 feet (2134mm) in any one dimension. R304.1 Minimum area. Habitable rooms shall have a floor area of not less than 70 square feet (6.5m<sup>2</sup>)

**Exception:** Kitchens

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

#### **48. IRC Section R308: Safety Glazing**

The following shall be considered hazardous locations for the purpose of glazing. These areas shall be safety glazed or equal. Such safety glazed units shall be identified by permanent etching visible when the unit is glazed or equal. Note the exceptions in Section R308.4.

1. (R308.4.1) Glazing in doors: glazing in fixed and operable panels of swinging, sliding and bifold doors shall be considered to be a hazardous location.
2. (R308.4.2) Glazing adjacent to doors: glazing in an individual fixed or operable panel adjacent to the 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 surfaces 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-winged door.
3. Glazing in windows (R308.4.3) Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered to be a hazardous location:
  1. Exposed area of an individual pane is larger than 9 square feet. B. The bottom edge of the glazing is less than 18 inches (457mm) above the floor.
  2. The bottom edge of the glazing is less than 18 inches above the floor.
  3. The top edge of the glazing is more than 36 inches (914mm) above the floor.
  4. One or more walking surfaces are within 36 inches (914mm), measured horizontally and in a straight line, of the glazing.
4. Glazing in guards and railings, including structural baluster panels and non-structural in-fill panels regardless of the area or height above the walking surface to be considered to be a hazardous location. (R308.4.4)

Structural glass baluster panels. Guards with structural glass baluster panels shall be installed with an attached top rail or handrail. The top rail or handrail shall be supported by not less than three glass baluster panels, or shall be otherwise supported to remain in place should one glass baluster panel fail.

Exception: An attached top rail or handrail is not required where the glass baluster panels are laminated glass with two or more glass plies of equal thickness and of the same glass type.
5. Glazing at wet surfaces. Glazing in walls, enclosures, or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bath tubs, showers and indoor and 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 a hazardous location. This shall apply to single glazing and each pane in multiple glazing. (R308.4.5)
6. Glazing adjacent to stairs and ramps. Glazing where the bottom exposed edge of the glazing is less than 36 inches above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered a hazardous location. (R308.4.6)
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 60 inch horizontal arc less than 180 degrees from the bottom tread nosing shall be considered to be a hazardous location. (R308.4.7)
8. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs, and spas where the bottom edge of the glazing is less than 60 inches (1524mm) above a walking surface and within 60 inches (1524mm) horizontally of the water's edge, including single glazing and all panes in multiple glazing.

**49. IRC Section R314.315: Smoke Detectors/Carbon Monoxide Alarms**

(WAC) R314.3--Smoke detectors/alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the dwelling, including basements and habitable attics and not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a

smoke alarm required by Section R314.3.

When interior alterations, repairs or additions requiring a permit occur, or when sleeping rooms are added or created in existing dwellings, smoke alarms and carbon monoxide detectors shall be provided, located, interconnected as required for new dwellings. See Exceptions, IRC Section R314.2.2

R314.4-In new construction, the required smoke alarms shall receive their primary power from the building wiring and shall be equipped with a battery back-up.

R315--For new construction, an approved carbon monoxide alarm shall be installed outside of each sleeping area in the immediate vicinity of the bedroom in dwelling units.

**50. WAC/IRC: Section 1004. 1005. 1006: Factory-built Fireplaces and Wood Stoves**

R1004.1 General. Factory-built fireplaces shall be listed and labeled and shall be installed in accordance with the conditions of the listing. Factory-built fireplaces shall be tested in accordance with UL 127.

R1005.1 Factory-built chimneys shall be listed and labeled and shall be installed and terminated in accordance with the manufacturer's instructions.

R1006.1 Exterior air, factory-built or masonry fireplaces covered in this chapter shall be equipped with an exterior air supply to ensure proper combustion unless the room is mechanically ventilated and controlled so that the indoor pressure is neutral or positive.

Approved factory-built fireplaces (zero clearance), metal chimneys, wood stoves, inserts, pellet stoves or similar heating appliances shall be installed in strict accordance with their listing and manufacturer's installation instructions. Such literature shall be provided on the job site at inspection.

All new and used wood stoves, factory-built fireplaces, and solid-fuel burning devices must be certified in WA State for emission standards. For a list of certified appliances go to [www.ecy.wa.gov](http://www.ecy.wa.gov) and enter "stove and fireplace info" Another source of wood heating information is available at [www.nwcleanair.org](http://www.nwcleanair.org) and enter "wood stove".

Solid fuel burning appliances & fireplaces shall be provided with tight fitting doors, and;

1. A source from outside the structure of primary air per manufacture's specifications; or
2. The appliance and manufacture's recommended combustion air supply unit. Refer to WAC/IRC Section 1006.2 for additional information and exceptions

### **51a. IRC Section R1003.3 Masonry Chimney Reinforcement & Anchorage**

R1003.3 Seismic reinforcing. Masonry or concrete chimneys shall be constructed, anchored, supported and reinforced as required in this chapter. In Seismic Design Category D(0), D(1) or D(2) masonry and concrete chimneys shall be reinforced and anchored as detailed in Sections R1003.3.1, R1003.3.2 and R1003.4. In Seismic Design Category A, B or C, reinforcement and seismic anchorage are not required.

R1003.3.1 Vertical reinforcing. For chimneys up to 40 inches (1016mm) wide, four No. 4 continuous vertical bars, anchored in the foundation, shall be placed in the concrete, or between wythes of solid masonry, or within the cells of hollow unit masonry, and grouted in accordance with Section R609.1.1. Grout shall be prevented from bonding with the flue liner so that the flue liner is free to move with thermal expansion. For chimneys more than 40 inches (1016mm) wide, two additional No. 4 vertical bars shall be installed for each additional 40 inches (1016mm) in width or fraction thereof.

R1003.3.2 Horizontal reinforcing. Vertical reinforcement shall be placed enclosed within ¼-inch (6.4mm) ties, or other reinforcing of equivalent net cross-sectional area, spaced not to exceed 18 inches (457mm) on center in concrete, or placed in the bed joints of unit masonry, at not less than every 18 inches (457mm) of vertical height. Two such ties shall be installed at each bend in the vertical bars.

### **51b. IRC Section R1003.9: Masonry Chimney Termination**

Every chimney shall extend not less than 3 feet (914mm) above the highest point of the roof where the chimney passes through, and shall extend at least 2 feet (610mm) higher than any portion of a building within 10 feet (3048mm) of the chimney.

### **51c. IRC Section R1003.18: Masonry Chimney Clearance**

When masonry chimneys are built within a structure, combustible material shall not be placed within 2 inches (51mm) of the fireplace, smoke chamber or chimney walls. When the chimney is built entirely outside the structure, 1 inch (25.4mm) clearance shall be maintained. The clearance space shall remain unfilled.

### **52. IRC Section R1003.18 Chimney Clearances**

Any portion of a masonry chimney located in the interior of the building or within the exterior wall of the building shall have a minimum air space clearance to combustibles of 2 inches (51mm). Chimneys located entirely outside the exterior walls of the building, including chimneys passing through the soffit or cornice, shall have a minimum air space clearance of 1 inch (25mm). The air space shall not be filled, except to provide fire blocking in accordance with section R1003.19).

Exceptions:

1. Masonry chimneys equipped with a chimney lining system listed and labeled for use in chimneys in contact with combustibles in accordance with UL 1777 and installed in accordance with the manufacturer's instructions are permitted to have combustible material in contact with their exterior surfaces.
2. Where masonry chimneys are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete wall less than 12 inches (305mm) from the inside surface of the nearest flue lining.
3. Exposed combustible trim and the edges of sheathing materials, such as wood siding and flooring, shall be permitted to abut the masonry chimney side walls, in accordance with Figure R1003.18, provided such combustible trim or sheathing is not less than 8 inches (203mm) from the inside surface of the nearest flue lining.

### **53. IRC Section R1001.9 & R1001.10: Hearth Extensions**

Masonry fireplace hearths and hearth extensions shall be constructed of concrete or masonry, supported by noncombustible materials, and reinforced to carry their own weight and all imposed loads. Combustible material shall not remain against the underside of hearths and hearth extensions after construction.

R1001.9 Hearth and hearth extension. Masonry fireplace hearths and hearth extensions shall be constructed of concrete or masonry, supported by noncombustible materials, and reinforced to carry their own weight and all imposed loads. Combustible material shall not remain against the underside of hearths and hearth extensions after construction.

R1001.9.1 Hearth thickness. The minimum thickness of fireplace hearths shall be 4 inches (102mm).

R1001.9.2 Hearth extension thickness. The minimum thickness of hearth extensions shall be 2 inches (51mm).

Exception: Where the bottom of the firebox opening is raised not less than 8 inches (203mm) above the top of the hearth extension, a hearth extension of not less than 3/8-inch thick (10mm) brick, concrete, stone, tile or other approved noncombustible material is permitted.

R1001.10 Hearth extension dimensions. Hearth extensions shall extend not less than 16 inches (406mm) in front of and not less than 8 inches (203mm) beyond each side of the fireplace opening. Where the fireplace opening is 6 square feet or larger, the hearth extension shall extend not less than 20 inches (508mm) in front of and not less than 12 inches (305mm) beyond each side of the fireplace opening.

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**TWO FAMILY DWELLINGS 55. IRC Section R302.3: Separation Between Units**

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.

**IRC MECHANICAL SYSTEM REQUIREMENTS**

**56. IRC Section M1307.3: Protection from Mechanical Damage**

Appliances having an ignition source (glow, spark or flame) shall be elevated such that the source is not less than 18 inches (457mm) above the floor in garages.

Appliances located in a garage or carport shall be protected from impact by vehicles. See Illustration #23. Reference Code Interpretation #C12004-02

**57. IRC Section M1503: Domestic Range Vents**

Ducts used for domestic kitchen range ventilation shall discharge to the outside, shall have a smooth interior surface, be airtight and shall be equipped with a backdraft damper. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building. Vents over 400 cfm require automatically controlled make up air (M1503.4)

**58. IRC Section M1502 & G2439: Domestic Clothes Dryer Exhaust**

Domestic clothes dryer exhaust shall be a minimum 28 gage rigid metal, having a smooth interior surface with joints running in the direction of airflow. Flexible transition ducts used to connect the dryer to the exhaust duct system shall be limited to single lengths not to exceed 8 feet (2438mm) in length. Flexible transition ducts shall not be concealed within construction. Ducts shall terminate on the outside of the building and shall be equipped with a back-draft damper. Ducts shall be mechanically fastened but fasteners may not extend into the duct more than an 1/8<sup>th</sup> of an inch and be sealed per section M1601.4.1. Dryer exhaust systems shall be independent of all other systems.

**59. IRC Section M1502 Table: Domestic Dryer Exhaust Duct Length Limitation**

The maximum combined horizontal and vertical length of a domestic dryer exhaust duct shall not exceed 35 feet in length. In reference to Table 1502.4.5.1, the length shall be reduced 2.5 feet (762mm) for each 45 degree bend and 5 feet (1524mm) for each 90 degree bend. The maximum length does not include the transition duct.

**60. M1505.4: Whole-House Mechanical Ventilation System**

Each dwelling unit shall be equipped with a ventilation system. The whole-house mechanical ventilation systems shall be designed in accordance with sections M1505.4.1 through M1505.4.4.

**61. IMC Section M1501 and 1504: Exhaust Vent Discharge**

The air removed by every mechanical exhaust system shall be discharged to the outdoors in accordance with Section M1504.3. Air shall not be exhausted into an attic, soffit, ridge vent or crawl space

**62. IRC Section M1305 and IMC Section 303(G2406): Prohibited Locations**

Appliances shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets, or in a space that opens only into such rooms or spaces.

**63. IRC Section M1305: Appliance Access**

Appliances shall be installed in accordance with the provisions set in M1305. 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.

**64. IRC Section M1801.7: Location & Support of Venting System**

Appliances shall not be vented into a fireplace or into a chimney serving a fireplace. Venting systems shall be adequately supported for the weight and the design of the material used.

**65. IRC Section M1601.4 IMC Section 603: Installation of Ducts**

Metal ducts shall be supported by 1/2 " wide 18 gage metal straps or 12 gage galvanized wire not exceeding 10 feet. Riser ducts shall be held in place by means of metal straps or angles and channels to secure the riser to the structure. Metal ducts shall not be installed in or within 4 inches (102mm) of the ground. Metal ducts when installed in or under a concrete slab shall be encased in at least 2 inches (51mm) of concrete. Ducts shall be braced and guyed to prevent lateral or horizontal swing.

**66. IMC Section 307 IRC M1411: Chilled Water & Evaporative Coolers**

Condensate from air-cooling coils, fuel-burning condensing appliances and the overflow from evaporative coolers and similar water-supplied equipment shall be collected and discharged to an approved plumbing fixture or disposal area. Condensate or waste water shall not drain over a public way. Plumbing pipes shall not be drilled or tapped.

**67. IRC Section M1701. G2407: Air Supply/Combustion Air**

Fuel-burning equipment shall be assured a sufficient supply of combustion air. The methods of providing combustion air in this chapter do not apply to direct-vent appliances. In buildings of unusually tight construction, combustion air shall be obtained from outside the sealed thermal envelope.

If the volume of the room or space in which fuel-burning appliances are installed is less than 50 cubic feet (1.5m<sup>3</sup>) per 1000 BTU/h of the total input of appliances, combustion air openings shall be provided. 1/2 of the required combustion air opening area shall be located within the upper 12 inches (305mm) of the enclosure and 1/2 of the opening area shall be located within the lower 12 inches (305mm) of the enclosure. Combustion air shall be taken from outside the building or approved source connected to the outside.

**68. IRC Section M1303, M1307: Labeling of Appliances**

The appliance installer shall leave the manufacturer's installation and operating instructions attached to the appliance. Clearances of listed appliances from combustible materials shall be as specified in the listing or on the rating plate.

**69. IRC Section M1307.2: Anchorage of Appliances**

Appliances designed to be fixed in position shall be fastened or anchored in an approved manner. Thermal storage units shall be anchored or strapped to resist horizontal displacement caused by earthquake motion in accordance with one of the following:

1. Anchorage and strapping shall be designed to resist a horizontal force equal to one-third of the operating weight of the water storage tank, acting in any horizontal direction.
2. The anchorage strapping shall be in accordance with the appliance manufacturer's recommendations.

Seismic anchorage and strapping of water heaters shall be in accordance with Section 507.2 of the state plumbing code.

**70. IRC Section R106.1, IBC Section 106.1 and IMC Section 106: IRC M2103 Radiant In-Floor Heating**

Provide plan drawings for a complete hydronic tubing design/layout of the proposed radiant floor heating system. The design shall include system design heat loss calculations (WSEC Section 503), a break down of all proposed heating zones, tubing layout for each zone, all applicable tubing layout spacing and clearance dimensions, system specifications and other related information. Designs shall be submitted prior to the required system pressure test. All systems shall remain accessible until approved for cover. The tubing design shall meet approved industry standards. Such approved standards may include design by a Washington State licensed Mechanical Engineer, design by the manufacturer of the tubing to be installed, design by a manufacturer approved agent or designer or design according to software provided by the tubing manufacturer. Other design standards may be approved at the discretion of the Building Official and according to IRC Section R104.11, IBC Section 104.11, and IMC Section 105.

**71. 2018 IFC Section 6014 & Table 6014.3: Location of Propane Tank**

Propane tanks must be located a minimum of 10 feet (3.05m) from all structures and from all property lines. Propane tanks adjacent to slopes are required to be bolted or anchored in a method approved by the Fire Marshal. See illustration #25.

**72. 2018 IFGC Sections 403 & 404: Underground Gas Piping**

Underground gas piping shall be a minimum 12 inches (304.8mm) below grade. Underground non-metallic piping shall have a minimum 18 AWG approved tracer wire per IFGC Section 404.14.3.

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**2021 UNIFORM PLUMBING CODE**

See Plumbing Schematic & Tables for Drain, Waste, Vent (DWV) Systems - Illustration #26

**73. UPC Section 608.5: Interior Relief Valves**

Relief valves located inside a building shall be provided with a drain not smaller than the relief valve outlet and shall extend from the valve to the outside of the building with the end of the pipe not more than 2 feet (610mm) or less than 6 inches (152mm) above the ground and pointing downward. No part of such drainpipe shall be trapped and the terminal end of the drainpipe shall not be threaded.

**74. UPC Section 507.13, 507.13.1, 507.2: Water Heater Installation Requirements**

Water heaters generating a glow or spark or flame capable of igniting flammable vapors may be installed in a garage, provided the pilots and burners or heating elements and switches are at least 18 inches (457mm) above the floor level.

All water heaters installed in areas where they may be subjected to physical damage shall be suitably guarded against such damage by being installed behind adequate barriers or by being elevated or located out of the normal path of a vehicle using any such area. See illustration #23. Reference Code Interpretation #C12004-02

Water heaters shall be anchored or strapped to resist horizontal displacement due to earthquake motion. The straps shall be installed within the upper 1/3 and lower 1/3 of the water heater vertical dimension.

**75. UPC Section 1006 & 1007: Floor Drain Traps**

Floor drains shall connect into a trap so constructed that it can be readily cleaned and of a size to serve efficiently the purpose for which it is intended. Floor drains or similar traps directly connected to the drainage system shall be provided with an automatic means of maintaining their water seals.

