

Part III—Building Planning and Construction

CHAPTER 3

BUILDING PLANNING

SECTION R301 DESIGN CRITERIA

R301.1 Application. Buildings and structures, and all parts thereof, shall be constructed to safely support all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed by this code. The construction of buildings and structures in accordance with the provisions of this code shall result in a system that provides a complete load path that meets all requirements for the transfer of all loads from their point of origin through the load-resisting elements to the foundation. Buildings and structures constructed as prescribed by this code are deemed to comply with the requirements of this section.

R301.1.1 Alternative provisions. As an alternative to the requirements in Section R301.1 the following standards are permitted subject to the limitations of this code and the limitations therein. Where engineered design is used in conjunction with these standards, the design shall comply with the *Building Code*.

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual* (WFCM).
2. American Iron and Steel Institute (AISI) *Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings* (AISI S230).
3. ICC-400 *Standard on the Design and Construction of Log Structures*.

R301.1.2 Construction systems. The requirements of this code are based on platform and balloon-frame construction for light-frame buildings. The requirements for concrete and masonry buildings are based on a balloon framing system. Other framing systems must have equivalent detailing to ensure force transfer, continuity and compatible deformations.

R301.1.3 Engineered design. When a building of otherwise conventional construction contains structural elements exceeding the limits of Section R301 or otherwise not conforming to this code, these elements shall be designed in accordance with accepted engineering practice. The extent of such design need only demonstrate compliance of nonconventional elements with other applicable provisions and shall be compatible with the performance of the conventional framed system. Engineered design in accordance with the *Building Code* is permitted for all buildings and structures, and parts thereof, included in the scope of this code.

R301.2 Climatic and geographic design criteria. Buildings shall be constructed in accordance with the provisions of this code as limited by the provisions of this section. Additional criteria shall be established as set forth in Table R301.2(1).

R301.2.1 Wind limitations. Buildings and portions thereof shall be limited by wind speed, as defined in Table R301.2(1) and construction methods in accordance with this code. Basic

wind speeds shall be determined from Figure R301.2(4). Where different construction methods and structural materials are used for various portions of a building, the applicable requirements of this section for each portion shall apply.

R301.2.1.1 Design criteria. In regions where the basic wind speeds from Figure R301.2(4) equal or exceed 100 miles per hour (45 m/s) in *hurricane-prone regions*, or 110 miles per hour (49 m/s) elsewhere, the design of buildings shall be in accordance with one of the following methods. The elements of design not addressed by those documents in Items 1 through 4 shall be in accordance with this code.

1. American Forest and Paper Association (AF&PA) *Wood Frame Construction Manual for One- and Two-Family Dwellings* (WFCM); or
2. International Code Council (ICC) *Standard for Residential Construction in High Wind Regions* (ICC-600); or
3. *Minimum Design Loads for Buildings and Other Structures* (ASCE-7); or
4. American Iron and Steel Institute (AISI), *Standard for Cold-Formed Steel Framing—Prescriptive Method For One- and Two-Family Dwellings* (AISI S230).
5. Concrete construction shall be designed in accordance with the provisions of this code.
6. Structural insulated panel (SIP) walls shall be designed in accordance with the provisions of this code.

R301.2.1.2 Protection of openings. Windows in buildings located in windborne debris regions shall have glazed openings protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and ASTM E 1886 referenced therein. Garage door glazed opening protection for windborne debris shall meet the requirements of an *approved* impact resisting standard or ANSI/DASMA 115.

Exception: Wood structural panels with a minimum thickness of $\frac{7}{16}$ inch (11 mm) and a maximum span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings. Panels shall be pre-cut and attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the component and cladding loads determined in accordance with ASCE 7, with the permanent corrosion-resistant attachment hardware provided and anchors permanently installed on the building.

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA^{l,m}

COUNTIES	ROOF SNOW LOAD ^a 25 lb per sq ft below elevation shown	WIND PRESSURE ^{b,c} (lb per sq ft)	SEISMIC DESIGN CATEGORY ^d	CONCRETE SUBJECT TO DAMAGE FROM		SUBJECT TO DAMAGE FROM	
				Weathering ^e	Frost depth	Termites	Decay
Baker	3,200	15	C	Severe	24	Moderate	Slight
Benton	400	18	D ₁	Moderate	12	Moderate	Moderate
Clackamas	500	18	D ₁	Moderate	12	Moderate	Moderate
Clatsop	400	23 ^f	D ₂	Moderate	12	Moderate	Moderate
Columbia	400	18	D ₁	Moderate	12	Moderate	Moderate
Coos	400	18 ^f	D ₂	Moderate	12	Moderate	Moderate
Crook	4,100	15	C	Severe	18	Moderate	Slight
Curry	400	23 ^f	D ₂	Moderate	12	Moderate	Moderate
Deschutes	4,000	15	C	Severe	18	Moderate	Slight
Douglas	1,500	18 ^f	D ₁ ^k	Moderate	18 ⁱ	Moderate	Moderate
Gilliam	3,000		C	Severe	24	Moderate	Moderate
S.45.5°N		15					
N.45.5°N		18					
Grant	4,100	15	C	Severe	24	Moderate	Slight
Harney	4,100	15	C	Severe	24	Moderate	Moderate
Hood River	Note g	18 ^h	D ₁	Severe	24	Moderate	Moderate
S.45.5°N		15					
N.45.5°N		23					
Jackson	2,000	18	D ₁	Moderate	18 ⁱ	Moderate	Slight
Jefferson	4,100	15	C	Severe	18	Moderate	Moderate
Josephine	4,100	18	D ₁	Moderate	18 ⁱ	Moderate	Moderate
Klamath	4,000	18	D ₁	Severe	24	Moderate	Moderate
Lake	4,200	15	D ₁	Severe	24	Moderate	Slight
Lane	500	18 ^f	D ₁ ^k	Moderate	12	Moderate	Moderate
Lincoln	400	23 ^f	D ₂	Moderate	12	Moderate	Moderate
Linn	700	18	D ₁	Moderate	12	Moderate	Moderate
Malheur	3,400	15	C	Severe	24	Moderate	Slight
Marion	500	18	D ₁	Moderate	12	Moderate	Moderate
Morrow	3,000		C	Severe	24	Moderate	Slight
S.45.5°N		15					
N.45.5°		18					
Multnomah	500	18 ^h	D ₁	Moderate	18	Moderate	Moderate
Polk	400	18	D ₁	Moderate	12	Moderate	Moderate
Sherman	2,000		C	Severe	24	Moderate	Slight
S.45.5°N		15					
N.45.5°N		18					
Tillamook	400	23 ^f	D ₂	Moderate	12	Moderate	Moderate
Umatilla	3,000		C	Severe	24	Moderate	Slight
S.45.5°N		15					
N.45.5°N ^j		18					
Union	3,000	15	C	Severe	24	Moderate	Slight
Wallowa	3,000	15	C	Severe	24	Moderate	Slight
Wasco	2,000		C	Severe	24	Moderate	Slight
S.45.5°N		15					
N.45.5°N		18					
Washington	400	18	D ₁	Moderate	12	Moderate	Moderate
Wheeler	4,100	15	C	Severe	24	Moderate	Slight
Yamhill	400	18	D ₁	Moderate	12	Moderate	Moderate

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kN/m².