**76. UPC Section 603.4.6 & 603.4.7: Hose Bibs and Lawn Hydrants**

All exterior hose bibs shall be "no freeze" type. All hose bibs shall be protected by an approved nonremovable type backflow prevention device unless hose bibs with approved vacuum breakers are manufactured as a unit.

**77. UPC Section 609.0: Water Service Installation**

All water service yard piping shall be at least 12 inches (305mm) below the average local frost depth of 18 inches (457.2mm). Water pipes shall not be run or laid in the same trench as the building sewer or drainage piping constructed of clay or materials which are not approved for use within a building unless both of the following conditions are met:

1. The bottom of the water pipe, at all points, shall be at least 12 inches (305mm) above the top of the sewer line.
2. The water pipe shall be placed on a solid shelf excavated at one side of the common trench.

**78. UPC Section 313.0 & Table 313.6: Hangers and Supports – see Illustration 27 for tables**

- **313.3** Suspended piping shall be supported at intervals not to exceed those shown in Table 3-2
- **313.4** All piping shall be supported in such a manner as to maintain its alignment and prevent sagging.
- **313.5** Piping in the ground shall be laid on a firm bed for its entire length; where other support is otherwise provided, it shall be approved per Section 301.0 of this code.
- **313.2** Hangers and anchors shall be of sufficient strength to support the weight of the pipe and its contents. Piping shall be isolated from incompatible materials.
- **313.1** All piping, fixtures, appliances, and appurtenances shall be adequately supported in accordance with this code, the manufacturer's installation instructions, and as required by the Authority Having Jurisdiction.
- **313.6** Hanger rod sizes shall be no smaller than those shown in Table 313.6.
- **313.7** All gas piping shall be supported by metal straps or hooks at intervals not to exceed those shown in Table 1210.2.4.1.

**79. UPC Section 603.3.5 & 807.3: Dishwashers**

No dishwasher shall be directly connected to the drainage system or food waste disposal without use of an approved air-gap. Such air-gaps shall be installed with flood level markings at or above flood level of the sink.

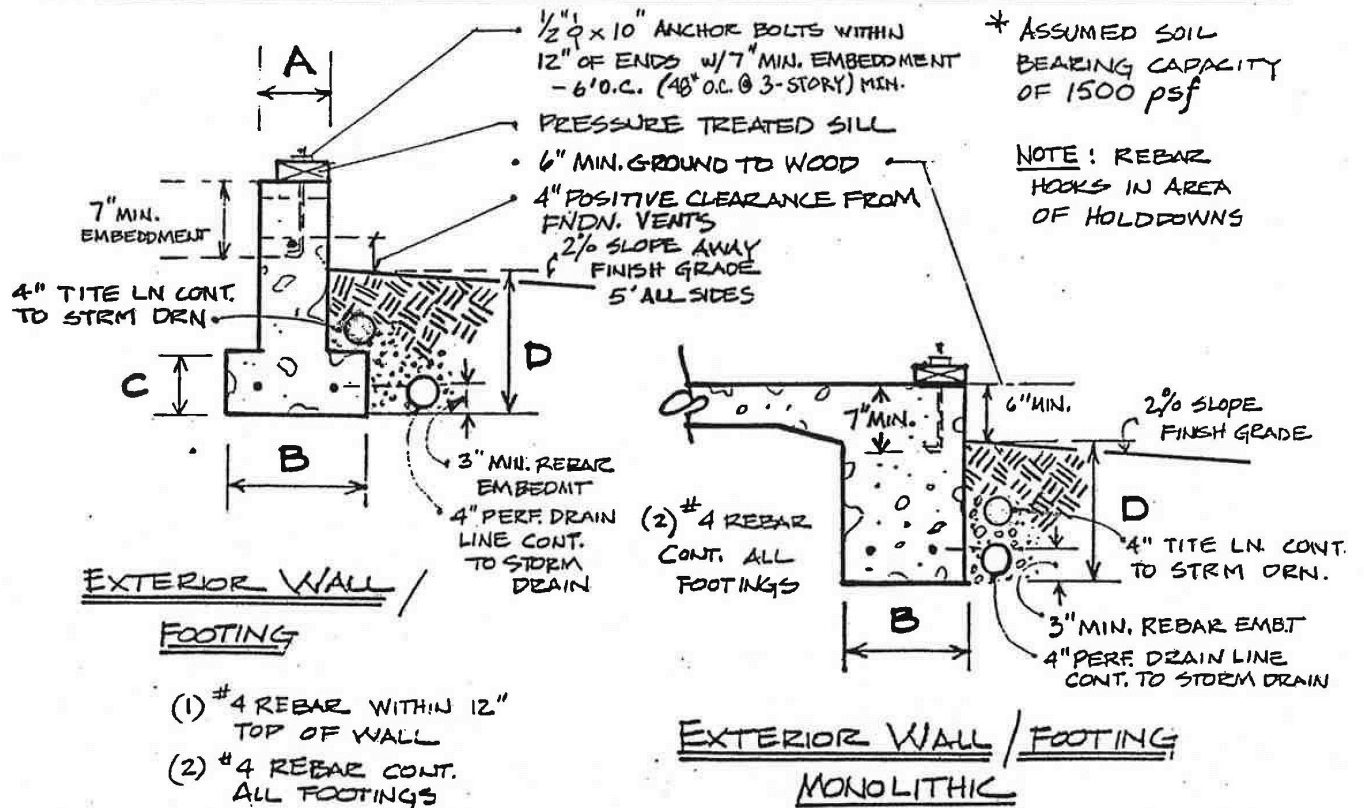
**80. UPC Section 409.4 Limitation of Hot Water in Bathtubs and Whirlpool Baths**

The maximum hot water temperature discharging from the bathtub and whirlpool bathtub filler shall be limited to 120 F (49 C) by a device that is in accordance with ASSE 1070 or CSA B125.3. The water heater thermostat shall not be considered a control for meeting this provision.

\*25 psf ground

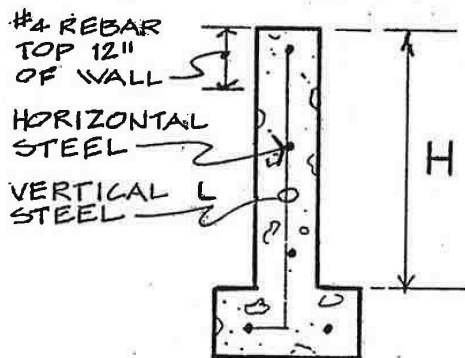
ACCEPTED WHATCOM COUNTY PRACTICE snow load only\*

DIMENSION	A	B	C	D *
NUMBER OF STORIES	THICKNESS OF FNDN (INCHES)	WIDTH OF FTG. (INCHES)	THICKNESS OF FTG. (INCHES)	DEPTH OF FTG. BELOW FINISH GRADE (INCHES)
1	6	13	6	18
2	8	16	7	18
3	10	23	8	24



**FOUNDATION WALL - REINFORCING SCHEDULE**

(\*UNLESS NOTED OTHERWISE ON PLANS)



HEIGHT 'H' IN FEET	VERTICAL REINFORCING	HORIZONTAL REINFORCING
0' TO 2'0"	NONE IF MONOLITHIC. #4 @ 4'0" O.C. 18" MIN. LENGTH	1-#4 REBAR WITHIN 12" OF TOP OF WALL
2' TO 4'	#4 @ 4'0" O.C.	#4 @ 24" O.C.
4' TO 6'	#4 @ 18" O.C.	#4 @ 18" O.C.

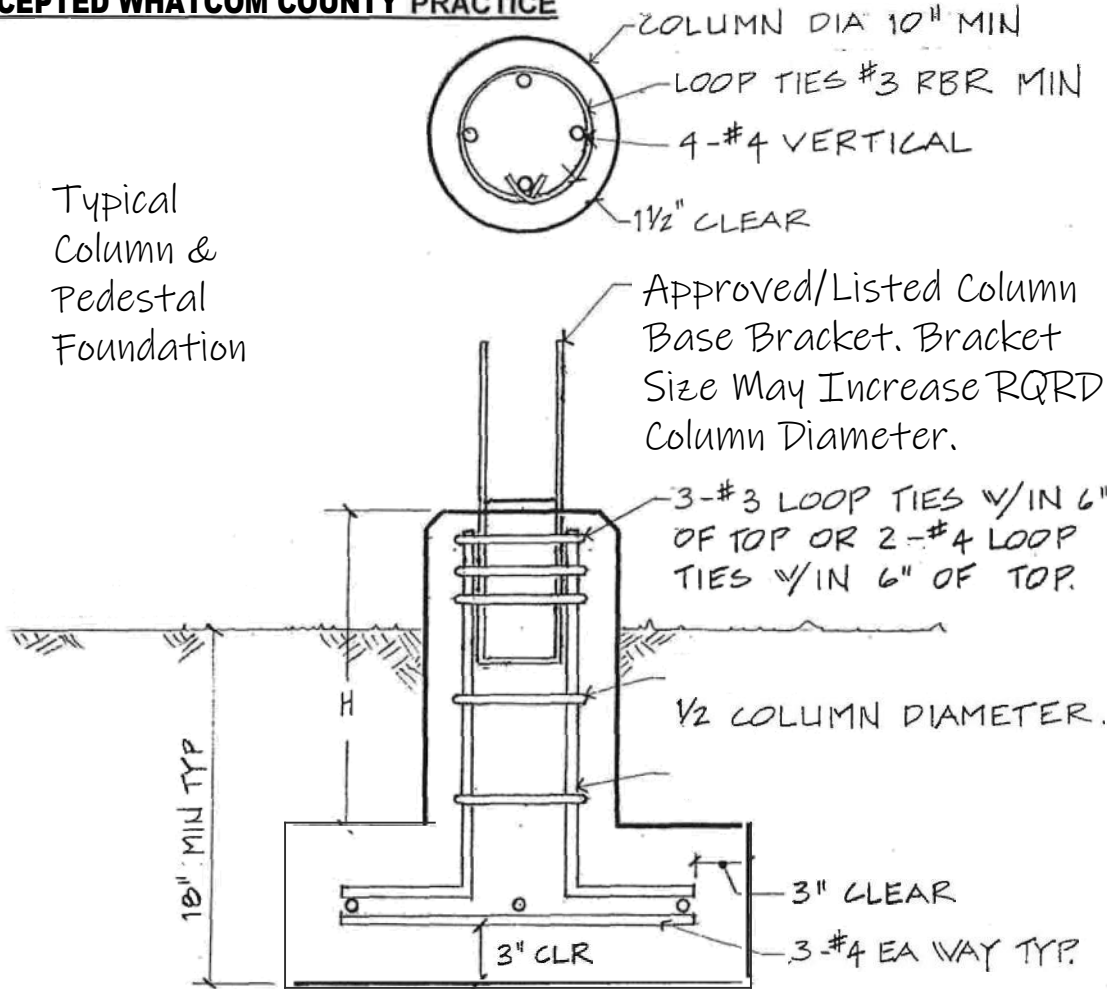
2-#4 REBAR CONT. @ ALL FOOTINGS

- FOUNDATION/RETAINING WALLS OVER 4 FT. MAY REQUIRE SOILS INVESTIGATION AND ENGINEERED DESIGN.
- BACKFILL DEPTH NOT TO EXCEED 24" ABOVE BOTTOM OF FOOTING.

Illustration 1a

**ACCEPTED WHATCOM COUNTY PRACTICE**

Typical  
Column &  
Pedestal  
Foundation



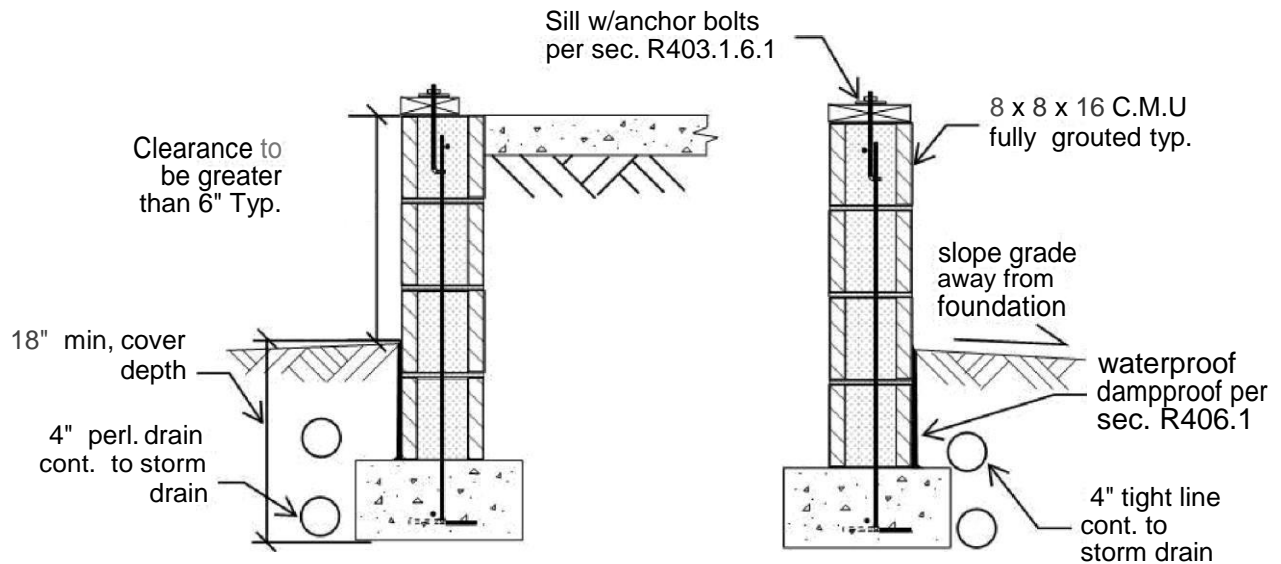
Notes: Column Height "H" Not to exceed 3 Feet w/out Engineering.

Concrete Pier Pad Column pedestal to be sized according to imposed loads. Install on undisturbed native soil. Min soil bearing capacity 1500PSF.

Concrete pedestal & column to be mono pour. Min concrete compressive strength 2500PSI

Illustration 2b

## Typical Masonry Stem Wall with Concrete Footing



Masonry stem wall with  
slab-on-grade and footing

Masonry stem wall with  
basement or crawl space  
and footing

### **Notes:**

1. **Minimum of one No. 4 vertical bar with a standard hook shall be installed at not more than 4 feet on center with support and cover per IRC sec. R403.1.3.5.3. Vertical bars shall extend a minimum of 14 inches into the stem wall.**
2. **Minimum of one No. 4 horizontal bar shall be installed within 12 inches of the top of the wall.**
3. **Minimum of one No. 4 horizontal bar shall be located 3-4 inches from the bottom of the footing.**
4. **Masonry stem with vertical reinforcement fully grouted cells with vertical reinforcement tied to the horizontal reinforcement in the Coatings.**
5. **Footings on undisturbed native soil min. 1300 P.S.F. bearing capacity.**