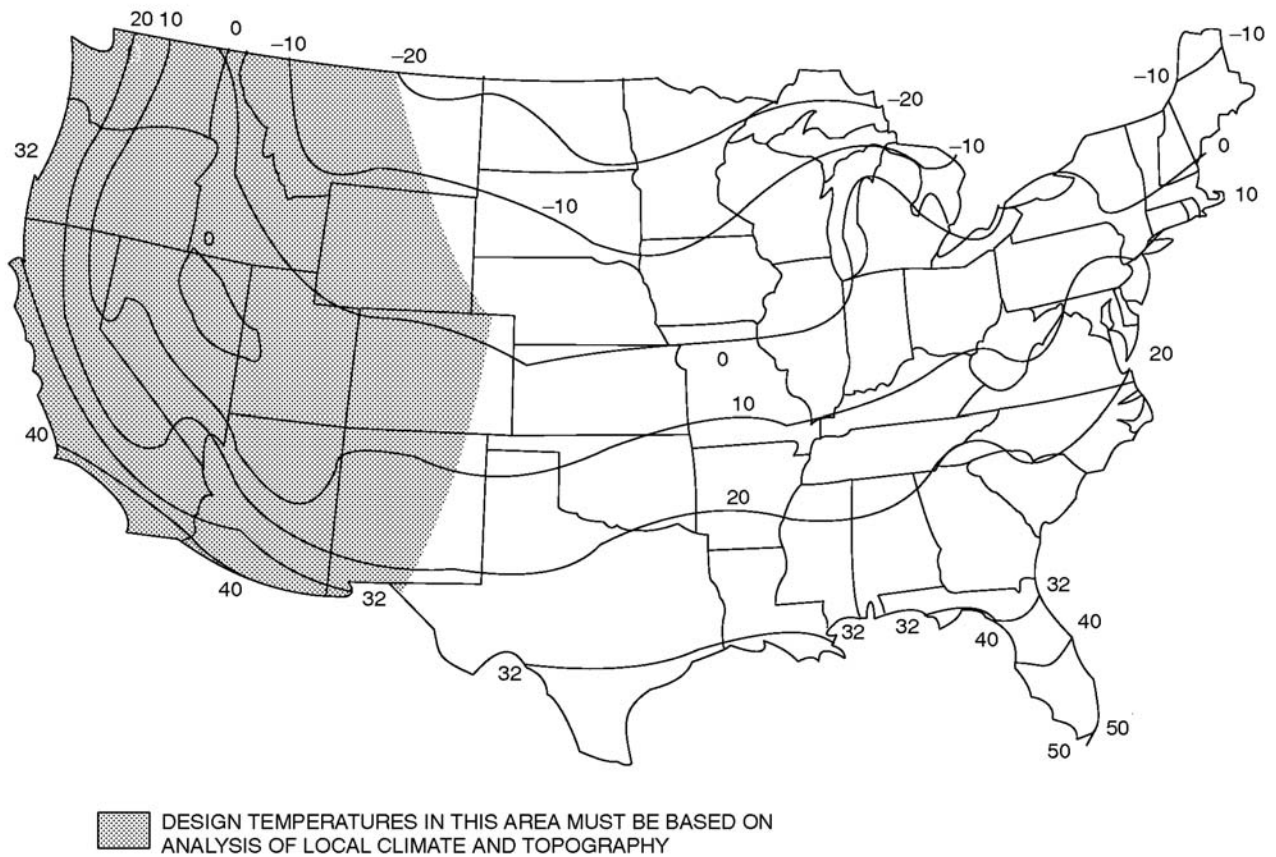
- For locations with elevation higher than the listed values or for a possible reduction in minimum design roof snow load from 25 psf to 20 psf, refer to the Snow Load Analysis for Oregon (including the ground snow load maps) published by the Structural Engineers Association of Oregon, December 2007.
- The values in this column were calculated using Exposure C.
- Wind design loads are determined from Figure R301.2(4).
- See Seismic Risk Map in Figure R301.2(2).
- A severe classification is where weather conditions result in significant snowfall combined with extended periods during which there is little or not natural thawing causing de-icing salts to be used extensively.
- All areas with full exposure to ocean winds shall be constructed to 28 pounds per square foot requirements.
- For elevations below 500 feet, the snow load is 50 pounds per square foot. Above 500 feet, see Footnote a.
- Areas in Multnomah and Hood River Counties with full exposure to Columbia River Gorge winds shall be designed to 28 pounds per square foot.
- The frost depth below 2,500 feet in Jackson and Josephine Counties is 12 inches.
- Umatilla County north of 45.5° and east of 118.5° is at 25 pounds per square foot.
- That portion of Douglas and Lane Counties which lies westerly of Range 10 West of the Willamette Meridian shall be designated as seismic design category.
- See Sections R301.2.4 and R322 for establishment of flood hazard design criteria.
- See Section R324 for establishment of wildfire hazard design criteria.

TABLE R301.2(2)
DESIGN WIND LOADS (pounds per square foot)

EXPOSURE CLASSIFICATION ^b	BASIC WIND SPEED ^a	BUILDING HEIGHT ^{c, f}					
		One Story		Two Story		Three Story	
		Walls	Roof Uplift ^d	Walls	Roof Uplift ^d	Walls	Roof Uplift ^d
A/B	100	NA ^e	NA ^e	NA ^e	NA	NA ^e	NA ^e
	110	NA ^e	NA ^e	NA ^e	NA	NA ^e	20
C	85	NA ^e	NA	NA ^e	NA	NA ^e	NA
	100	NA ^e	20	NA ^e	22	NA ^e	25
	110	NA ^e	26	NA ^e	28	NA ^e	31
D	85	NA ^e	20	NA ^e	22	NA ^e	24
	100	NA ^e	27	NA ^e	28	NA ^e	31
	110	32	37	36	40	39	43

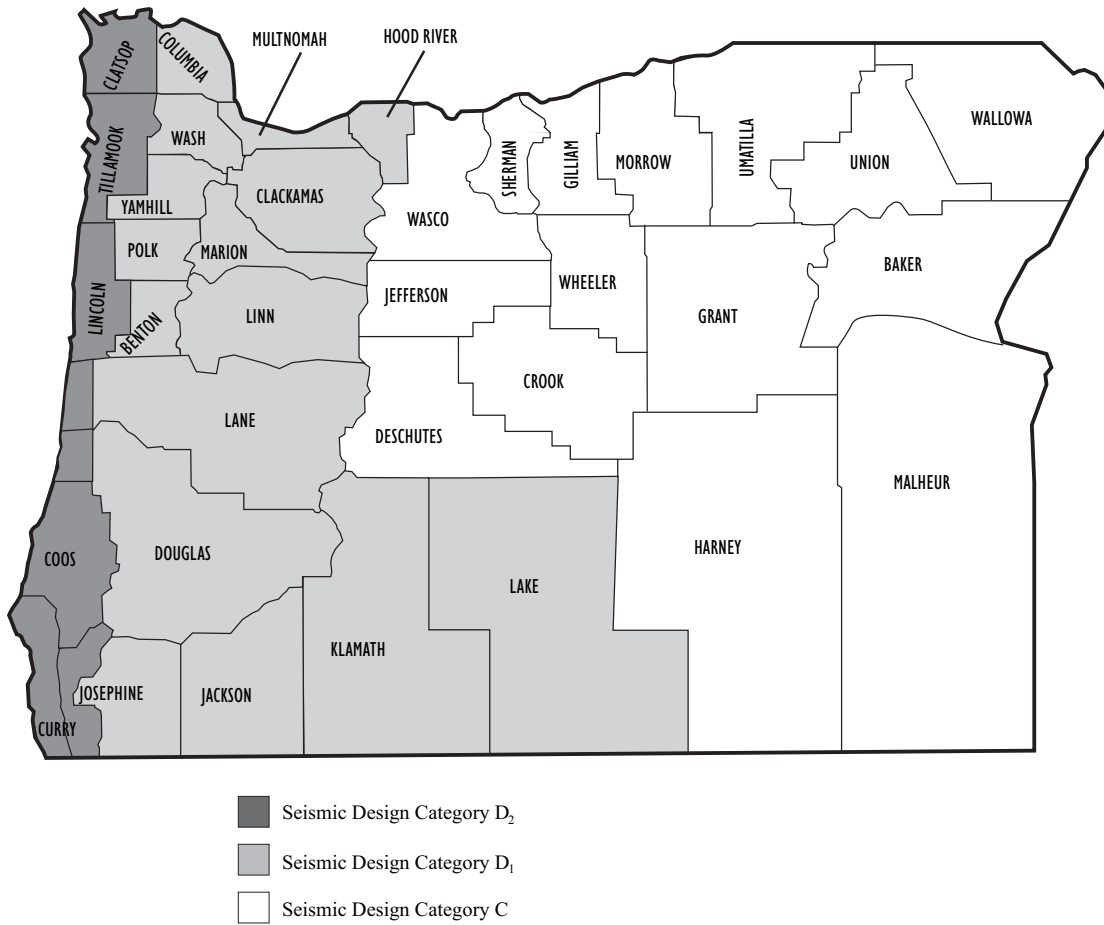
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.88 Pa, 1 mile per hour = 0.44 m/s.