Illustration 2c

Above grade insulation  
must be protected

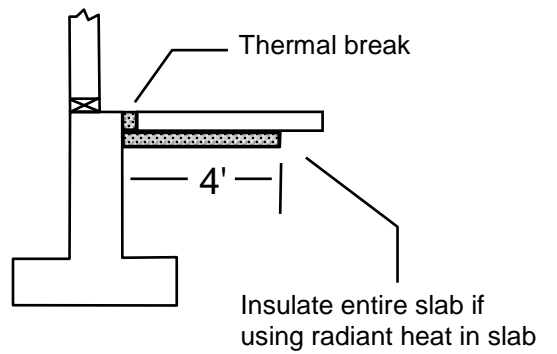
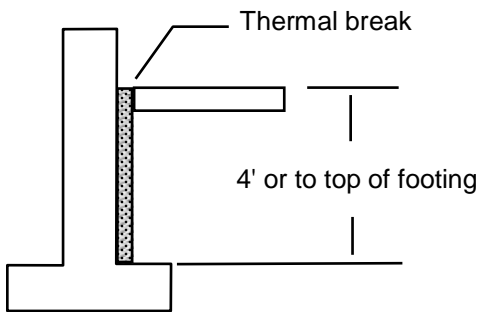
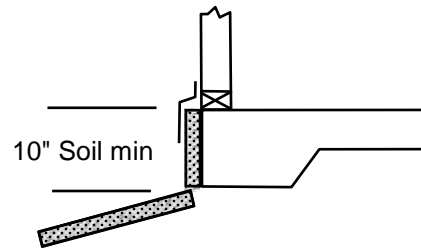
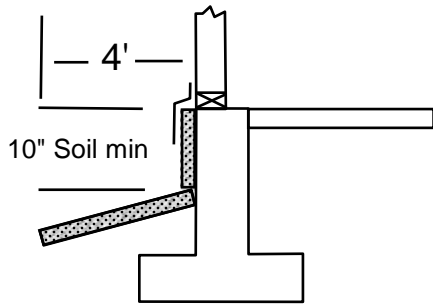
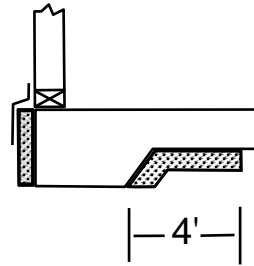
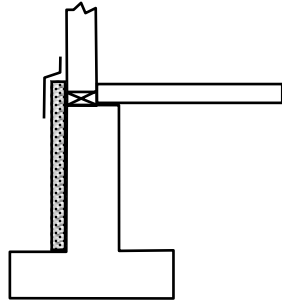
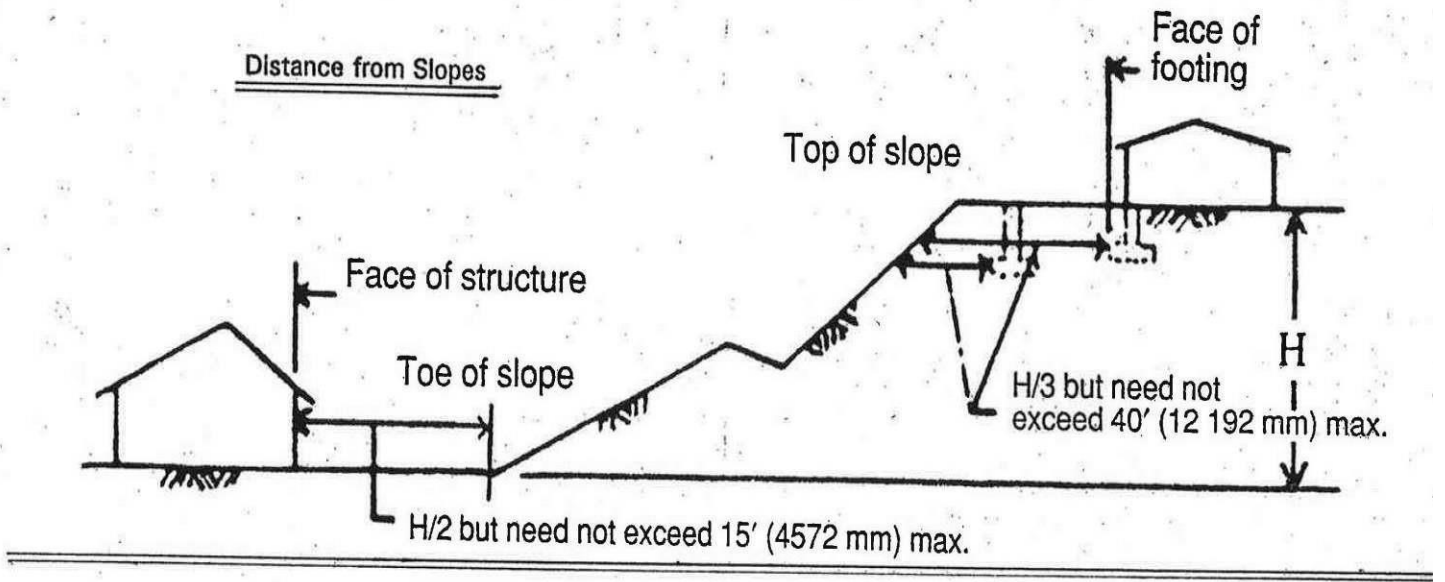


Illustration #4



Retaining walls exempt from permit up to 4' in height must meet these restrictions. Anything outside of these parameters will require a building permit.

Over 4' requires a building permit

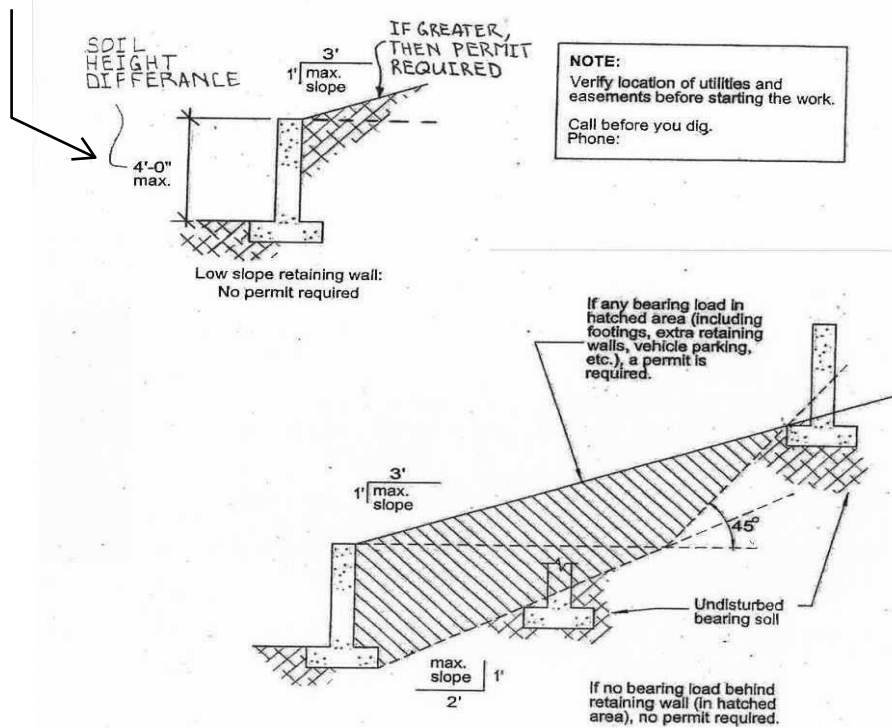


Illustration #5

**TABLE R602.3(1)  
FASTENING SCHEDULE**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER <sup>a, b, c</sup>	SPACING AND LOCATION
<b>Roof</b>			
1	Blocking between ceiling joists or rafters to top plate	4-8d box (2 1/2" x 0.113") or 3-8d common (2 1/2" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	Toe nail
2	Ceiling joists to top plate	4-8d box (2 1/2" x 0.113"); or 3-8d common (2 1/2" x 0.131"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	Per joist, toe nail
3	Ceiling joist not attached to parallel rafter, laps over partitions [see Sections R802.3.1, R802.3.2 and Table R802.5.1(9)]	4-10d box (3" x 0.128"); or 3-16d common (3 1/2" x 0.162"); or 4-3" x 0.131" nails	Face nail
4	Ceiling joist attached to parallel rafter (heel joint) [see Sections R802.3.1 and R802.3.2 and Table R802.5.1(9)]	Table R802.5.1(9)	Face nail
5	Collar tie to rafter, face nail or 1 1/4" x 20 ga. ridge strap to rafter	4-10d box (3" x 0.128"); or 3-10d common (3" x 0.148"); or 4-3" x 0.131" nails	Face nail each rafter
6	Rafter or roof truss to plate	3-16d box nails (3 1/2" x 0.135"); or 3-10d common nails (3" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss <sup>1</sup>
7	Roof rafters to ridge, valley or hip rafters or roof rafter to minimum 2" ridge beam	4-16d (3 1/2" x 0.135"); or 3-10d common (3 1/2" x 0.148"); or 4-10d box (3" x 0.128"); or 4-3" x 0.131" nails	Toe nail
		3-16d box 3 1/2" x 0.135"); or 2-16d common (3 1/2" x 0.162"); or 3-10d box (3" x 0.128"); or 3-3" x 0.131" nails	End nail
<b>Wall</b>			
8	Stud to stud (not at braced wall panels)	16d common (3 1/2" x 0.162")	24" o.c. face nail
		10d box (3" x 0.128"); or 3" x 0.131" nails	16" o.c. face nail
9	Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	16d box (3 1/2" x 0.135"); or 3" x 0.131" nails	12" o.c. face nail
		16d common (3 1/2" x 0.162")	16" o.c. face nail
10	Built-up header (2" to 2" header with 1/2" spacer)	16d common (3 1/2" x 0.162")	16" o.c. each edge face nail
		16d box (3 1/2" x 0.135")	12" o.c. each edge face nail
11	Continuous header to stud	5-8d box (2 1/2" x 0.113"); or 4-8d common (2 1/2" x 0.131"); or 4-10d box (3" x 0.128")	Toe nail
12	Top plate to top plate	16d common (3 1/2" x 0.162")	16" o.c. face nail
		10d box (3" x 0.128"); or 3" x 0.131" nails	12" o.c. face nail
13	Double top plate splice for SDCs A-D <sub>2</sub> with seismic braced wall line spacing < 25'	8-16d common (3 1/2" x 0.162"); or 12-16d box (3 1/2" x 0.135"); or 12-10d box (3" x 0.128"); or 12-3" x 0.131" nails	Face nail on each side of end joint (minimum 24" lap splice length each side of end joint)
	Double top plate splice SDCs D <sub>0</sub> , D <sub>1</sub> , or D <sub>2</sub> ; and braced wall line spacing ≥ 25'	12-16d (3 1/2" x 0.135")	

(continued)

**Illustration 6a**

**TABLE R602.3(1)—continued  
FASTENING SCHEDULE**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER <sup>a, b, c</sup>	SPACING AND LOCATION
14	Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	16d common (3½" × 0.162")	16" o.c. face nail
		16d box (3½" × 0.135"); or 3" × 0.131" nails	12" o.c. face nail
15	Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 4-3" × 0.131" nails	3 each 16" o.c. face nail 2 each 16" o.c. face nail 4 each 16" o.c. face nail
16	Top or bottom plate to stud	4-8d box (2½" × 0.113"); or 3-16d box (3½" × 0.135"); or 4-8d common (2½" × 0.131"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	Toe nail
		3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	End nail
17	Top plates, laps at corners and intersections	3-10d box (3" × 0.128"); or 2-16d common (3½" × 0.162"); or 3-3" × 0.131" nails	Face nail
18	1" brace to each stud and plate	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-10d box (3" × 0.128"); or 2 staples 1¾"	Face nail
19	1" × 6" sheathing to each bearing	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 2-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., 1¾" long	Face nail
20	1" × 8" and wider sheathing to each bearing	3-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3 staples, 1" crown, 16 ga., 1¾" long	Face nail
		Wider than 1" × 8" 4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 4 staples, 1" crown, 16 ga., 1¾" long	
<b>Floor</b>			
21	Joist to sill, top plate or girder	4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Toe nail
22	Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box (2½" × 0.113")	4" o.c. toe nail
		8d common (2½" × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails	6" o.c. toe nail
23	1" × 6" subfloor or less to each joist	3-8d box (2½" × 0.113"); or 2-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 2 staples, 1" crown, 16 ga., 1¾" long	Face nail

(continued)

**Illustration 6b**

**TABLE 602.3(1)  
FASTENING SCHEDULE—continued**

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER <sup>a, b, c</sup>	SPACING AND LOCATION	
<b>Floor</b>				
24	2" subfloor to joist or girder	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162")	Blind and face nail	
25	2" planks (plank & beam—floor & roof)	3-16d box (3½" × 0.135"); or 2-16d common (3½" × 0.162")	At each bearing, face nail	
26	Band or rim joist to joist	3-16d common (3½" × 0.162") 4-10 box (3" × 0.128"), or 4-3" × 0.131" nails; or 4-3" × 14 ga. staples, 7/16" crown	End nail	
27	Built-up girders and beams, 2-inch lumber layers	20d common (4" × 0.192"); or	Nail each layer as follows: 32" o.c. at top and bottom and staggered.	
		10d box (3" × 0.128"); or 3" × 0.131" nails	24" o.c. face nail at top and bottom staggered on opposite sides	
		And: 2-20d common (4" × 0.192"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Face nail at ends and at each splice	
28	Ledger strip supporting joists or rafters	4-16d box (3½" × 0.135"); or 3-16d common (3½" × 0.162"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	At each joist or rafter, face nail	
29	Bridging to joist	2-10d (3" × 0.128")	Each end, toe nail	
ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER <sup>a, b, c</sup>	<b>SPACING OF FASTENERS</b>	
			Edges (inches) <sup>b</sup>	Intermediate supports <sup>c, e</sup> (inches)
<b>Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing</b> [see Table R602.3(3) for wood structural panel exterior wall sheathing to wall framing]				
30	3/8" – 1/2"	6d common (2" × 0.113") nail (subfloor, wall) <sup>i</sup> 8d common (2½" × 0.131") nail (roof)	6	12 <sup>f</sup>
31	19/32" – 1"	8d common nail (2½" × 0.131")	6	12 <sup>f</sup>
32	1 1/8" – 1 1/4"	10d common (3" × 0.148") nail; or 8d (2½" × 0.131") deformed nail	6	12
<b>Other wall sheathing<sup>g</sup></b>				
33	1/2" structural cellulosic fiberboard sheathing	1½" galvanized roofing nail, 7/16" head diameter, or 1" crown staple 16 ga., 1¼" long	3	6
34	25/32" structural cellulosic fiberboard sheathing	1¾" galvanized roofing nail, 7/16" head diameter, or 1" crown staple 16 ga., 1¼" long	3	6
35	1/2" gypsum sheathing <sup>d</sup>	1½" galvanized roofing nail; staple galvanized, 1½" long; 1¼" screws, Type W or S	7	7
36	5/8" gypsum sheathing <sup>d</sup>	1¾" galvanized roofing nail; staple galvanized, 1 5/8" long; 1 3/8" screws, Type W or S	7	7
<b>Wood structural panels, combination subfloor underlayment to framing</b>				
37	3/4" and less	6d deformed (2" × 0.120") nail; or 8d common (2½" × 0.131") nail	6	12
38	7/8" – 1"	8d common (2½" × 0.131") nail; or 8d deformed (2½" × 0.120") nail	6	12
39	1 1/8" – 1 1/4"	10d common (3" × 0.148") nail; or 8d deformed (2½" × 0.120") nail	6	12

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

(continued)

### Illustration 6c

**TABLE R602.3(1)—continued  
FASTENING SCHEDULE**

- a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.
- b. Staples are 16 gage wire and have a minimum  $\frac{7}{16}$ -inch on diameter crown width.
- c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.
- e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).
- f. For wood structural panel roof sheathing attached to gable end roof framing and to intermediate supports within 48 inches of roof edges and ridges, nails shall be spaced at 6 inches on center where the ultimate design wind speed is less than 130 mph and shall be spaced 4 inches on center where the ultimate design wind speed is 130 mph or greater but less than 140 mph.
- g. Gypsum sheathing shall conform to ASTM C1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C208.
- h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.
- i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.
- j. RSRS-01 is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

## Illustration 6d

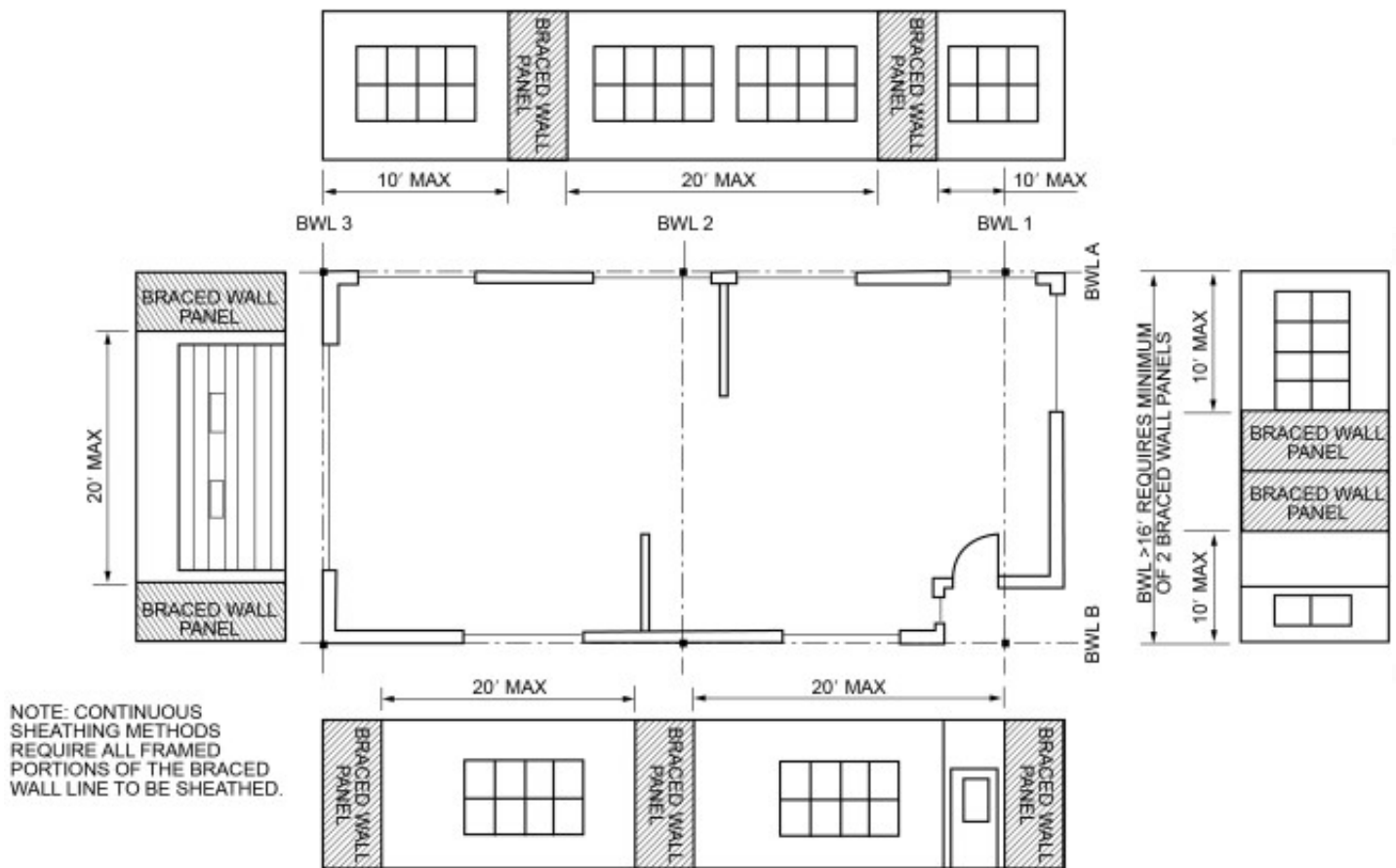
**Sec. R602.10 Wall Bracing.**

Wood frame residential structures must meet wall bracing requirements in this section which is too large for inclusion in this guide book format.