- a. Basic wind speed is based on 3-second gust wind speeds in miles per hour at 33 feet above ground.
- b. Exposure classification to be determined using Section R301.2.1.4.
- c. Building heights used to determine design wind loads are: One story = 20 feet, Two story = 30 feet and Three story = 50 feet.
- d. Uplift loads act normal to the roof or overhang.
- e. NA = No design is required in accordance with Sections R602.3 and R802.11.
- f. Buildings over 50 feet in height, or with unusual construction or geometric shapes, with overhanging eave, projections greater than 24 inches, or located in special wind regions or localities, shall be designed in accordance with the provisions in the *Building Code*.



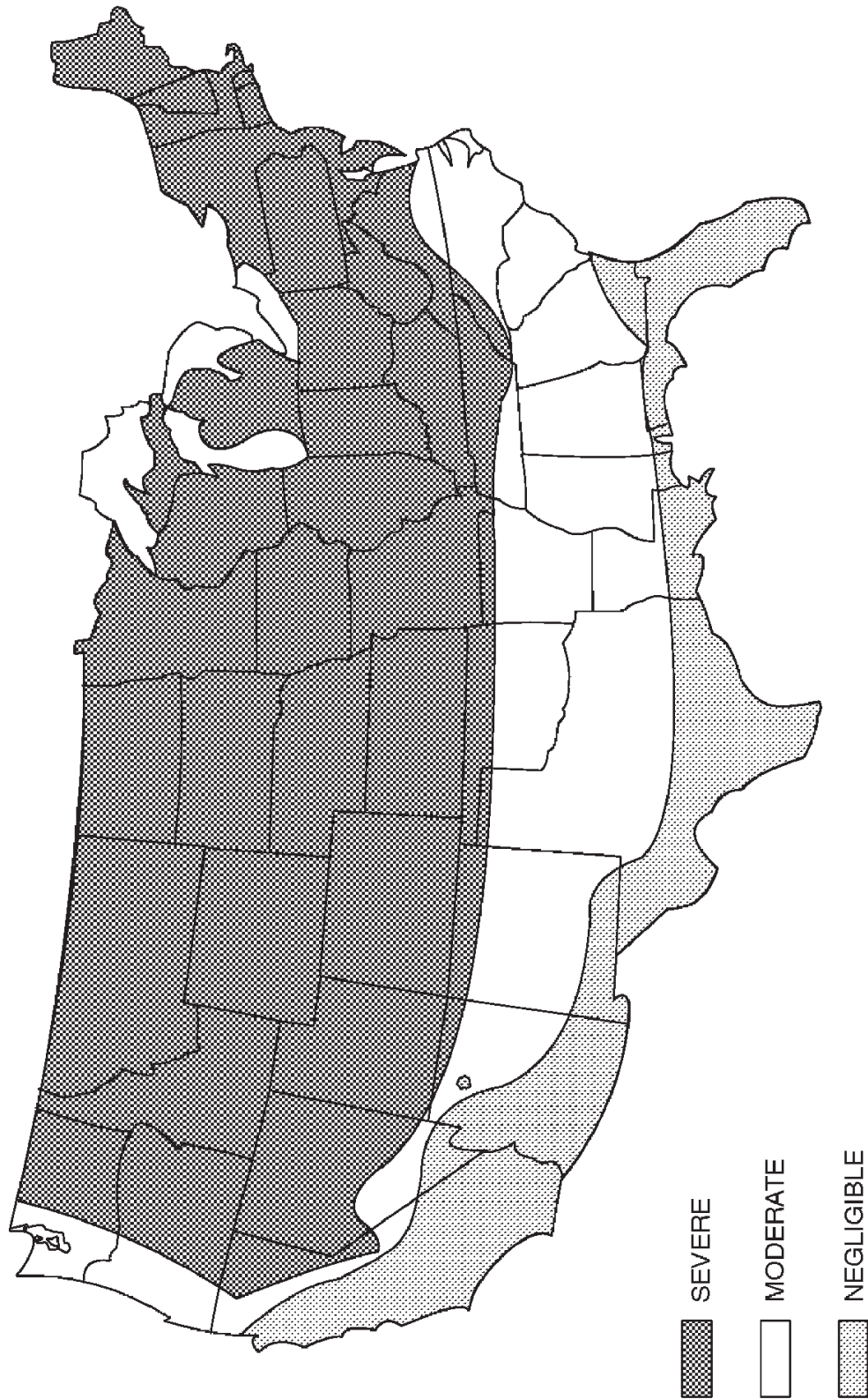
For SI: °C = [(°F)-32]/1.8.

FIGURE R301.2(1)
ISOLINES OF THE 97¹/₂ PERCENT WINTER (DECEMBER, JANUARY AND FEBRUARY) DESIGN TEMPERATURES (°F)
(Not adopted by the State of Oregon)



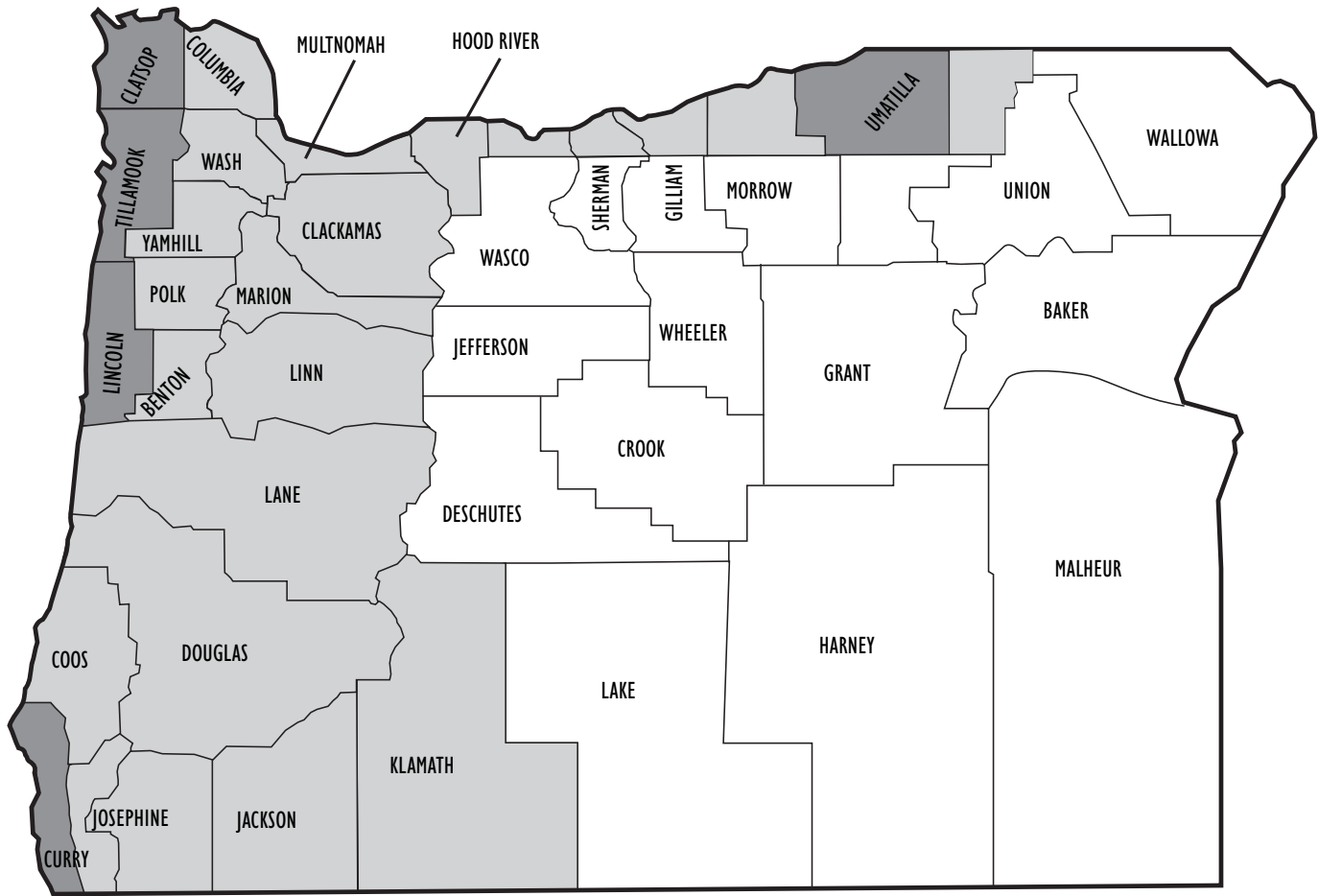
The boundary of Seismic Design Category D₂ in Douglas and Lane Counties is that land which lies westerly of Range 10 west of the Willamette Meridian.