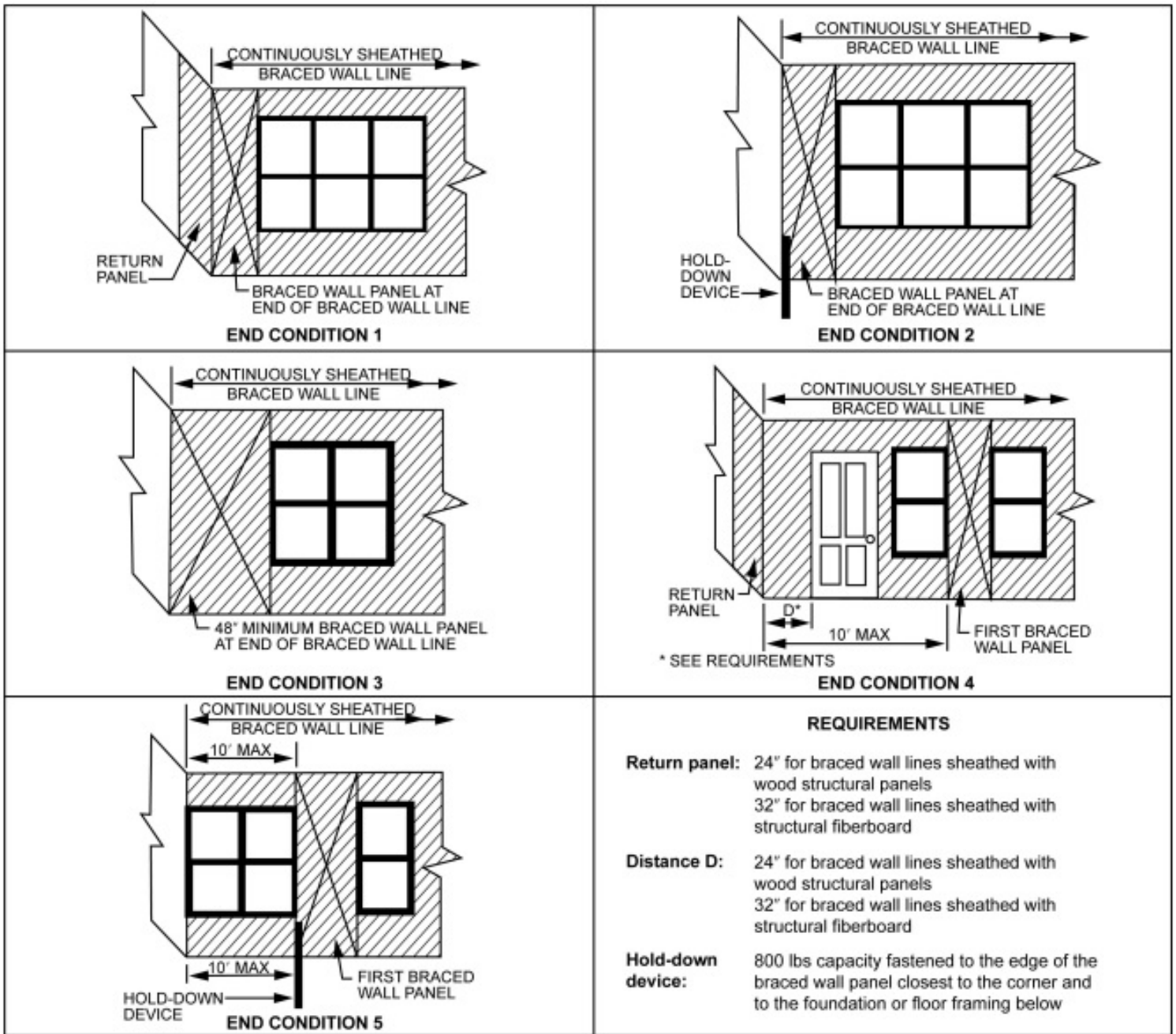
The following diagrams are simplified illustrations of basic bracing requirements from the 2021 IRC. They are applicable to continually sheathed buildings of one story. They will not provide full bracing information for many larger, irregularly shaped, or multi-story structures.

A complete copy of this code section may be purchased from our office if needed for prescriptive design purposes.

A more detailed wall bracing guide specific to Seismic Design Category D will be completed shortly and will accompany this section.



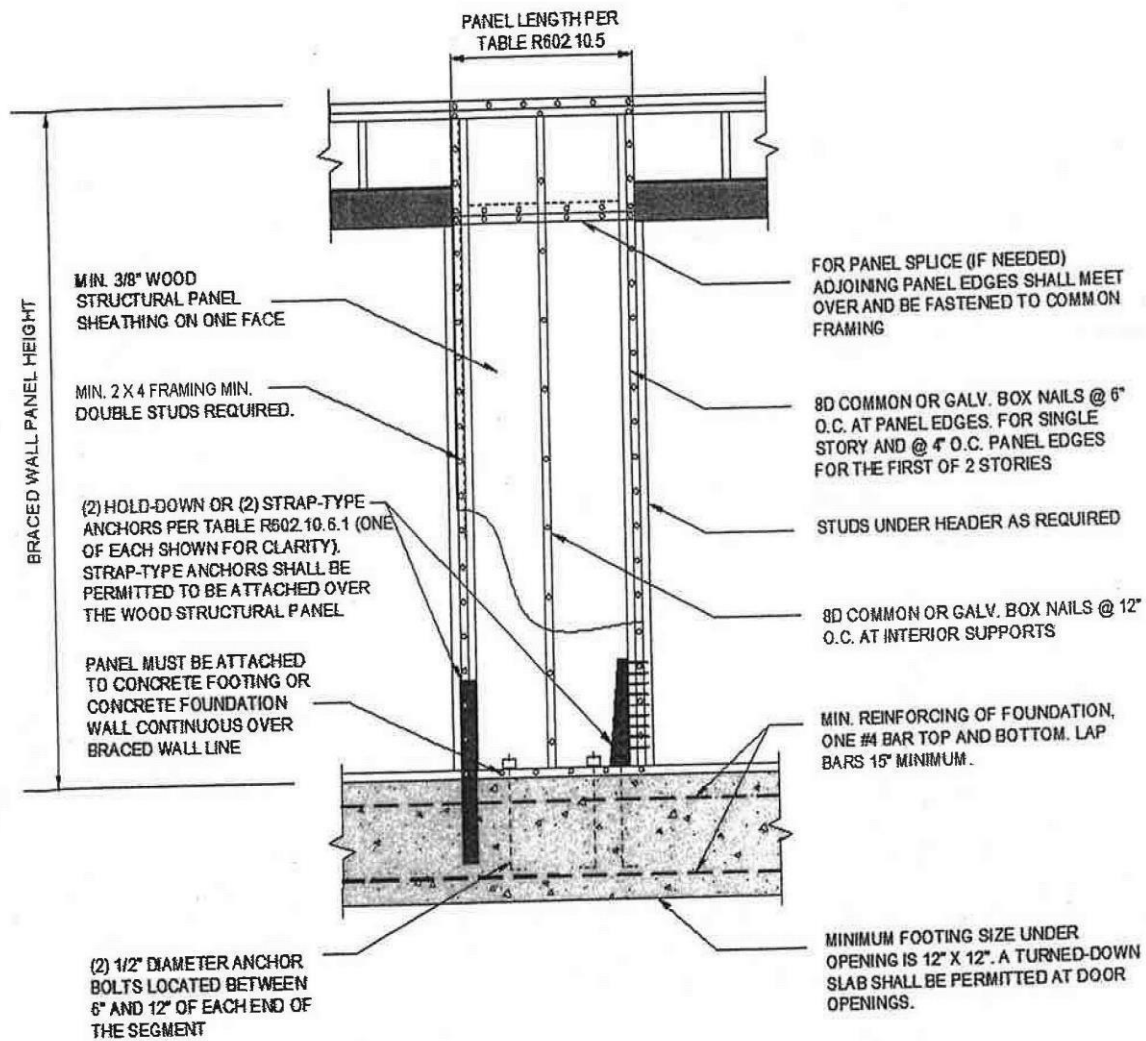
**Illustration 7a**



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

Illustration 7b

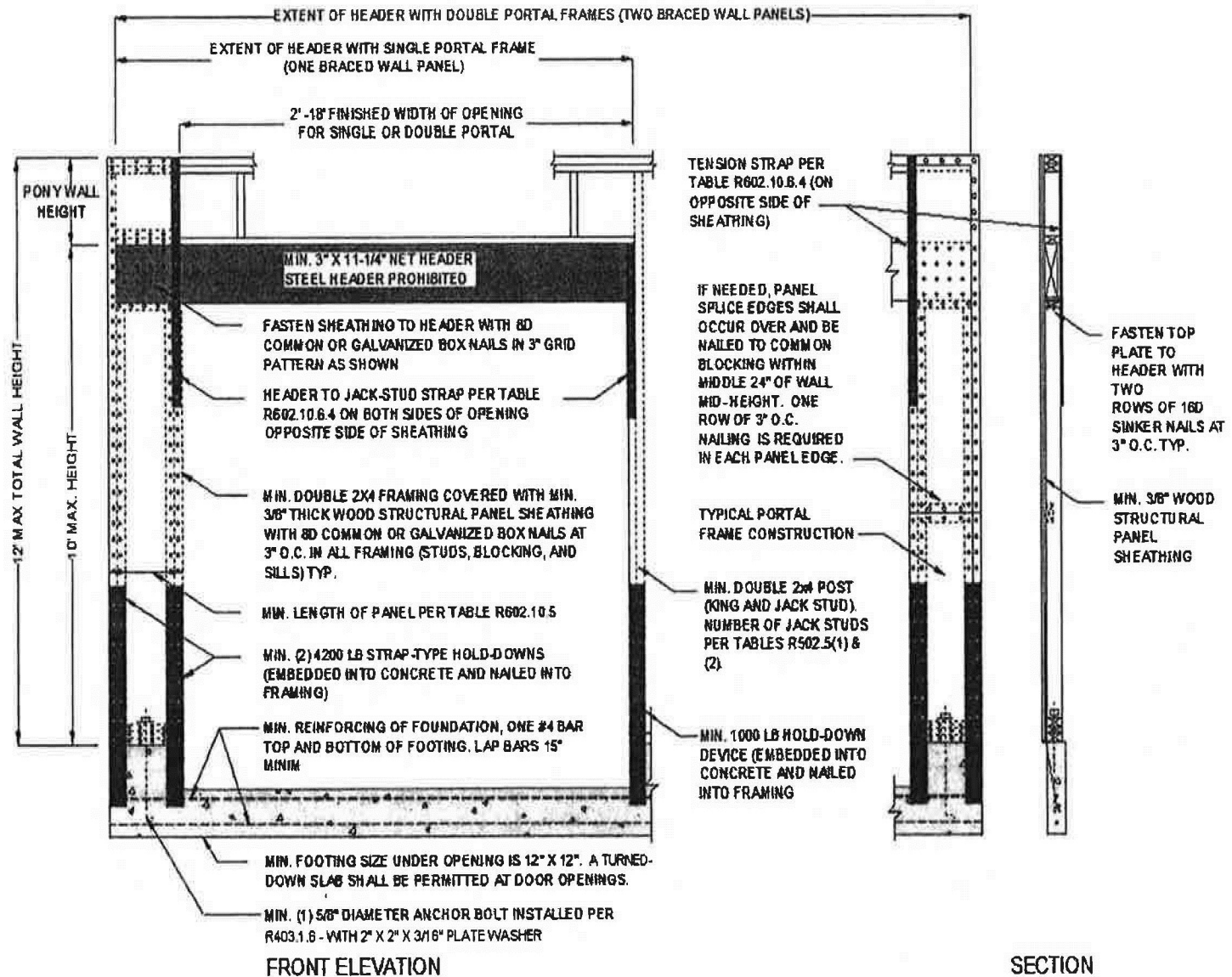


**TABLE R602.10.6.1**  
**MINIMUM HOLD-DOWN FORCES FOR METHOD ABW BRACED WALL PANELS**

SEISMIC DESIGN CATEGORY AND WIND SPEED	SUPPORTING/STORY	HOLD-DOWN FORCE (pounds)				
		Height of Braced Wall Panel				
		8 feet	9 feet	10 feet	11 feet	12 feet
SDC A, B and C Ultimate design wind speed < 140 mph	One story	1,800	1,800	1,800	2,000	2,200
	First of two stories	3,000	3,000	3,000	3,300	3,600
SDC D <sub>0</sub> , D <sub>1</sub> and D <sub>2</sub> Ultimate design wind speed < 140 mph	One story	1,800	1,800	1,800	NP	NP
	First of two stories	3,000	3,000	3,000	NP	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.45 N, 1 mile per hour = 0.447 m/s.  
 NP = Not Permitted.

Illustration 9



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

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

ANCHOR BOLT/HOLDOWN CONNECTION, THRU PONY WALL

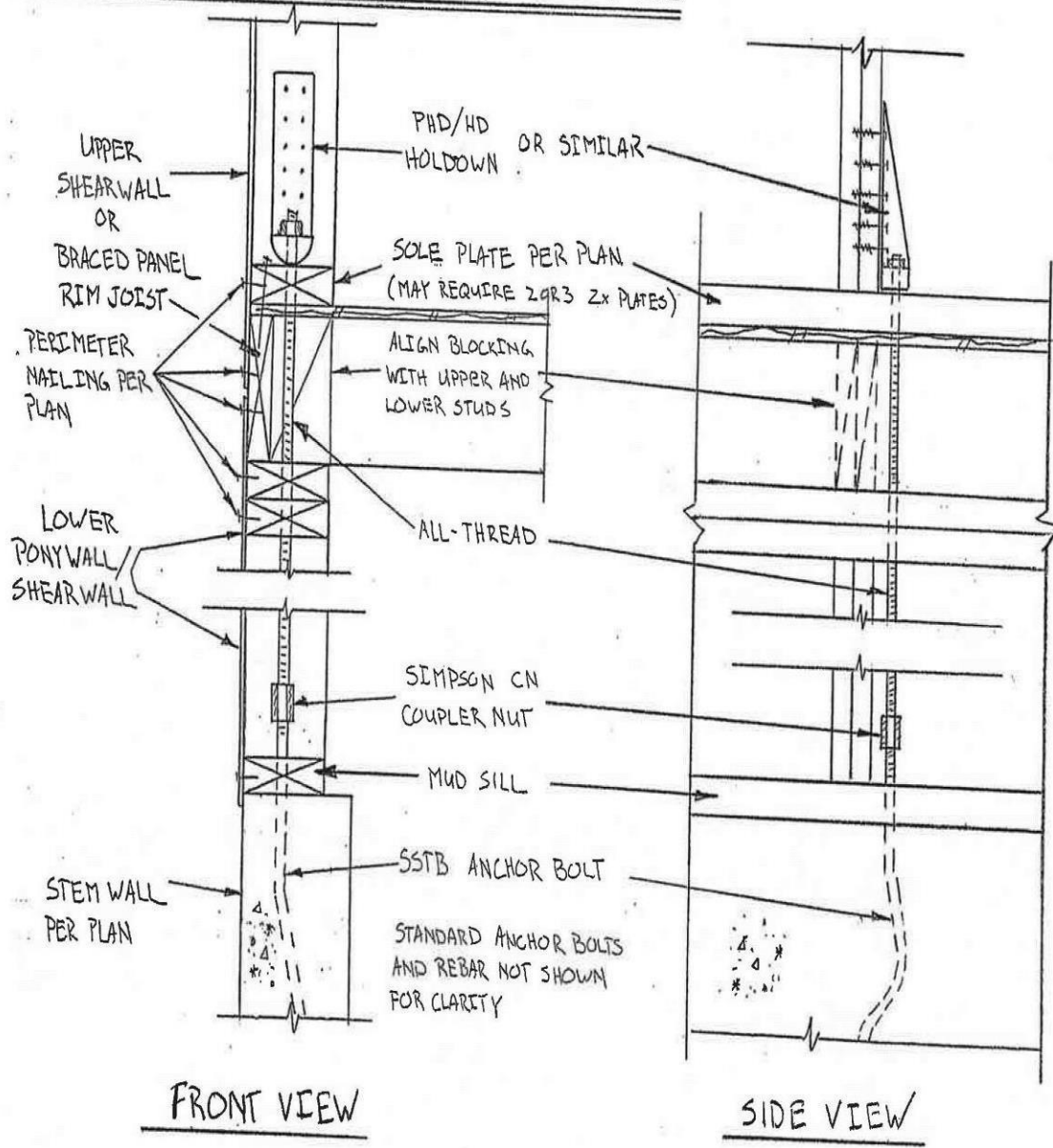


illustration #10

**Illustration 10**

**TABLE R502.3.1(1)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Residential sleeping areas, live load = 30 psf, L/Δ = 360)<sup>a</sup>

JOIST SPACING (Inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2 x 6	2 x 8	2 x 10	2 x 12	2 x 6	2 x 8	2 x 10	2 x 12
			Maximum floor joist spans							
		(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	
12	Douglas fir-larch	SS	12-6	16-6	21-0	25-7	12-6	16-6	21-0	25-7
	Douglas fir-larch	#1	12-0	15-10	20-3	24-8	12-0	15-7	19-0	22-0
	Douglas fir-larch	#2	11-10	15-7	19-10	23-4	11-8	14-9	18-0	20-11
	Douglas fir-larch	#3	9-11	12-7	15-5	17-10	8-11	11-3	13-9	16-0
	Hem-fir	SS	11-10	15-7	19-10	24-2	11-10	15-7	19-10	24-2
	Hem-fir	#1	11-7	15-3	19-5	23-7	11-7	15-3	18-9	21-9
	Hem-fir	#2	11-0	14-6	18-6	22-6	11-0	14-4	17-6	20-4
	Hem-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Southern pine	SS	12-3	16-2	20-8	25-1	12-3	16-2	20-8	25-1
	Southern pine	#1	11-10	15-7	19-10	24-2	11-10	15-7	18-7	22-0
	Southern pine	#2	11-3	14-11	18-1	21-4	10-9	13-8	16-2	19-1
	Southern pine	#3	9-2	11-6	14-0	16-6	8-2	10-3	12-6	14-9
	Spruce-pine-fir	SS	11-7	15-3	19-5	23-7	11-7	15-3	19-5	23-7
	Spruce-pine-fir	#1	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#2	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-pine-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
16	Douglas fir-larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-3
	Douglas fir-larch	#1	10-11	14-5	18-5	21-4	10-8	13-6	16-5	19-1
	Douglas fir-larch	#2	10-9	14-2	17-5	20-3	10-1	12-9	15-7	18-1
	Douglas fir-larch	#3	8-7	10-11	13-4	15-5	7-8	9-9	11-11	13-10
	Hem-fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-fir	#1	10-6	13-10	17-8	21-1	10-6	13-4	16-3	18-10
	Hem-fir	#2	10-0	13-2	16-10	19-8	9-10	12-5	15-2	17-7
	Hem-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
	Southern pine	SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern pine	#1	10-9	14-2	18-0	21-4	10-9	13-9	16-1	19-1
	Southern pine	#2	10-3	13-3	15-8	18-6	9-4	11-10	14-0	16-6
	Southern pine	#3	7-11	10-0	11-1	14-4	7-1	8-11	10-10	12-10
	Spruce-pine-fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-4
	Spruce-pine-fir	#1	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-pine-fir	#2	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-pine-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6

(continued)

Illustration 11a

FLOORS

**TABLE R502.3.1(1)—continued**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
**(Residential sleeping areas, live load = 30 psf, L/Δ = 360)<sup>a</sup>**

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

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

**Note:** Check sources for availability of lumber in lengths greater than 20 feet.

a. Dead load limits for townhouses in Seismic Design Category C and all structures in Seismic Design Categories D<sub>0</sub>, D<sub>1</sub> and D<sub>2</sub> shall be determined in accordance with Section R301.2.2.2.1.

**Illustration 11b**

**TABLE R502.3.1(2)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Residential living areas, live load = 40 psf, L/Δ = 360)<sup>b</sup>

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

(continued)

**Illustration 12a**

FLOORS

**TABLE R502.3.1(2)—continued**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Residential living areas, live load = 40 psf, L/Δ = 360)<sup>b</sup>

JOIST SPACING (Inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2 × 6	2 × 8	2 × 10	2 × 12	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas fir-larch	SS	9-8	12-10	16-4	19-10	9-8	12-10	16-4	19-6
	Douglas fir-larch	#1	9-4	12-4	15-0	17-5	8-10	11-3	13-8	15-11
	Douglas fir-larch	#2	9-2	11-8	14-3	16-6	8-5	10-8	13-0	15-1
	Douglas fir-larch	#3	7-0	8-11	10-11	12-7	6-5	8-2	9-11	11-6
	Hem-fir	SS	9-2	12-1	15-5	18-9	9-2	12-1	15-5	18-9
	Hem-fir	#1	9-0	11-10	14-10	17-2	8-9	11-1	13-6	15-8
	Hem-fir	#2	8-7	11-3	13-10	16-1	8-2	10-4	12-8	14-8
	Hem-fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Southern pine	SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Southern pine	#1	9-2	12-1	14-8	17-5	9-0	11-5	13-5	15-11
	Southern pine	#2	8-6	10-10	12-10	15-1	7-9	9-10	11-8	13-9
	Southern pine	#3	6-5	8-2	9-10	11-8	5-11	7-5	9-0	10-8
	Spruce-pine-fir	SS	9-0	11-10	15-1	18-4	9-0	11-10	15-1	17-9
	Spruce-pine-fir	#	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-pine-fir	#2	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-pine-fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
24	Douglas fir-larch	SS	9-0	11-11	15-2	18-5	9-0	11-11	15-0	17-5
	Douglas fir-larch	#1	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Douglas fir-larch	#2	8-3	10-5	12-9	14-9	7-6	9-6	11-8	13-6
	Douglas fir-larch	#3	6-3	8-0	9-9	11-3	5-9	7-3	8-11	10-4
	Hem-fir	SS	8-6	11-3	14-4	17-5	8-6	11-3	14-4	16-10 <sup>a</sup>
	Hem-fir	#1	8-4	10-10	13-3	15-5	7-10	9-11	12-1	14-0
	Hem-fir	#2	7-11	10-2	12-5	14-4	7-4	9-3	11-4	13-1
	Hem-fir	#3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1
	Southern pine	SS	8-10	11-8	14-11	18-1	8-10	11-8	14-11	18-0
	Southern pine	#1	8-6	11-3	13-1	15-7	8-1	10-3	12-0	14-3
	Southern pine	#2	7-7	9-8	11-5	13-6	7-0	8-10	10-5	12-4
	Southern pine	#3	5-9	7-3	8-10	10-5	5-3	6-8	8-1	9-6
	Spruce-pine-fir	SS	8-4	11-0	14-0	17-0	8-4	11-0	13-8	15-11
	Spruce-pine-fir	#1	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-pine-fir	#2	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-pine-fir	#3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1

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

**Note:** Check sources for availability of lumber in lengths greater than 20 feet.

a. End bearing length shall be increased to 2 inches.

b. Dead load limits for townhouses in Seismic Design Category C and all structures in Seismic Design Categories D<sub>0</sub>, D<sub>1</sub>, and D<sub>2</sub> shall be determined in accordance with Section R301.2.2.2.1.

**Illustration 12b**

**TABLE R802.4.1(4)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground snow load = 30 psf, ceiling attached to rafters, L/Δ = 240)

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

(continued)

ROOF-CEILING CONSTRUCTION

**TABLE R802.4.1(4)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground snow load = 30 psf, ceiling attached to rafters,  $L/\Delta = 240$ )

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

Check sources for availability of lumber in lengths greater than 20 feet.

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

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. Where ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the following factors:

$H_c/H_r$	Rafter Span Adjustment Factor
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

where:

$H_c$  = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls,

$H_r$  = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

**TABLE R502.3.3(1)**  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY<sup>a, b, c, f, g, h</sup>**  
**(Floor Live Load ≤ 40 psf, Roof Live Load ≤ 20 psf)**

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

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

- a. Tabulated values are for clear-span roof supported solely by exterior bearing walls.
- b. Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, and spruce-pine-fir for repetitive (three or more) members. No.1 or better shall be used for southern pine.
- c. Ratio of backspan to cantilever span shall be not less than 3:1.
- d. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.
- e. Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).
- f. See Section R301.2.2.2.5, Item 1, for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Category D<sub>0</sub>, D<sub>1</sub>, or D<sub>2</sub> and townhouses in Seismic Design Category C, D<sub>0</sub>, D<sub>1</sub> or D<sub>2</sub>.
- g. A full-depth rim joist shall be provided at the unsupported end of the cantilever joists. Solid blocking shall be provided at the supported end. Where the cantilever length is 24 inches or less and the building is assigned to Seismic Design Category A, B or C, solid blocking at the support for the cantilever shall not be required.
- h. Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

**TABLE R502.3.3(2)**  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY<sup>a, b, e, f</sup>**

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

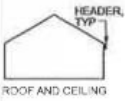
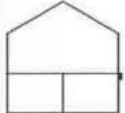
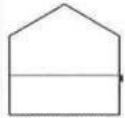
For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

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

**Illustration 13**

WALL CONSTRUCTION

TABLE R602.7(1)  
**GIRDER SPANS<sup>a</sup> AND HEADER SPANS<sup>a</sup> FOR EXTERIOR BEARING WALLS**  
 (Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir<sup>b</sup> and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) <sup>a</sup>																	
		30						50						70					
		Building width <sup>c</sup> (feet)																	
		12		24		36		12		24		36		12		24		36	
Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>	Span'	NJ <sup>d</sup>		
Roof and ceiling 	1-2 x 6	4-0	1	3-1	2	2-7	2	3-5	1	2-8	2	2-3	2	3-0	2	2-4	2	2-0	2
	1-2 x 8	5-1	2	3-11	2	3-3	2	4-4	2	3-4	2	2-10	2	3-10	2	3-0	2	2-6	3
	1-2 x 10	6-0	2	4-8	2	3-11	2	5-2	2	4-0	2	3-4	3	4-7	2	3-6	3	3-0	3
	1-2 x 12	7-1	2	5-5	2	4-7	3	6-1	2	4-8	3	3-11	3	5-5	2	4-2	3	3-6	3
	2-2 x 4	4-0	1	3-1	1	2-7	1	3-5	1	2-7	1	2-2	1	3-0	1	2-4	1	2-0	1
	2-2 x 6	6-0	1	4-7	1	3-10	1	5-1	1	3-11	1	3-3	2	4-6	1	3-6	2	2-11	2
	2-2 x 8	7-7	1	5-9	1	4-10	2	6-5	1	5-0	2	4-2	2	5-9	1	4-5	2	3-9	2
	2-2 x 10	9-0	1	6-10	2	5-9	2	7-8	2	5-11	2	4-11	2	6-9	2	5-3	2	4-5	2
	2-2 x 12	10-7	2	8-1	2	6-10	2	9-0	2	6-11	2	5-10	2	8-0	2	6-2	2	5-2	3
	3-2 x 8	9-5	1	7-3	1	6-1	1	8-1	1	6-3	1	5-3	2	7-2	1	5-6	2	4-8	2
	3-2 x 10	11-3	1	8-7	1	7-3	2	9-7	1	7-4	2	6-2	2	8-6	1	6-7	2	5-6	2
	3-2 x 12	13-2	1	10-1	2	8-6	2	11-3	2	8-8	2	7-4	2	10-0	2	7-9	2	6-6	2
	4-2 x 8	10-11	1	8-4	1	7-0	1	9-4	1	7-2	1	6-0	1	8-3	1	6-4	1	5-4	2
	4-2 x 10	12-11	1	9-11	1	8-4	1	11-1	1	8-6	1	7-2	2	9-10	1	7-7	2	6-4	2
4-2 x 12	15-3	1	11-8	1	9-10	2	13-0	1	10-0	2	8-5	2	11-7	1	8-11	2	7-6	2	
Roof, ceiling and one center-bearing floor 	1-2 x 6	3-3	1	2-7	2	2-2	2	3-0	2	2-4	2	2-0	2	2-9	2	2-2	2	1-10	2
	1-2 x 8	4-1	2	3-3	2	2-9	2	3-9	2	3-0	2	2-6	3	3-6	2	2-9	2	2-4	3
	1-2 x 10	4-11	2	3-10	2	3-3	3	4-6	2	3-6	3	3-0	3	4-1	2	3-3	3	2-9	3
	1-2 x 12	5-9	2	4-6	3	3-10	3	5-3	2	4-2	3	3-6	3	4-10	3	3-10	3	3-3	4
	2-2 x 4	3-3	1	2-6	1	2-2	1	3-0	1	2-4	1	2-0	1	2-8	1	2-2	1	1-10	1
	2-2 x 6	4-10	1	3-9	1	3-3	2	4-5	1	3-6	2	3-0	2	4-1	1	3-3	2	2-9	2
	2-2 x 8	6-1	1	4-10	2	4-1	2	5-7	2	4-5	2	3-9	2	5-2	2	4-1	2	3-6	2
	2-2 x 10	7-3	2	5-8	2	4-10	2	6-8	2	5-3	2	4-5	2	6-1	2	4-10	2	4-1	2
	2-2 x 12	8-6	2	6-8	2	5-8	2	7-10	2	6-2	2	5-3	3	7-2	2	5-8	2	4-10	3
	3-2 x 8	7-8	1	6-0	1	5-1	2	7-0	1	5-6	2	4-8	2	6-5	1	5-1	2	4-4	2
	3-2 x 10	9-1	1	7-2	2	6-1	2	8-4	1	6-7	2	5-7	2	7-8	2	6-1	2	5-2	2
	3-2 x 12	10-8	2	8-5	2	7-2	2	9-10	2	7-8	2	6-7	2	9-0	2	7-1	2	6-1	2
	4-2 x 8	8-10	1	6-11	1	5-11	1	8-1	1	6-4	1	5-5	2	7-5	1	5-11	1	5-0	2
	4-2 x 10	10-6	1	8-3	2	7-0	2	9-8	1	7-7	2	6-5	2	8-10	1	7-0	2	6-0	2
4-2 x 12	12-4	1	9-8	2	8-3	2	11-4	2	8-11	2	7-7	2	10-4	2	8-3	2	7-0	2	
Roof, ceiling and one clear-span floor 	1-2 x 6	2-11	2	2-3	2	1-11	2	2-9	2	2-1	2	1-9	2	2-7	2	2-0	2	1-8	2
	1-2 x 8	3-9	2	2-10	2	2-5	3	3-6	2	2-8	2	2-3	3	3-3	2	2-6	3	2-2	3
	1-2 x 10	4-5	2	3-5	3	2-10	3	4-2	2	3-2	3	2-8	3	3-11	2	3-0	3	2-6	3
	1-2 x 12	5-2	2	4-0	3	3-4	3	4-10	3	3-9	3	3-2	4	4-7	3	3-6	3	3-0	4
	2-2 x 4	2-11	1	2-3	1	1-10	1	2-9	1	2-1	1	1-9	1	2-7	1	2-0	1	1-8	1
	2-2 x 6	4-4	1	3-4	2	2-10	2	4-1	1	3-2	2	2-8	2	3-10	1	3-0	2	2-6	2
	2-2 x 8	5-6	2	4-3	2	3-7	2	5-2	2	4-0	2	3-4	2	4-10	2	3-9	2	3-2	2
	2-2 x 10	6-7	2	5-0	2	4-2	2	6-1	2	4-9	2	4-0	2	5-9	2	4-5	2	3-9	3
	2-2 x 12	7-9	2	5-11	2	4-11	3	7-2	2	5-7	2	4-8	3	6-9	2	5-3	3	4-5	3
	3-2 x 8	6-11	1	5-3	2	4-5	2	6-5	1	5-0	2	4-2	2	6-1	1	4-8	2	4-0	2
	3-2 x 10	8-3	2	6-3	2	5-3	2	7-8	2	5-11	2	5-0	2	7-3	2	5-7	2	4-8	2
	3-2 x 12	9-8	2	7-5	2	6-2	2	9-0	2	7-0	2	5-10	2	8-6	2	6-7	2	5-6	3
	4-2 x 8	8-0	1	6-1	1	5-1	2	7-5	1	5-9	2	4-10	2	7-0	1	5-5	2	4-7	2
	4-2 x 10	9-6	1	7-3	2	6-1	2	8-10	1	6-10	2	5-9	2	8-4	1	6-5	2	5-5	2
4-2 x 12	11-2	2	8-6	2	7-2	2	10-5	2	8-0	2	6-9	2	9-10	2	7-7	2	6-5	2	

(continued)

WALL CONSTRUCTION

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

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING Width <sup>e</sup> (feet)					
		12		24		36	
		Span <sup>a</sup>	NJ <sup>d</sup>	Span <sup>a</sup>	NJ <sup>d</sup>	Span <sup>a</sup>	NJ <sup>d</sup>
One floor only	2-2 x 4	4-1	1	2-10	1	2-4	1
	2-2 x 6	6-1	1	4-4	1	3-6	1
	2-2 x 8	7-9	1	5-5	1	4-5	2
	2-2 x 10	9-2	1	6-6	2	5-3	2
	2-2 x 12	10-9	1	7-7	2	6-3	2
	3-2 x 8	9-8	1	6-10	1	5-7	1
	3-2 x 10	11-5	1	8-1	1	6-7	2
	3-2 x 12	13-6	1	9-6	2	7-9	2
	4-2 x 8	11-2	1	7-11	1	6-5	1
	4-2 x 10	13-3	1	9-4	1	7-8	1
	4-2 x 12	15-7	1	11-0	1	9-0	2
Two floors	2-2 x 4	2-7	1	1-11	1	1-7	1
	2-2 x 6	3-11	1	2-11	2	2-5	2
	2-2 x 8	5-0	1	3-8	2	3-1	2
	2-2 x 10	5-11	2	4-4	2	3-7	2
	2-2 x 12	6-11	2	5-2	2	4-3	3
	3-2 x 8	6-3	1	4-7	2	3-10	2
	3-2 x 10	7-5	1	5-6	2	4-6	2
	3-2 x 12	8-8	2	6-5	2	5-4	2
	4-2 x 8	7-2	1	5-4	1	4-5	2
	4-2 x 10	8-6	1	6-4	2	5-3	2
	4-2 x 12	10-1	1	7-5	2	6-2	2

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

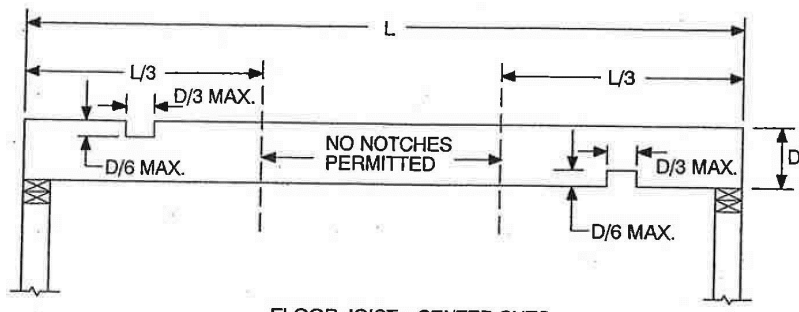
- a. Spans are given in feet and inches.
- b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine, and spruce-pine-fir.
- c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.
- e. Spans are calculated assuming the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), tabulated spans for headers consisting of 2 x 8, 2 x 10, or 2 x 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.