FIGURE R301.2(2)
OREGON SEISMIC DESIGN CATEGORIES—SITE CLASS D

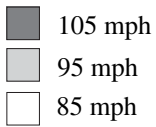


a. Alaska and Hawaii are classified as severe and negligible, respectively.
 b. Lines defining areas are approximate only. Local conditions may be more or less severe than indicated by region classification. A severe classification is where weather conditions result in significant snowfall combined with extended periods during which there is little or no natural thawing causing deicing salts to be used extensively.

**FIGURE R301.2(3)
 WEATHERING PROBABILITY MAP FOR CONCRETE**

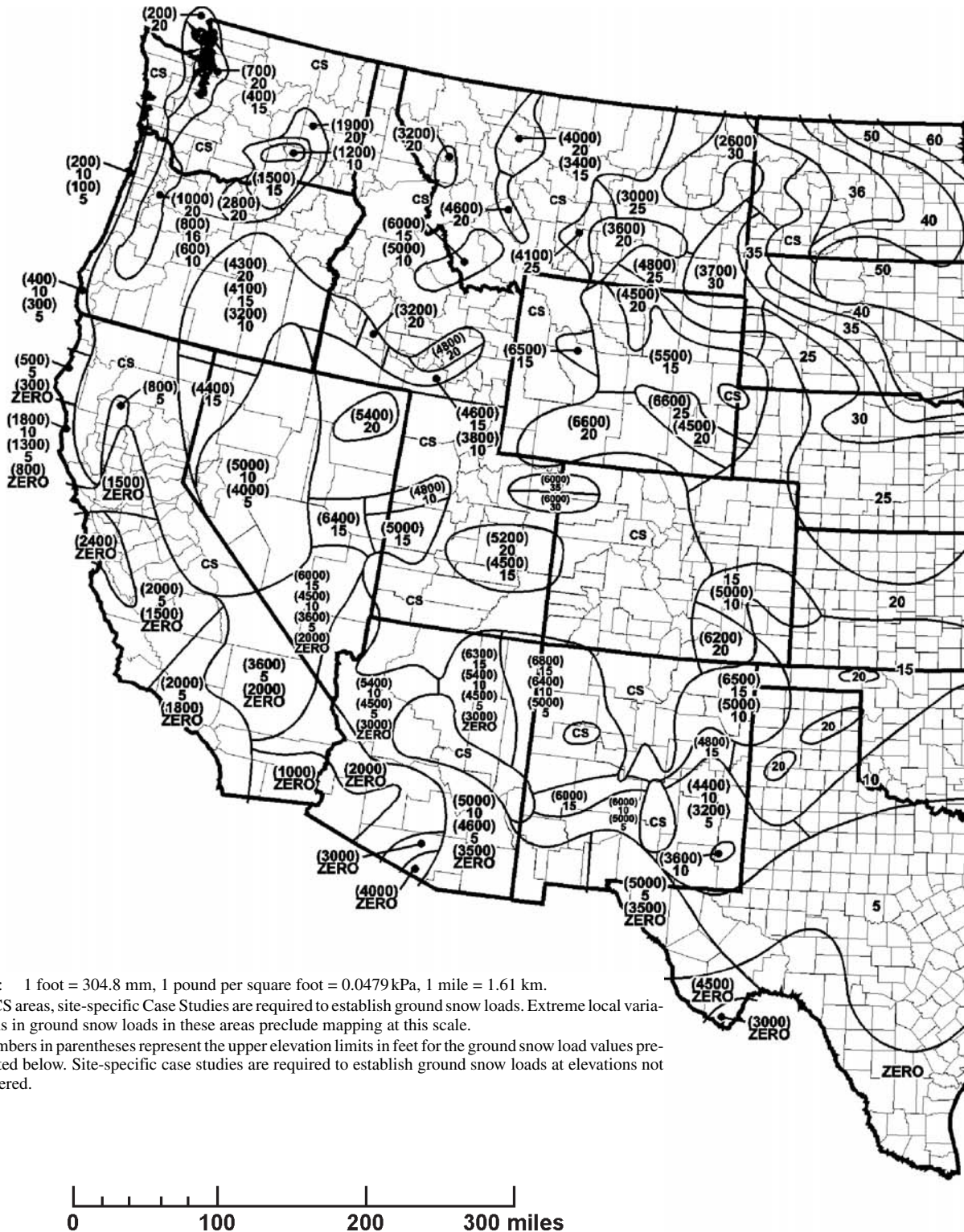


- a. All areas with full exposure to ocean winds shall be designed 105 mph areas.
- b. Values are nominal design 3-second gust wind speeds in miles per hour at 33 feet above ground for Exposure C category.



For SI: 1 mile per hour = 0.44 m/s

FIGURE R301.2(4)^{a, b}
OREGON BASIC WIND SPEEDS FOR 50-YEAR MEAN RECURRENCE INTERVAL



For SI: 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 mile = 1.61 km.

- In CS areas, site-specific Case Studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.
- Numbers in parentheses represent the upper elevation limits in feet for the ground snow load values presented below. Site-specific case studies are required to establish ground snow loads at elevations not covered.

FIGURE R301.2(5)
GROUND SNOW LOADS, P_g , FOR THE UNITED STATES (lb/ft²)
(Not adopted by the State of Oregon)

(continued)



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

FIGURE R301.2(5)
GROUND SNOW LOADS, P_g , FOR THE UNITED STATES (lb/ft²)
 (Not adopted by the State of Oregon)

R301.2.1.3 Wind speed conversion. When referenced documents are based on fastest mile wind speeds, the three-second gust basic wind speeds, V_{3s} , of Figure R301.2(4) shall be converted to fastest mile wind speeds, V_{fm} , using Table R301.2.1.3.

R301.2.1.4 Exposure category. For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

1. Exposure A. Large city centers with at least 50 percent of the buildings having a height in excess of 70 feet (21 336 mm). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mile (0.8 km) or 10 times the height of the building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account.
2. Exposure B. Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure.
3. Exposure C. Open terrain with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet (9144 mm) extending more than 1,500 feet (457 m) from the building site in any quadrant. This exposure shall also apply to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet (183 m). This category includes flat open country, grasslands and shorelines in hurricane prone regions.
4. Exposure D. Flat, unobstructed areas exposed to wind flowing over open water (excluding shore-

lines in hurricane prone regions) for a distance of at least 1 mile (1.61 km). Shorelines in Exposure D include inland waterways, the Great Lakes, and coastal areas of California, Oregon, Washington and Alaska. This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of 1500 feet (457 m) or 10 times the height of the building or structure, whichever is greater.