**TABLE R602.7(3)**  
**GIRDER AND HEADER SPANS<sup>a</sup> FOR OPEN PORCHES**  
 (Maximum span for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir<sup>b</sup>)

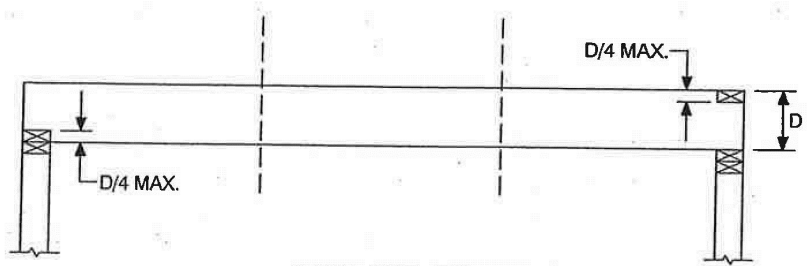
SIZE	SUPPORTING ROOF						SUPPORTING FLOOR	
	GROUND SNOW LOAD (psf)							
	30		50		70			
	DEPTH OF PORCH <sup>c</sup> (feet)							
	8	14	8	14	8	14	8	14
2-2 x 6	7-6	5-8	6-2	4-8	5-4	4-0	6-4	4-9
2-2 x 8	10-1	7-7	8-3	6-2	7-1	5-4	8-5	6-4
2-2 x 10	12-4	9-4	10-1	7-7	8-9	6-7	10-4	7-9
2-2 x 12	14-4	10-10	11-8	8-10	10-1	7-8	11-11	9-0

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

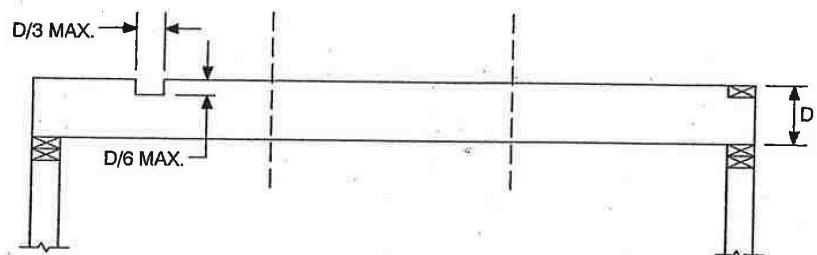
- a. Spans are given in feet and inches.
- b. Tabulated values assume No. 2 grade lumber, wet service and incising for refractory species. Use 30 psf ground snow load for cases in which ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.
- c. Porch depth is measured horizontally from building face to centerline of the header. For depths between those shown, spans are permitted to be interpolated.



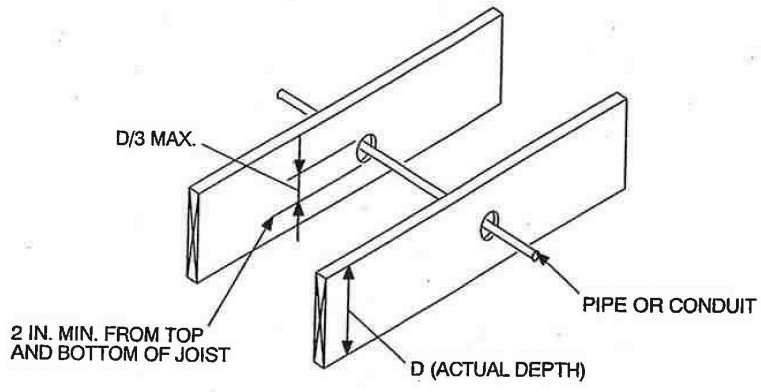
FLOOR JOIST—CENTER CUTS



FLOOR JOIST—END CUTS



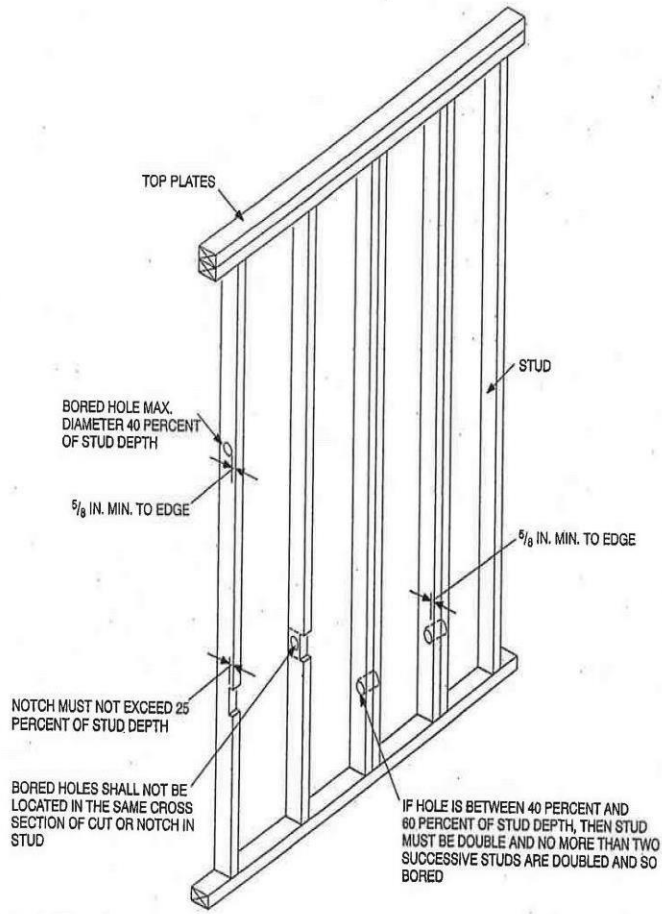
RAFTER/CEILING JOISTS (R802.7.1)



For SI: 1 inch = 25.4 mm.

FIGURE R502.8  
CUTTING, NOTCHING AND DRILLING

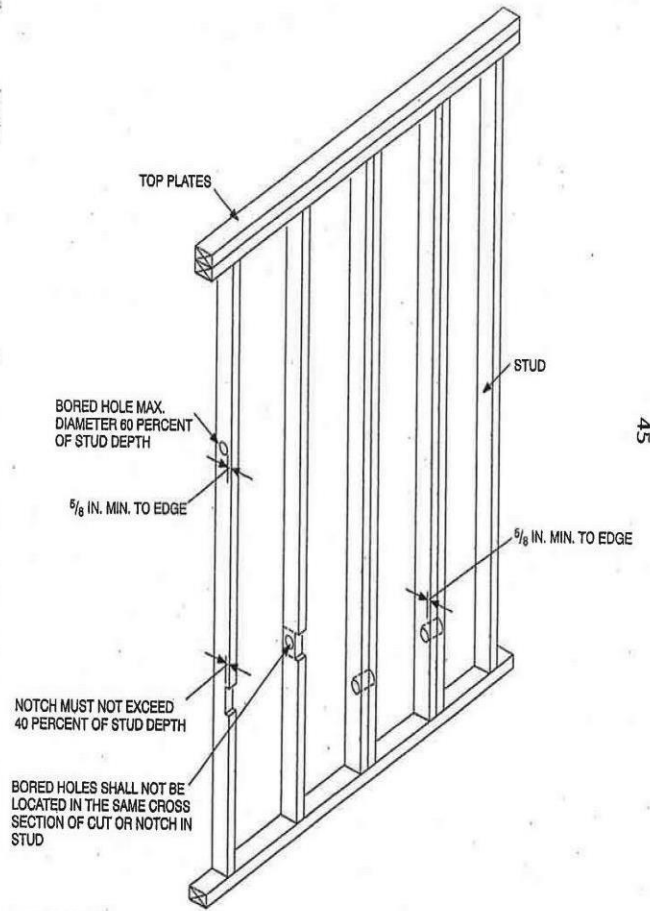
Illustration #16



For SI: 1 inch = 25.4 mm.

Note: Condition for exterior and bearing walls.

FIGURE R602.6(1)  
NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS



For SI: 1 inch = 25.4 mm.

FIGURE R602.6(2)  
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS

45

### Illustration 16a

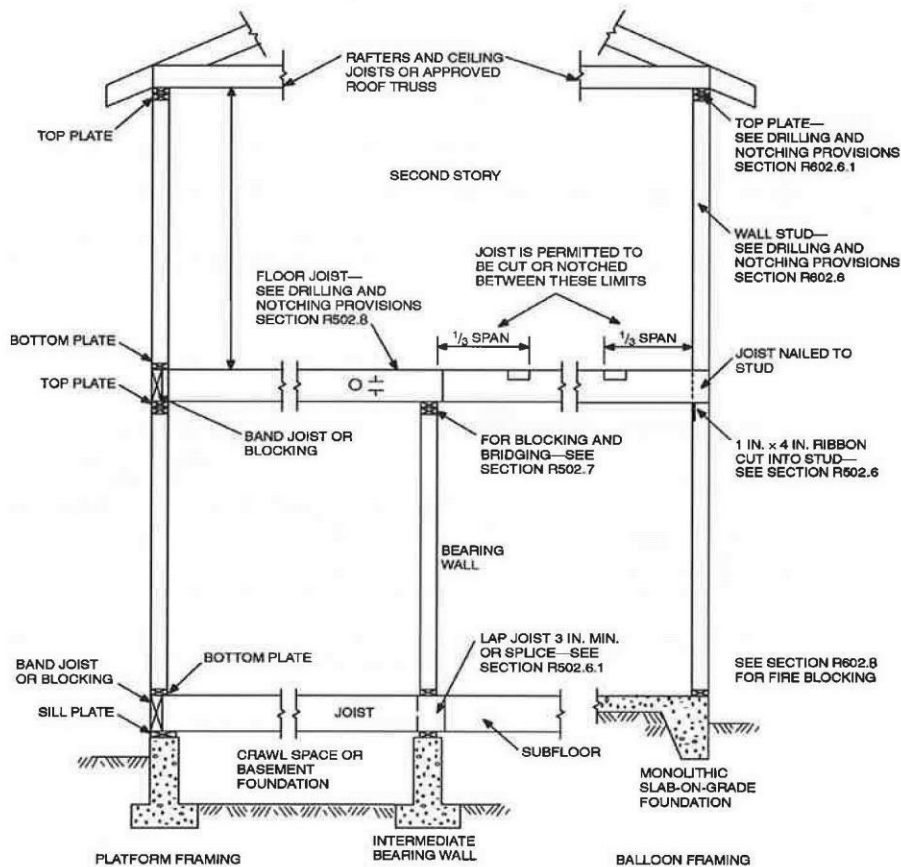
**WALL CONSTRUCTION**

**TABLE R602.3(5)  
SIZE, HEIGHT AND SPACING OF WOOD STUDS\***

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height* (feet)	Maximum spacing when supporting a roof-ceiling assembly or a habitable attic assembly, only (Inches)	Maximum spacing when supporting one floor, plus a roof-ceiling assembly or a habitable attic assembly (Inches)	Maximum spacing when supporting two floors, plus a roof-ceiling assembly or a habitable attic assembly (Inches)	Maximum spacing when supporting one floor height* (inches)	Laterally unsupported stud height* (feet)	Maximum spacing (inches)
2 x 3 <sup>b</sup>	—	—	—	—	—	10	16
2 x 4	10	24 <sup>c</sup>	16 <sup>c</sup>	—	24	14	24
3 x 4	10	24	24	16	24	14	24
2 x 5	10	24	24	—	24	16	24
2 x 6	10	24	24	16	24	20	24

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

- a. Listed heights are distances between points of lateral support perpendicular to the plane of the wall. Bearing walls shall be sheathed on not less than one side or bridging shall be installed not greater than 4 feet apart measured vertically from either end of the stud. Increases in unsupported height are permitted where in compliance with Exception 2 of Section R602.3.1 or designed in accordance with accepted engineering practice.
- b. Shall not be used in exterior walls.
- c. A habitable attic assembly supported by 2 x 4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall be increased to 2 x 6 or the studs shall be designed in accordance with accepted engineering practice.



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

**FIGURE R602.3(1)  
TYPICAL WALL, FLOOR AND ROOF FRAMING**

**Illustration 16b**

## Wall Construction

**TABLE R602.3(3)**  
**REQUIREMENTS FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES<sup>a, b, c</sup>**

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (Inches)	PANEL NAIL SPACING		ULTIMATE DESIGN WIND SPEED $V_{ult}$ (mph)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category		
							B	C	D
6d Common (2.0" × 0.113")	1.5	24/0	$\frac{3}{8}$	16	6	12	140	115	110
8d Common (2.5" × 0.131")	1.75	24/16	$\frac{7}{16}$	16	6	12	170	140	135
				24	6	12	140	115	110

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

- a. Panel strength axis parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.
- b. Table is based on wind pressures acting toward and away from building surfaces in accordance with Section R301.2. Lateral bracing requirements shall be in accordance with Section R602.10.
- c. Wood structural panels with span ratings of Wall-16 or Wall-24 shall be permitted as an alternate to panels with a 24/0 span rating. Plywood siding rated 16 o.c. or 24 o.c. shall be permitted as an alternate to panels with a 24/16 span rating. Wall-16 and Plywood siding 16 o.c. shall be used with studs spaced not more than 16 inches on center.

**TABLE R602.3(4)**  
**ALLOWABLE SPANS FOR PARTICLEBOARD WALL SHEATHING<sup>a</sup>**

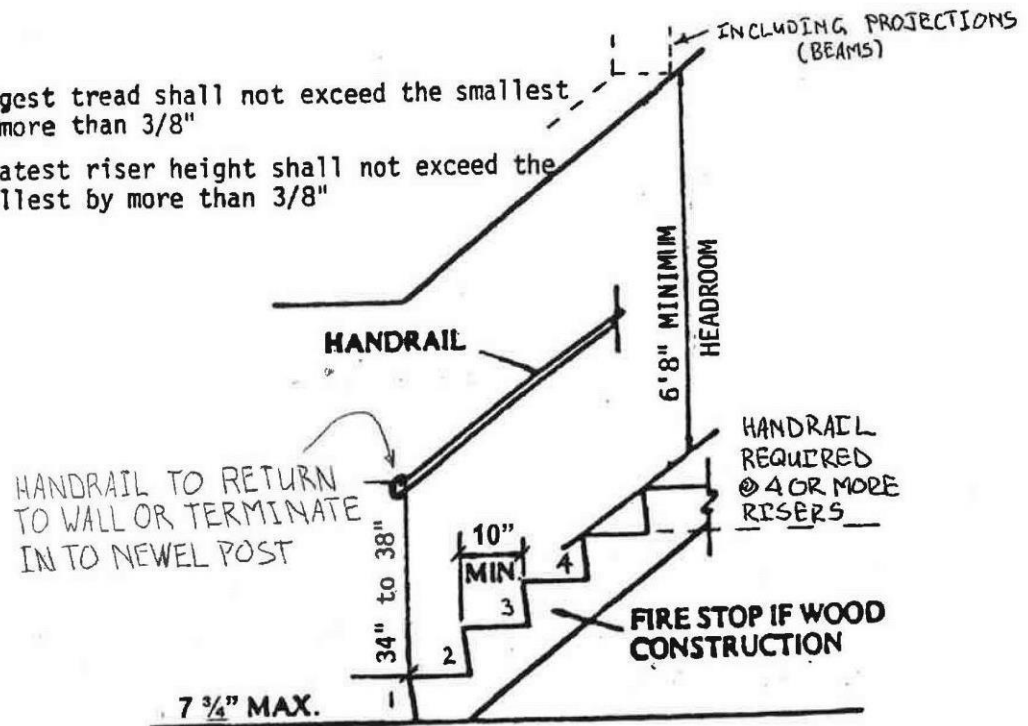
THICKNESS (inch)	GRADE	STUD SPACING (inches)	
		When siding is nailed to studs	When siding is nailed to sheathing
$\frac{3}{8}$	M-1 Exterior glue	16	—
$\frac{1}{2}$	M-2 Exterior glue	16	16

For SI: 1 inch = 25.4 mm.