R301.2.2 Seismic provisions. The seismic provisions of this code shall apply to buildings constructed in Seismic Design Categories C, D₁ and D₂, as determined in accordance with this section.

Exception: Detached one- and two-family *dwellings* located in Seismic Design Category C are exempt from the seismic requirements of this code.

R301.2.2.1 Determination of seismic design category. Buildings shall be assigned a seismic design category in accordance with Table R301.2(1).

R301.2.2.1.1 Alternate determination of seismic design category. The Seismic Design Categories and corresponding Short Period Design Spectral Response Accelerations, S_{DS} shown in Figure R301.2(2) are based on soil Site Class D, as defined in Section 1613.5.2 of the *Building Code*. If soil conditions are other than Site Class D, the Short Period Design Spectral Response Accelerations, S_{DS} , for a site can be determined according to Section 1613.5 of the *Building Code*. The value of S_{DS} determined according to Section 1613.5 of the *Building Code* is permitted to be used to set the seismic design category according to Table R301.2.2.1.1.

**TABLE R301.2.2.1.1
SEISMIC DESIGN CATEGORY DETERMINATION**

CALCULATED S_{DS}	SEISMIC DESIGN CATEGORY
$S_{DS} \leq 0.17g$	A
$0.17g < S_{DS} \leq 0.33g$	B
$0.33g < S_{DS} \leq 0.50g$	C
$0.50g < S_{DS} \leq 0.83g$	D ₁
$0.83g < S_{DS} \leq 1.17g$	D ₂
$1.17g < S_{DS}$	E

**TABLE R301.2.1.3
EQUIVALENT BASIC WIND SPEEDS^a**

3-second gust, V_{3s}	85	90	100	105	110	120	125	130	140	145	150	160	170
Fastest mile, V_{fm}	71	76	85	90	95	104	109	114	123	128	133	142	152

For SI: 1 mile per hour = 0.447 m/s.

a. Linear interpolation is permitted.

R301.2.2.1.2 Alternative determination of Seismic Design Category E. Buildings located in Seismic Design Category E in accordance with Figure R301.2(2) are permitted to be reclassified as being in Seismic Design Category D₂ provided one of the following is done:

1. A more detailed evaluation of the seismic design category is made in accordance with the provisions and maps of the *Building Code*. Buildings located in Seismic Design Category E per Table R301.2.2.1.1, but located in Seismic Design Category D per the *Building Code*, may be designed using the Seismic Design Category D₂ requirements of this code.
2. Buildings located in Seismic Design Category E that conform to the following additional restrictions are permitted to be constructed in accordance with the provisions for Seismic Design Category D₂ of this code:
 - 2.1. All exterior shear wall lines or *braced wall panels* are in one plane vertically from the foundation to the uppermost story.
 - 2.2. Floors shall not cantilever past the exterior walls.
 - 2.3. The building is within all of the requirements of Section R301.2.2.2.5 for being considered as regular.

R301.2.2.2 Seismic limitations. The following limitations apply to buildings in all seismic design categories regulated by seismic provisions of this code.

R301.2.2.2.1 Weights of materials. Average dead loads shall not exceed 15 pounds per square foot (720 Pa) for the combined roof and ceiling assemblies (on a horizontal projection) or 15 pounds per square foot (720 Pa) for floor assemblies, except as further limited by Section R301.2.2.2. Dead loads for walls above grade shall not exceed:

1. Fifteen pounds per square foot (720 Pa) for exterior light-frame wood walls.
2. Fourteen pounds per square foot (670 Pa) for exterior light-frame cold-formed steel walls.
3. Ten pounds per square foot (480 Pa) for interior light-frame wood walls.
4. Five pounds per square foot (240 Pa) for interior light-frame cold-formed steel walls.
5. Eighty pounds per square foot (3830 Pa) for 8-inch-thick (203 mm) masonry walls.
6. Eighty-five pounds per square foot (4070 Pa) for 6-inch-thick (152 mm) concrete walls.
7. Ten pounds per square foot (480 Pa) for SIP walls.

Exceptions:

1. Roof and ceiling dead loads of 15 psf, but not exceeding 25 pounds per square foot (1190 Pa) shall be permitted

provided the wall bracing amounts in Chapter 6 are increased in accordance with Table R301.2.2.2.1.

2. Light-frame walls with stone or masonry veneer shall be permitted in accordance with the provisions of Sections R702.1 and R703.
3. Fireplaces and chimneys shall be permitted in accordance with Chapter 10.

**TABLE R301.2.2.2.1
WALL BRACING ADJUSTMENT FACTORS BY
ROOF COVERING DEAD LOAD^a**

WALL SUPPORTING	ROOF/CEILING DEAD LOAD	
	15 psf or less	25 psf
Roof only	1.0	1.2
Roof plus one or two stories	1.0	1.1

For SI: 1 pound per square foot = 0.0479 kPa.

a. Linear interpolation shall be permitted.

R301.2.2.2.2 Stone and masonry veneer. Anchored stone and masonry veneer shall comply with the requirements of Sections R702.1 and R703.

R301.2.2.2.3 Masonry construction. Masonry construction shall comply with the requirements of Section R606.11.2.

R301.2.2.2.4 Concrete construction. Detached one- and two-family *dwelling*s with exterior above-grade concrete walls shall comply with the requirements of Section R611, PCA 100 or shall be designed in accordance with ACI 318. *Townhouses* with above-grade exterior concrete walls shall comply with the requirements of PCA 100 or shall be designed in accordance with ACI 318.

R301.2.2.2.5 Irregular buildings. Prescriptive construction as regulated by this code shall not be used for irregular structures located in Seismic Design Categories C, D₁ and D₂. Irregular portions of structures shall be designed in accordance with accepted engineering practice to the extent the irregular features affect the performance of the remaining structural system. When the forces associated with the irregularity are resisted by a structural system designed in accordance with accepted engineering practice, design of the remainder of the building shall be permitted using the provisions of this code. A building or portion of a building shall be considered to be irregular when one or more of the following conditions occur:

1. When exterior shear wall lines or *braced wall panels* are not in one plane vertically from the foundation to the uppermost *story* in which they are required.

Exception: For wood light-frame construction, floors with cantilevers or setbacks not exceeding four times the nominal depth of the wood floor joists are permitted to support

braced wall panels that are out of plane with *braced wall panels* below provided that:

1. Floor joists are nominal 2 inches by 10 inches (51 mm by 254 mm) or larger and spaced not more than 16 inches (406 mm) on center.
 2. The ratio of the back span to the cantilever is at least 2 to 1.
 3. Floor joists at ends of *braced wall panels* are doubled.
 4. For wood-frame construction, a continuous rim joist is connected to ends of all cantilever joists. When spliced, the rim joists shall be spliced using a galvanized metal tie not less than 0.058 inch (1.5 mm) (16 gage) and 1½ inches (38 mm) wide fastened with six 16d nails on each side of the splice or a block of the same size as the rim joist of sufficient length to fit securely between the joist space at which the splice occurs fastened with eight 16d nails on each side of the splice; and
 5. Gravity loads carried at the end of cantilevered joists are limited to uniform wall and roof loads and the reactions from headers having a span of 8 feet (2438 mm) or less.
2. When a section of floor or roof is not laterally supported by shear walls or *braced wall lines* on all edges.

Exception: Portions of floors that do not support shear walls or *braced wall panels* above, or roofs, shall be permitted to extend no more than 6 feet (1829 mm) beyond a shear wall or *braced wall line*.

3. When the end of a *braced wall panel* occurs over an opening in the wall below and ends at a horizontal distance greater than 1 foot (305 mm) from the edge of the opening. This provision is applicable to shear walls and *braced wall panels* offset in plane and to *braced wall panels* offset out of plane as permitted by the exception to Item 1 above.

Exception: For wood light-frame wall construction, one end of a *braced wall panel* shall be permitted to extend more than 1 foot (305 mm) over an opening not more than 8 feet (2438 mm) wide in the wall below provided that the opening includes a header in accordance with the following:

1. The building width, loading condition and framing member species limitations of Table R502.5(1) shall apply; and

2. Not less than one 2 × 12 or two 2 × 10 for an opening not more than 4 feet (1219 mm) wide; or
 3. Not less than two 2 × 12 or three 2 × 10 for an opening not more than 6 feet (1829 mm) wide; or
 4. Not less than three 2 × 12 or four 2 × 10 for an opening not more than 8 feet (2438 mm) wide; and
 5. The entire length of the *braced wall panel* does not occur over an opening in the wall below.
4. Where openings in the floor or roof diaphragms having a maximum dimension of greater than 50 percent of the distance between lines of bracing or an area greater than 25 percent of the area between orthogonal pairs of braced wall lines are present, the structure shall be considered to be irregular.
5. When portions of a floor level are vertically offset.

Exceptions:

1. Framing supported directly by continuous foundations at the perimeter of the building.
2. For wood light-frame construction, floors shall be permitted to be vertically offset when the floor framing is lapped or tied together as required by Section R502.6.1.
6. When shear walls and *braced wall lines* do not occur in two perpendicular directions.
7. When stories above-grade partially or completely braced by wood wall framing in accordance with Section R602 or steel wall framing in accordance with Section R603 include masonry or concrete construction.

Exception: Fireplaces, chimneys and masonry veneer as permitted by this code. When this irregularity applies, the entire *story* shall be designed in accordance with accepted engineering practice.

R301.2.2.3 Seismic Design Categories D₁ and D₂.

Structures assigned to Seismic Design Categories D₁ and D₂ shall conform to the requirements for Seismic Design Category C and the additional requirements of this section.

R301.2.2.3.1 Height limitations. Wood framed buildings shall be limited to three stories above *grade* or the limits given in Table R602.10.1.2(2). Cold-formed steel framed buildings shall be limited to less than or equal to three stories above *grade* in accordance with AISI S230. Mezzanines as defined in Section R202 shall not be considered as stories. Struc-

tural insulated panel buildings shall be limited to two stories above *grade*.

R301.2.2.3.2 Stone and masonry veneer. Anchored stone and masonry veneer shall comply with the requirements of Sections R702.1 and R703.

R301.2.2.3.3 Masonry construction. Masonry construction in Seismic Design Category D₁ shall comply with the requirements of Section R606.11.3. Masonry construction in Seismic Design Category D₂ shall comply with the requirements of Section R606.11.4.

R301.2.2.3.4 Concrete construction. Buildings with exterior above-*grade* concrete walls shall comply with PCA 100 or shall be designed in accordance with ACI 318.

R301.2.2.3.5 Cold-formed steel framing in Seismic Design Categories D₁ and D₂. In Seismic Design Category D₁ and D₂ in addition to the requirements of this code, cold-formed steel framing shall comply with the requirements of AISI S230.

R301.2.2.3.6 Masonry chimneys. Masonry chimneys shall be reinforced and anchored to the building in accordance with Sections R1003.3 and R1003.4.

R301.2.2.3.7 Anchorage of water heaters. Water heaters shall be anchored against movement and overturning in accordance with Section M1307.2.

R301.2.2.4 Seismic Design Category E. Buildings in Seismic Design Category E shall be designed in accordance with the *Building Code*, except when the seismic design category is reclassified to a lower seismic design category in accordance with Section R301.2.2.1.

R301.2.3 Snow loads. Wood framed construction, cold-formed steel framed construction and masonry and concrete construction, and structural insulated panel construction in regions with ground snow loads 70 pounds per square foot (3.35 kPa) or less, shall be in accordance with Chapters 5, 6 and 8. Buildings in regions with ground snow loads greater than 70 pounds per square foot (3.35 kPa) shall be designed in accordance with accepted engineering practice.

Exception: Wood framed construction shall be permitted to be constructed in accordance with WWPA Western Lumber Span Tables.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established by the local jurisdiction shall be designed and constructed in accordance with Section R322. The jurisdiction shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency (FEMA) in an engineering report entitled "The Flood Insurance Study for [INSERT NAME OF JURISDICTION]," dated [INSERT DATE OF ISSUANCE], as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM)

and related supporting data along with any revisions thereto. The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this section.

R301.3 Story height. Buildings constructed in accordance with these provisions shall be limited to *story heights* of not more than the following:

1. For wood wall framing, the laterally unsupported bearing wall stud height permitted by Table R602.3(5) plus a height of floor framing not to exceed 16 inches (406 mm).

Exception: For wood framed wall buildings with bracing in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2), the wall stud clear height used to determine the maximum permitted *story height* may be increased to 12 feet (3658 mm) without requiring an engineered design for the building wind and seismic force resisting systems provided that the length of bracing required by Table R602.10.1.2(1) is increased by multiplying by a factor of 1.10 and the length of bracing required by Table R602.10.1.2(2) is increased by multiplying by a factor of 1.20. Wall studs are still subject to the requirements of this section.

2. For steel wall framing, a stud height of 10 feet (3048 mm), plus a height of floor framing not to exceed 16 inches (406 mm).
3. For masonry walls, a maximum bearing wall clear height of 12 feet (3658 mm) plus a height of floor framing not to exceed 16 inches (406 mm).

Exception: An additional 8 feet (2438 mm) is permitted for gable end walls.

4. For insulating concrete form walls, the maximum bearing wall height per *story* as permitted by Section R611 tables plus a height of floor framing not to exceed 16 inches (406 mm).
5. For structural insulated panel (SIP) walls, the maximum bearing wall height per *story* as permitted by Section 614 tables shall not exceed 10 feet (3048 mm) plus a height of floor framing not to exceed 16 inches (406 mm).

Individual walls or walls studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided *story heights* are not exceeded. Floor framing height shall be permitted to exceed these limits provided the *story height* does not exceed 11 feet 7 inches (3531 mm). An engineered design shall be provided for the wall or wall framing members when they exceed the limits of Chapter 6. Where the *story height* limits are exceeded, an engineered design shall be provided in accordance with the *Building Code* for the overall wind and seismic force resisting systems.

R301.4 Dead load. The actual weights of materials and construction shall be used for determining dead load with consideration for the dead load of fixed service *equipment*.

R301.5 Live load. The minimum uniformly distributed live load shall be as provided in Table R301.5.

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(in pounds per square foot)

USE	LIVE LOAD
Attics without storage ^b	10
Attics with limited storage ^{b, g}	20
Attics served with fixed stairs	30
Balconies (exterior) and decks ^c	40
Fire escapes	40
Guardrails and handrails ^d	200 ^h
Guardrail in-fill components ^f	50 ^h
Passenger vehicle garages ^a	50 ^a
Rooms other than sleeping room	40
Sleeping rooms	30
Stairs	40 ^c

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 6-inch square-area anywhere when on the floor and shall be capable of supporting two 2000-pound loads each applied over 6-inch-square areas centered 5 feet apart perpendicular to the direction of vehicle entry and a second pair of 2000-pound loads 9 feet from and aligned with the first pair of 2000-pound loads. These loads shall be applied anywhere on the floor but need not be applied closer than 2 feet from the interior end wall nor closer than 1 foot from interior sidewalls.
- b. No storage with roof not over 3 units in 12 units.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R502.2.2 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. For attics with limited storage and constructed with trusses, this live load need be applied only to those portions of the bottom chord where there are two or more adjacent trusses with the same web configuration capable of containing a rectangle 42 inches high or greater by 2 feet wide or greater, located within the plane of the truss. The rectangle shall fit between the top of the bottom chord and the bottom of any other truss member, provided that each of the following criteria is met.
 - 1. The attic area is accessible by a pull-down stairway or framed opening in accordance with Section R807.1.
 - 2. The truss has a bottom chord pitch less than 2:12.
 - 3. Required insulation depth is less than the bottom chord member depth.