- a. Wall sheathing not exposed to the weather. If the panels are applied horizontally, the end joints of the panel shall be offset so that four panel corners will not meet. All panel edges must be supported. Leave a  $\frac{1}{16}$ -inch gap between panels and nail not less than  $\frac{3}{8}$  inch from panel edges.

### Illustration 17

NOTE: -Largest tread shall not exceed the smallest by more than 3/8"  
 -Greatest riser height shall not exceed the smallest by more than 3/8"



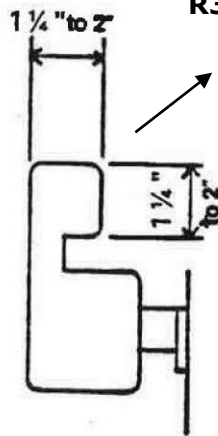
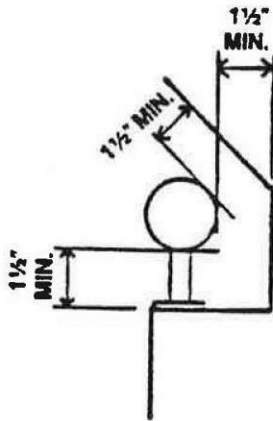
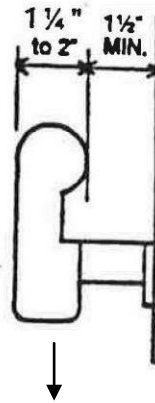
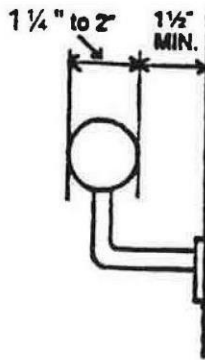
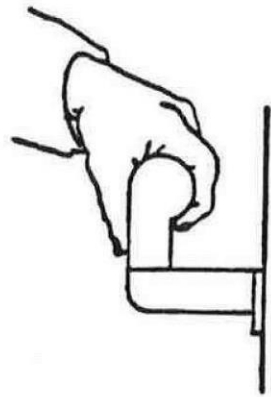
**STAIR DETAIL  
 PRIVATE STAIRWAY WITH  
 OCCUPANT LOAD LESS THAN 10**

See IRC Section R311.7

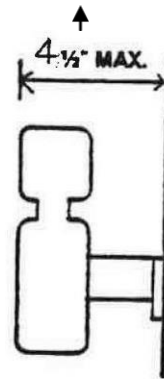
Stairs

**Illustration 19**

ACCEPTABLE HANDRAIL DETAILS

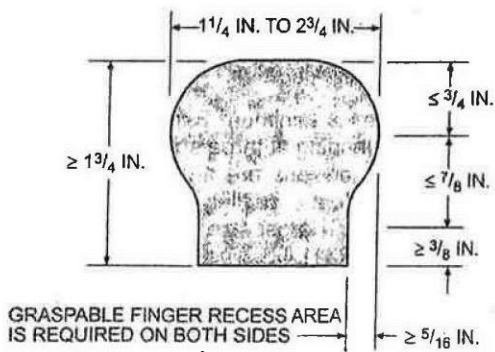


R311.7.8.5 #1 See 2018 IRC

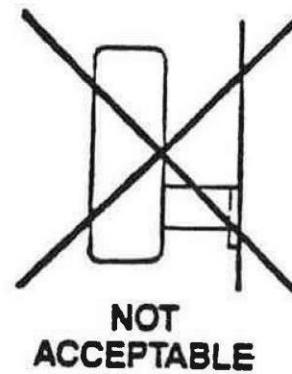


HANDRAIL PERIMETER > 6 1/4 IN.

NOTE:  
OTHER SHAPES MAY BE ACCEPTABLE  
IF THEY PROVIDE AN  
EQUIVALENT GRIPPING SERVICE.



R311.7.8.5 IRC

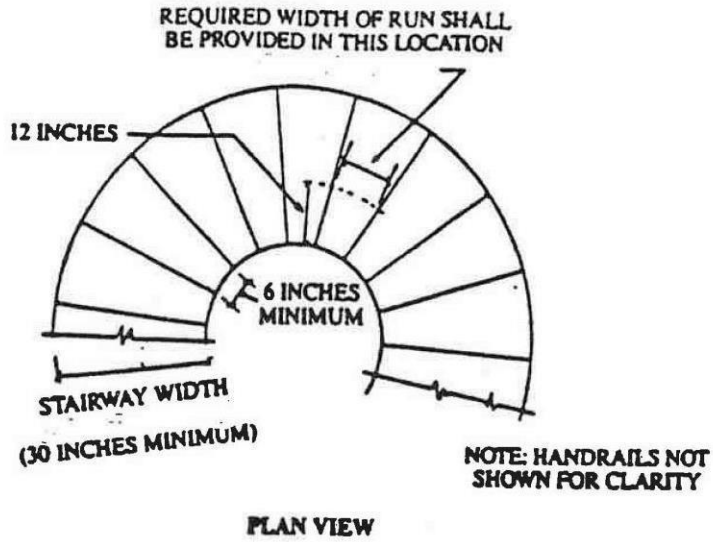


Stairway Handrail

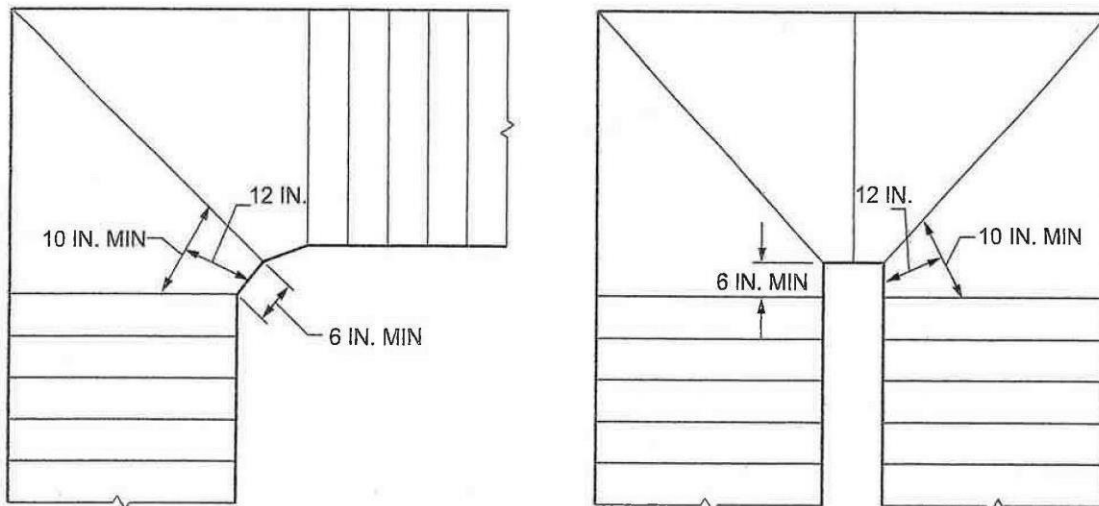
illustration #20

Illustration 20

# STAIRWAY REQUIREMENTS



NOTE: RESIDENTIAL USES ONLY.  
LIMITATION: APPLIES TO R-3 OCCUPANCY  
AND PRIVATE STAIRWAYS IN R-1 OCCUPANCY.



1 inch = 25.4 mm.

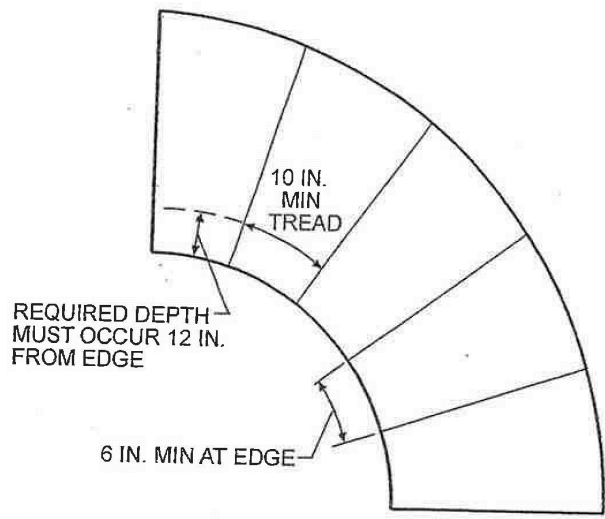
Figure R311.7.5.2.1(1)  
WINDERS

NOTE: RESIDENTIAL USES ONLY.  
LIMITATION: APPLIES TO R-3 OCCUPANCY  
AND PRIVATE STAIRWAYS IN R-1 OCCUPANCY.

Winding Stairs

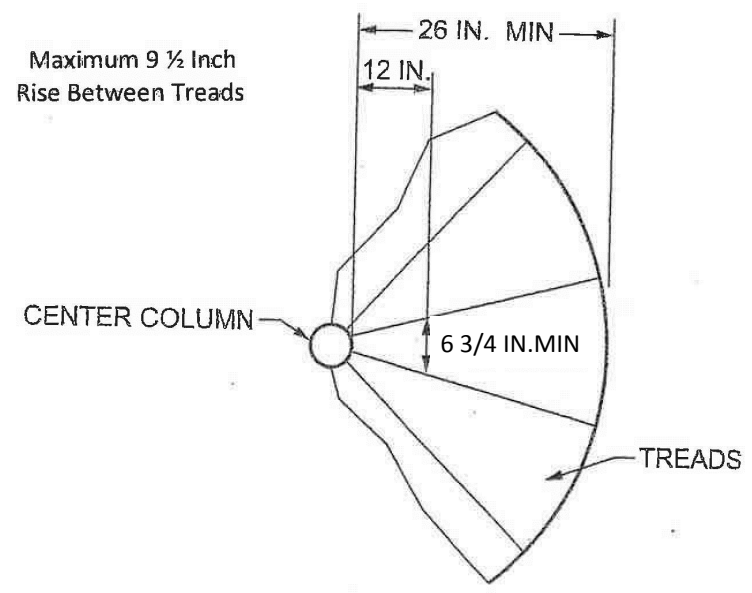
illustration #21a

Illustration 21a



For SI: 1 inch = 25.4 mm.

**WINDERS USED FOR CIRCULAR STAIRWAY.  
 PERMITTED IN ALL OCCUPANCIES.  
 CIRCULAR STAIRWAY**

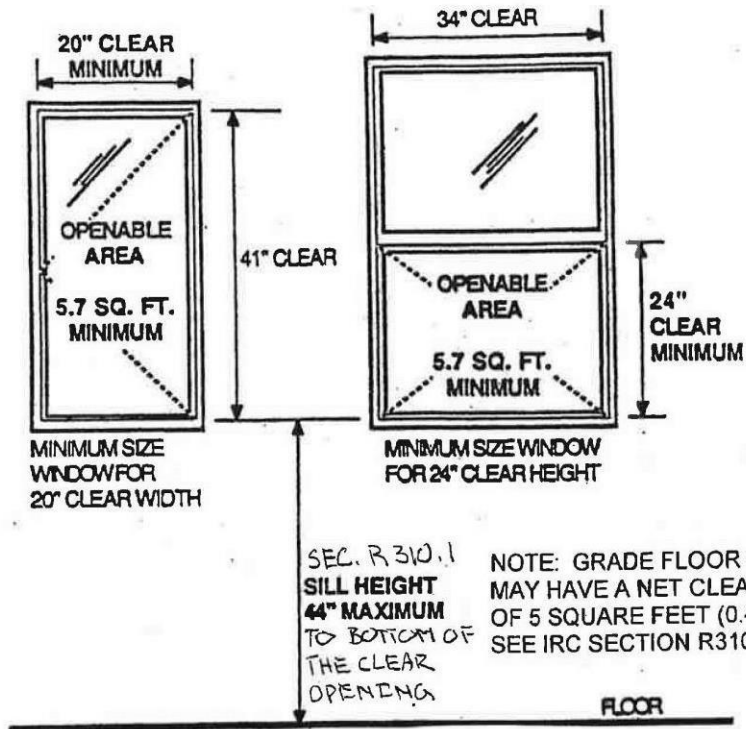


For SI: 1 inch = 25.4 mm.

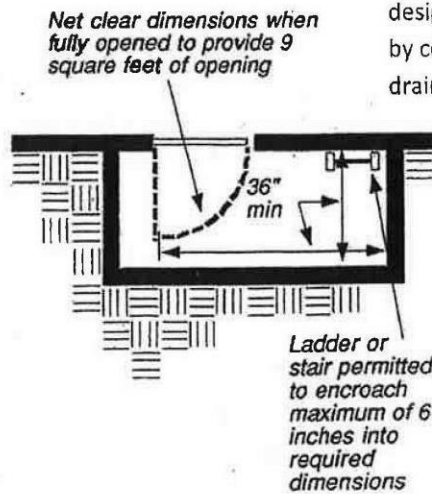
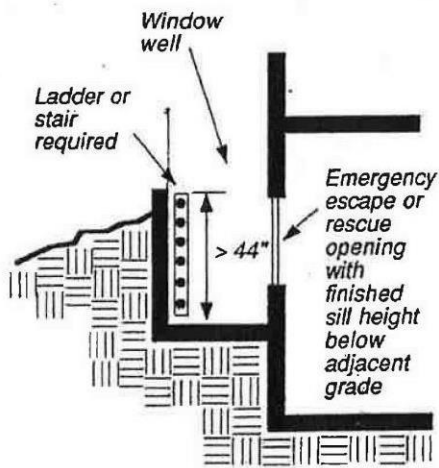
**Figure R311.7.10.1  
 SPIRAL STAIRS**

**Illustration 21b**

# MINIMUM SIZED RESCUE OR ESCAPE WINDOWS FROM SLEEPING ROOMS



## Section R310 EMERGENCY ESCAPES



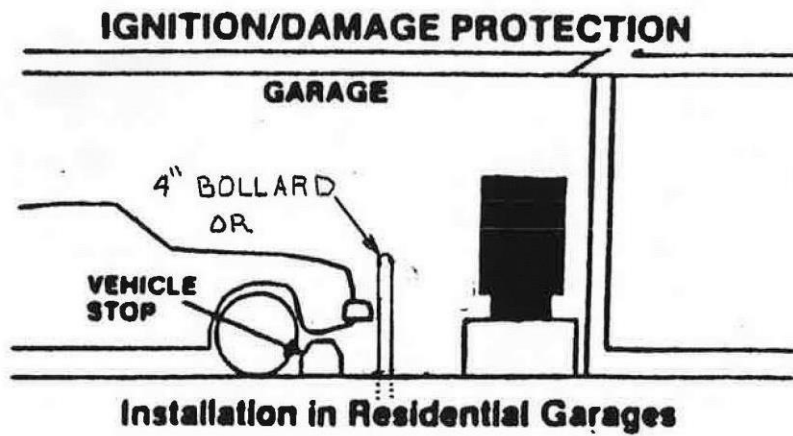
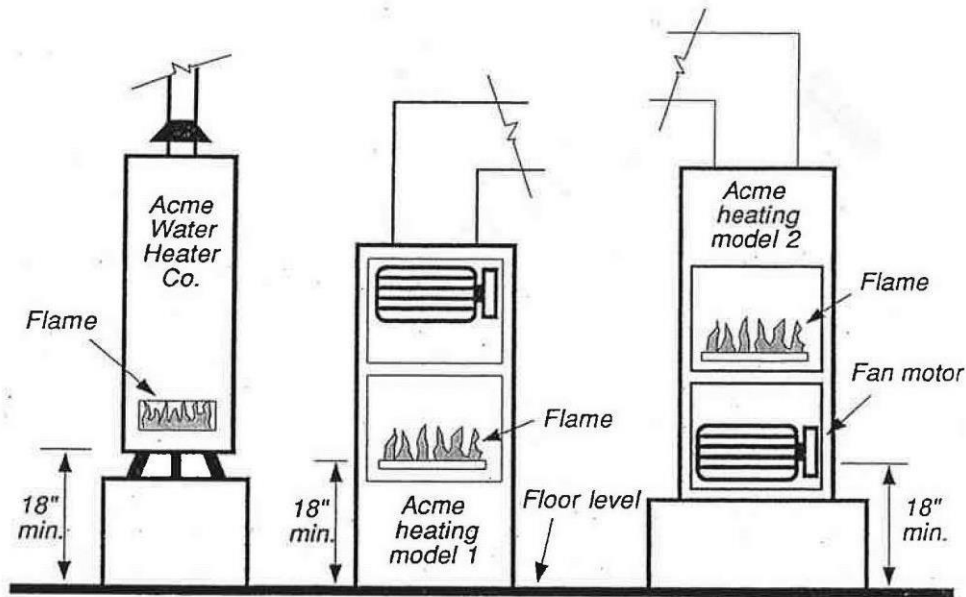
## Section 310.2.2

Window well shall be designed for proper drainage by connecting to foundation drainage

Egress Window • Window Well

illustration #22

Illustration 22



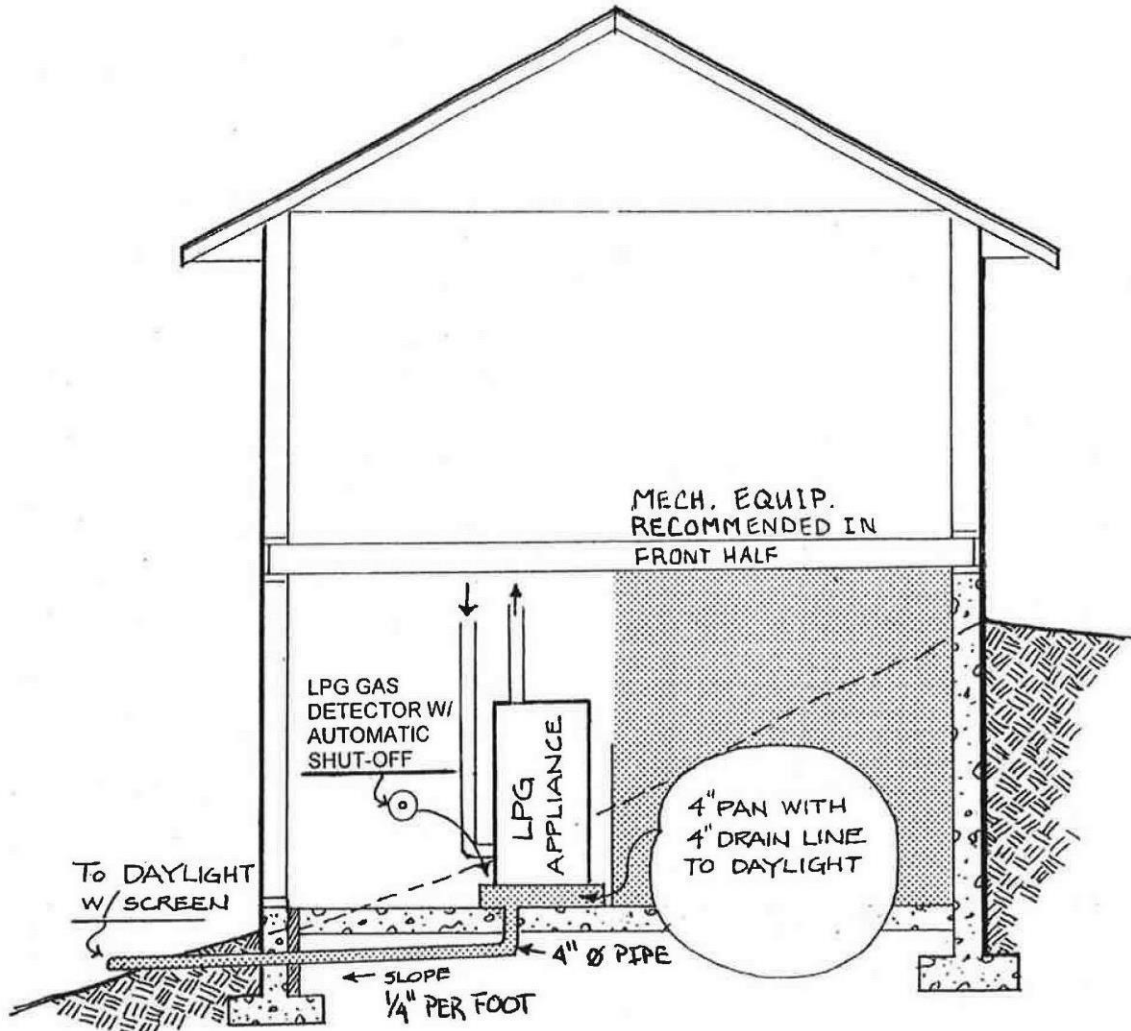
Protection from Damage

illustration #23

Illustration 23

# WHATCOM COUNTY RECOMMENDED INSTALLATION

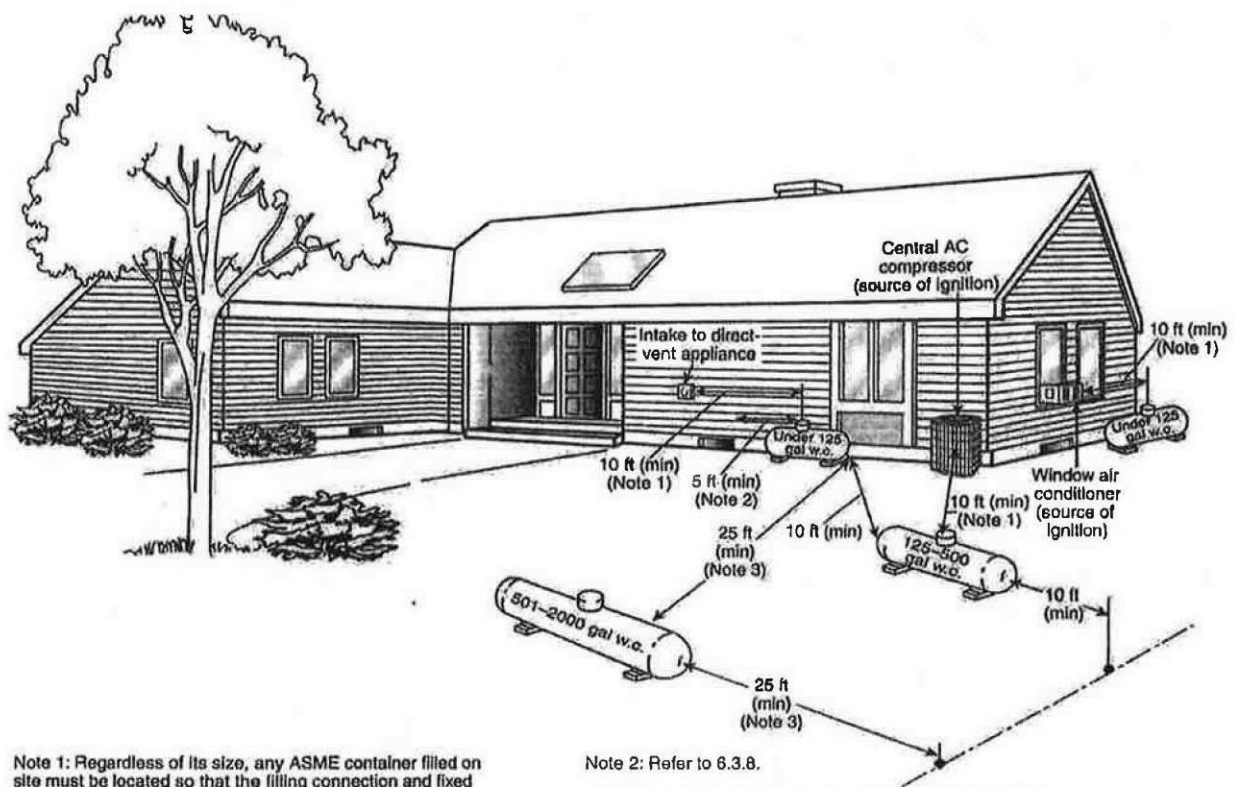
## LPG APPLIANCES BELOW - GRADE INSTALLATION



Propane Appliances

illustration #24

**Illustration 24**



Note 1: Regardless of its size, any ASME container filled on site must be located so that the filling connection and fixed maximum liquid level gauge are at least 10 ft from any external source of ignition (e.g., open flame, window AC, compressor), intake to direct-vented gas appliance, or intake to a mechanical ventilation system. Refer to 6.3.9.

Note 2: Refer to 6.3.8.

Note 3: This distance can be reduced to no less than 10 ft for a single container of 1200 gal (4.5 m<sup>3</sup>) water capacity or less, provided such container is at least 25 ft from any other LP-Gas container of more than 125 gal (0.5 m<sup>3</sup>) water capacity. Refer to 6.3.3.

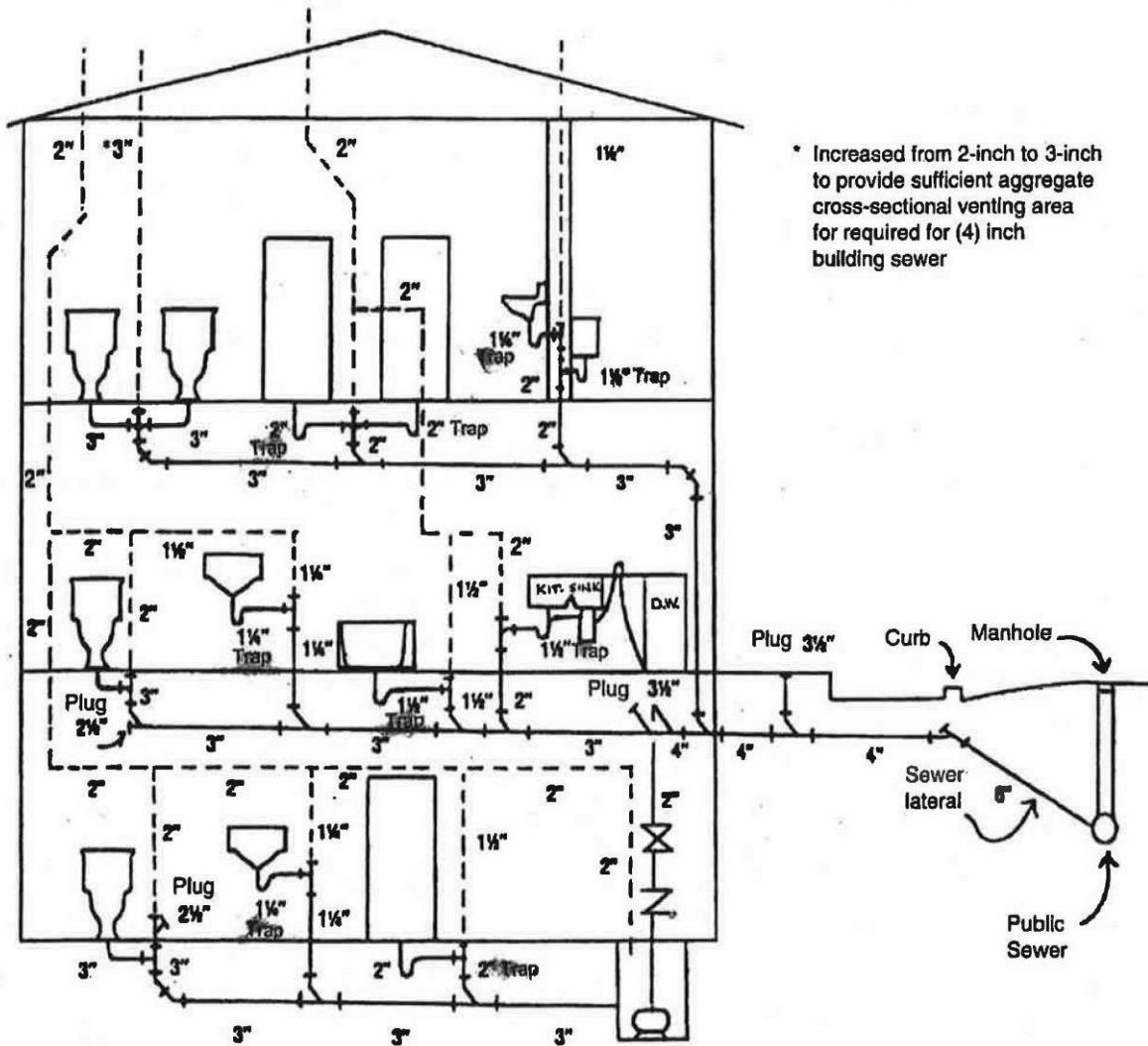
FIGURE I.1(b) Aboveground ASME Containers. (Figure for illustrative purposes only; code shall govern.)

Propane Tank Locations

illustration #25

Illustration 25

**EXAMPLE  
RESIDENTIAL BUILDING**



Plumbing Schematics

illustration #26

**Illustration 26**

**TABLE 313.3  
HANGERS AND SUPPORTS**

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Cast	Lead and Oakum	5 feet, except 10 feet where 10 foot lengths are installed <sup>1, 2, 3</sup>	Base and each floor, not to exceed 15 feet
	Compression Gasket	Every other joint, unless over 4 feet then support each joint <sup>1, 2, 3</sup>	Base and each floor, not to exceed 15 feet
Cast-Iron Hubless	Shielded Coupling	Every other joint, unless over 4 feet then support each joint <sup>1, 2, 3, 4</sup>	Base and each floor, not to exceed 15 feet
Copper & Copper Alloys	Soldered, Brazed, Threaded, or Mechanical	1½ inches and smaller, 6 feet; 2 inches and larger, 10 feet	Each floor, not to exceed 10 feet <sup>5</sup>
Steel Pipe for Water or DWV	Threaded or Welded	¾ inch and smaller, 10 feet; 1 inch and larger, 12 feet	Every other floor, not to exceed 25 feet <sup>5</sup>
Steel Pipe for Gas	Threaded or Welded	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1¼ inches and larger, 10 feet	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1¼ inches every floor level
Schedule 40 PVC and ABS DWV	Solvent Cemented	All sizes, 4 feet; allow for expansion every 30 feet <sup>3</sup>	Base and each floor; provide mid-story guides; provide for expansion every 30 feet
CPVC	Solvent Cemented	1 inch and smaller, 3 feet; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides
CPVC-AL-CPVC	Solvent Cemented	½ inch, 5 feet; ¾ inch, 65 inches; 1 inch, 6 feet	Base and each floor; provide mid-story guide
Lead	Wiped or Burned	Continuous Support	Not to exceed 4 feet
Steel	Mechanical	In accordance with standards acceptable to the Authority Having Jurisdiction	
PEX	Cold Expansion, Insert and Compression	1 inch and smaller, 32 inches; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides
PEX-AL-PEX	Metal Insert and Metal Compression	½ inch ¾ inch 1 inch } All sizes 98 inches	Base and each floor; provide mid-story guides
PE-AL-PE	Metal Insert and Metal Compression	½ inch ¾ inch 1 inch } All sizes 98 inches	Base and each floor; provide mid-story guides
PE-RT	Insert and Compression	1 inch and smaller, 32 inches; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides
Polypropylene (PP)	Fusion weld (socket, butt, saddle, electrofusion), threaded (metal threads only), or mechanical	1 inch and smaller, 32 inches; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides

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

**Notes:**

- <sup>1</sup> Support adjacent to joint, not to exceed 18 inches (457 mm).
- <sup>2</sup> Brace not to exceed 40 foot (12 192 mm) intervals to prevent horizontal movement.
- <sup>3</sup> Support at each horizontal branch connection.
- <sup>4</sup> Hangers shall not be placed on the coupling.
- <sup>5</sup> Vertical water lines shall be permitted to be supported in accordance with recognized engineering principles with regard to expansion and contraction, where first approved by the Authority Having Jurisdiction.

**TABLE 3-1  
Hanger Rod Sizes**

Pipe and Tube Size		Rod Size	
Inches	mm	Inches	mm
1/2 – 4	12.7 – 102	3/8	9.5
5 – 8	127 – 203	1/2	12.7
10 – 12	254 – 305	5/8	15.9

**Illustration 27**

**M1505.4.3 Mechanical ventilation rate.** The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate as determined in accordance with Table M1505.4.3(1) or Equation 15-1.

**Equation 15-1**

Ventilation rate in cubic feet per minute =  $(0.01 \times \text{total square foot area of house}) + [7.5 \times (\text{number of bedrooms} + 1)]$   
but not less than 30 cfm for each dwelling unit

**TABLE M1505.4.3(1)  
WHOLE-HOUSE MECHANICAL VENTILATION AIRFLOW RATE**

Dwelling Unit Floor Area (square feet)	Number of Bedrooms				
	0 - 1	2	3	4	5 or more
< 500	30	30	35	45	50
501 - 1,000	30	35	40	50	55
1,001 - 1,500	30	40	45	55	60
1,501 - 2,000	35	45	50	60	65
2,001 - 2,500	40	50	55	65	70
2,501 - 3,000	45	55	60	70	75
3,001 - 3,500	50	60	65	75	80
3,501 - 4,000	55	65	70	80	85
4,001 - 4,500	60	70	75	85	90
4,501 - 5,000	65	75	80	90	95

**M1505.4.4.1 Local exhaust.**

Bathrooms, toilet rooms, and kitchens shall include a local exhaust system. Such local exhaust systems shall have the capacity to exhaust the minimum airflow rate in accordance with Table M1505.4.4.1. Fans required by this section shall be provided with controls that enable manual override or automatic occupancy sensor, humidity sensor, timer controls, or pollutant sensor controls. An “on/off” switch shall meet this requirement for manual controls. Manual fan controls shall be readily accessible in the room served by the fan.

**Illustration 28**