The bottom chords of trusses meeting the above criteria for limited storage shall be designed for the greater of the actual imposed dead load or 10 psf, uniformly distributed over the entire span.
- h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

R301.6 Roof load. The roof shall be designed for the live load indicated in Table R301.6 or the snow load indicated in Table R301.2(1), whichever is greater.

R301.7 Deflection. The allowable deflection of any structural member under the live load listed in Sections R301.5 and R301.6 shall not exceed the values in Table R301.7.

TABLE R301.6
MINIMUM ROOF LIVE LOADS IN POUNDS-FORCE
PER SQUARE FOOT OF HORIZONTAL PROJECTION

ROOF SLOPE	TRIBUTARY LOADED AREA IN SQUARE FEET FOR ANY STRUCTURAL MEMBER		
	0 to 200	201 to 600	Over 600
Flat or rise less than 4 inches per foot (1:3)	20	16	12
Rise 4 inches per foot (1:3) to less than 12 inches per foot (1:1)	16	14	12
Rise 12 inches per foot (1:1) and greater	12	12	12

For SI: 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kPa, 1 inch per foot = 83.3 mm/m.

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

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Rafters having slopes greater than 3:12 with no finished ceiling attached to rafters	L/180
Interior walls and partitions	H/180
Floors and plastered ceilings	L/360
All other structural members	L/240
Exterior walls with plaster or stucco finish	H/360
Exterior walls—wind loads ^a with brittle finishes	H/240
Exterior walls—wind loads ^a with flexible finishes	L/120 ^d
Lintels supporting masonry veneer walls ^c	L/600

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

- a. The wind load shall be permitted to be taken as 0.7 times the Component and Cladding loads for the purpose of the determining deflection limits herein.
- b. For cantilever members, L shall be taken as twice the length of the cantilever.
- c. For aluminum structural members or panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or sandwich panels, the total load deflection shall not exceed L/60. For continuous aluminum structural members supporting edge of glass, the total load deflection shall not exceed L/175 for each glass lite or L/60 for the entire length of the member, whichever is more stringent. For sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed L/120.
- d. Deflection for exterior walls with interior gypsum board finish shall be limited to an allowable deflection of H/180.
- e. Refer to Section R703.7.2.

R301.8 Nominal sizes. For the purposes of this code, where dimensions of lumber are specified, they shall be deemed to be nominal dimensions unless specifically designated as actual dimensions.

SECTION R302
FIRE-RESISTANT CONSTRUCTION

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

Exceptions:

- 1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.

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

R302.2 Townhouses. Each townhouse shall be considered a separate building and shall be separated by a 2-hour fire-resistance-rated wall assemblies meeting the requirements of this section for exterior walls. The fire-resistance wall assembly shall be allowed to be reduced to 1 hour when an automatic fire sprinkler system is installed in accordance with Appendix T, NFPA 13D or other approved sprinkler system. Where a sprinkler system is not installed, such walls shall be of one of the following types:

1. Two 1-hour fire-resistance-rated fire walls, one on each side of the common property line as shown in Figures R302.2(a) and R302.2(b).
2. A common “modified” 2-hour fire-resistance rated firewall centered over the common property line as shown in Figures R302.2(c) and R302.2(d). Plumbing or mechanical equipment, ducts or vents are not permitted in the cavity of the “modified” 2-hour wall. Electrical installations shall be installed in accordance with the *Electrical Code*. Penetrations of electrical outlet boxes shall be in accordance with Section R302.3.
3. A common 2-hour fire-resistance-rated wall. Plumbing or mechanical equipment, ducts or vents are not permitted in the cavity of the common 2-hour wall. Electrical installations shall be installed in accordance with the *Electrical Code*. Penetrations of electrical outlet boxes shall be in accordance with Section R302.3.

Exception: A common 2-hour fire-resistance-rated wall is not permitted townhouses that are separated by a real property line.

4. Other listed, tested assemblies that provide an equivalent fire protection rating.

Exception: Privacy walls may be constructed of heavy timber construction.

Mixed occupancies are not permitted in townhouse buildings. Such buildings shall be designed and constructed in accordance with the requirements set forth for mixed occupancies in the *Building Code*.

Exception: Private garages and carports attached to dwelling units and totaling not more than 1,000 square feet (92.9 m²) in area per dwelling unit.

Buildings shall adjoin or have access to a yard, street, alley, or public way on not less than one side. The centerline of an adjoining public way shall be considered an adjacent property line.

R302.2.1 Maintenance agreements and utility easements. The formation, approval and recording or maintenance agreements and utility easements shall comply with the requirements of this section.

R302.2.1.1 Maintenance agreements. Where townhouses are separated by real property lines, the building official shall review, approve, cosign and maintain a record of all maintenance agreements as required by this section.

R302.2.1.1.1 Maintenance agreements and easements. Building elements and utilities that cross real property lines require the creation of legally documented easements. Maintenance agreements shall be created and signed by the affected townhouse property owners. The maintenance agreements must address the repair, upkeep and replacement and access to shared or common use building elements and utilities. Easements may be general in nature, or they may describe specific locations. When available, a copy of the plat showing the locations of such ease-

**TABLE R302.1
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	(Fire-resistance rated)	1 hour-tested in accordance with ASTM E 119 or UL 263 with exposure from both sides	< 3 feet
	(Not fire-resistance rated)	0 hours	≥ 3 feet
Projections	(Fire-resistance rated)	1 hour on the underside	≥ 2 feet to 3 feet
	(Not fire-resistance rated)	0 hours	3 feet
Openings in walls	Not allowed	N/A	< 3 feet
	Unlimited	0 hours	3 feet or greater
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet or greater

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

ments shall be attached to the maintenance agreement.

Prior to recording at the county recorder's office, the maintenance agreement shall be reviewed and approved by the building official. In cases where individual townhouses are separated by real property lines and are structurally dependent, the building official shall cosign the maintenance agreements and require that the recorded easements and maintenance agreements not be modified or suspended without building official approval. Unless otherwise approved by the building official, the applicant shall provide a copy of the recorded easements and maintenance agreements to the building official prior to issuance of the building permit. Maintenance agreements and easements shall be recorded for each dwelling unit and the book and page number provided to the jurisdiction having authority.

Maintenance agreements shall include, but not be limited to, the following information:

1. Names and contact information of the property owners included in the maintenance agreement;
2. Physical address and map and tax lot number of the affected properties;
3. A detailed listing of common or shared structural elements such as common foundations, common or shared fire walls, porches and porch coverings, and projections crossing real property lines, roofing or exterior finish materials, lateral force resisting systems in the case of structurally dependant townhouses, and common or shared utilities and service equipment;
4. A statement of responsibility, including duties and sharing of cost for the maintenance and repair of common or shared fire walls separating individual townhouses; attached garages, porches and decks, and porch coverings;
5. A description of easements, common areas, surface drainage provisions and on-site improvements;
6. Possible enforcement actions by the building official or affected parties to facilitate the maintenance, repair or replacement of common property line fire walls may be included as a condition of the cosigned maintenance agreements. Such maintenance, repair or replacement may also be facilitated through application of a local housing or nuisance abatement ordinance, or an existing building or property maintenance code.

R302.2.1.2 Site utilities, service equipment and easements. The portions of underground electrical, plumbing or gas utilities that are shared or in common use shall lie within a recorded easement and be recorded in a maintenance agreement as required by Section R302.2.1.1. Shared or common use utilities shall not run beneath a townhouse. Separate utility services shall be supplied to

each individual townhouse. Utilities serving an individual townhouse shall not run beneath another townhouse. For townhouses on assumed property lines, service equipment and meters may be grouped in one or more locations as approved by local ordinance and the utility provider. The locations of all site utilities, service equipment, and easements shall be clearly shown on the plans.

R302.2.2 Continuity. The fire-resistance-rated wall or assembly separating *townhouses* shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed *accessory structures*.

R302.2.2.1 Fire-resistance-rated wall continuity. The continuity of fire-resistance-rated walls shall be as follows:

1. Exterior walls and common townhouse separation walls shall be continuous from the foundation to the underside of the roof sheathing when the roof/ceiling assembly is constructed in accordance with Section R302.2.4.1. The common townhouse separation wall shall extend to completely separate adjacent townhouses and any attached accessory structures.
2. Privacy walls separating porches and decks without a cover shall be continuous from the foundation to the top of the guardrail and have a minimum height of 3 feet (914 mm) above the porch or deck finish floor elevation. The privacy wall shall extend out to the outermost point of the porch or deck.
3. Privacy walls separating porch and deck coverings shall be continuous from the foundation to the underside of the roof sheathing when the roof/ceiling assembly is constructed in accordance with Section R302.2.4.1. The privacy wall shall extend out to the outermost point of the porch covering.

The fire-rated gypsum wallboard used in exterior walls, privacy walls, and common townhouse separation walls shall be continuous behind building elements, such as showers, bathtubs, cabinets, chases, soffits, electrical panels, and stair stringers.

Exception: Gypsum board may be omitted behind stair stringers, provided that the stringers are constructed of:

1. Solid sawn dimensional lumber of not less than 3 inches (76 mm) nominal thickness when used in conjunction with two 1-hour fire-resistive-rated wall assemblies as shown in Figure R302.2.2 (Detail A).
2. Solid sawn dimensional lumber of not less than 4.5 inches (114 mm) nominal thickness when used in conjunction with a 2-hour fire-resistive-rated wall assembly as shown in Figure R302.2.2 (Detail B).

3. Engineered wood systems that have been tested and listed for equivalent burning characteristics.

R302.2.2.2 Fire-resistive-rated protection for porches and decks without a cover. Fire-resistive-rated protection shall be provided for porches and decks without a cover in accordance with this section. Porches and decks shall be protected by one of the following methods.

1. In the case where one porch or deck is adjacent to another porch or deck, and both are within 3 feet (914 mm) of the common property line, a single 1-hour fire-resistance-rated privacy wall shall be provided for each porch or deck. The privacy walls shall extend out at least to the furthest point where the porches or decks are adjacent.
2. In the case where one porch or deck abuts another adjacent porch or deck at a common property line, either two 1-hour fire-resistive-rated walls or a “modified” 2-hour fire-resistive-rated common townhouse separation wall shall be provided. The townhouse separation wall shall extend out to the furthest point where either porches or decks are adjacent.
3. In the case where a porch or deck is within 3 feet (914 mm) of a common property line and there is no adjacent porch or deck, the porch or deck shall be either noncombustible or heavy timber construction (see Figure R302.2.2.1). Heavy timber porch components supporting only the dead load of the porch or deck and the live load listed in Table R301.5 shall be constructed using the following:
 - 3.1. Supporting posts for porches and decks shall be a minimum of 6 inch (153 mm) nominal thickness.
 - 3.2. Joists or beams supporting porches and decks shall be a minimum of 4-inch (102 mm) nominal thickness.
 - 3.3. Decking on porches and decks shall be a minimum of 2-inch (51 mm) nominal thickness.

The fire-resistive-rated walls required in Items 1 and 2 shall be continuous from the foundation to top of the guardrail and have a minimum height of 3 feet (914 mm) above the porch or deck finish floor elevation. Porches and decks that extend beyond the privacy wall on one side only need not be protected past the privacy wall unless they are within 3 feet (914 mm) of a common property line.

Exception: Porches and decks without a cover and located within 3 feet (914 mm) of a common property line need not be fire-resistance rated when the finish floor of the deck or porch is less than 30 inches (762 mm) above grade.

R302.2.2.3 Fire-resistive-rated separation for porch covers. Fire-resistive-rated protection shall be provided for porch covers in accordance with this section. Abutting porch covers attached to structurally independent or dependent townhouses may share building elements as allowed by Section R302.2.5.

In the case where one porch cover is adjacent to another porch cover, and both are within 3 feet (914 mm) of the common property line, a single 1-hour fire-resistive privacy wall shall be provided for each porch cover. The privacy walls shall extend out to the furthest point where the porch covers are adjacent.

In the case where one porch cover abuts another adjacent porch cover at a common property line, either two 1-hour fire-resistive-rated walls or a “modified” 2-hour fire-resistive rated common townhouse separation wall shall be provided. The townhouse separation wall shall extend out to the furthest point where both porch covers are adjacent.

In the case where there is no adjacent porch cover, a 1-hour fire-resistive-rated exterior wall shall be provided. The exterior wall shall extend out to the furthest point of the porch cover.

The fire-resistive-rated walls required in Items 1 through 3 shall be continuous from the foundation to the roof sheathing when the roof/ceiling assembly is constructed in accordance with Section R302.2.4.1. When the roof/ceiling assembly is not constructed in accordance with Section R302.2.4.1, the wall shall terminate in a parapet constructed in accordance with Section R302.2.3. Porch covers separated by a fire-resistive-rated privacy or dwelling unit separation wall need not be fire resistance rated.

Exceptions:

1. A privacy wall need not protect porch covers and the porch covering need not be fire-resistance rated when each individual townhouse is provided with a fire suppression system in accordance with NFPA 13D. The porch covering may be open construction or it may be fully enclosed when the ceiling is of not less than 1-hour fire-resistive construction.
2. A privacy wall need not protect a porch cover when the cover is constructed entirely of heavy timber construction. Heavy timber porch cover components shall be provided according to the following:
 - 2.1. Supporting post for porch coverings shall be a minimum of 6-inch (153 mm) nominal thickness.
 - 2.2. Joists or beams supporting porch coverings shall be a minimum of 4-inch (102 mm) nominal thickness.
 - 2.3. Roof sheathing shall be a minimum of 2-inch (51 mm) nominal thickness.

The heavy timber porch cover shall be open construction unless enclosed at the ceiling by not less than 1-hour fire-resistive construction.

3. A privacy wall need not protect porch covers, and they may be of nonfire resistance rated construction when they project no further than 2 feet (610 mm) from the face of the building.
4. A privacy wall need not protect porch covers and they may be of nonfire resistance rated construction when:
 - 4.1. The exterior wall of the building perpendicular to the common property line is 1-hour fire-resistive construction for a distance of 4 feet (1219 mm) each side of common property line, and there are no openings from the foundation to underside of the porch roof sheathing. When individual townhouses are stepped, no openings shall be allowed in the foundation within 4 feet (1219 mm) of the property line.
 - 4.2. Where a porch cover projects less than 4 feet (1220 mm) from the face of the building, the adjacent building walls and porch roof may be protected for a distance equal to the distance the porch cover projects.
 - 4.3. The porch cover may be open-frame construction. When fully enclosed the ceiling shall be of not less than 1-hour fire-resistive construction (see Figure R302.2.2.2).
 - 4.4. Enclosed attic space shall be separated at the common property line with either two 1-hour separation walls or one common “modified” 2-hour townhouse separation wall.
 - 4.5. The parapet may be omitted on both open-framed and enclosed porch covers when the roof is sheathed with fire retardant treated plywood or $\frac{5}{8}$ -inch (9.6 mm) Type X gypsum sheathing for a horizontal distance of 4 feet (1219 mm) measured perpendicular to the common property line.

R302.2.2.4 Fire-resistive rated construction for exterior stairways. Exterior stairs located within 3 feet (914 mm) of a common property line shall be of fire-resistance-rated construction in accordance with this section (see Figure R302.2.2.3).

1. Structurally independent stairs may be connected at the common property line with common treads a minimum of 6 feet (1829 mm) wide of noncombustible or heavy timber construction.
2. Stairs serving an uncovered porch that serves not more than two individual townhouses may cross

the common property line. Such stairs shall be a minimum of 44 inches (1118 mm) in width and be of noncombustible or heavy timber construction.

3. Stairs constructed using heavy timbers shall comply with this section and Figure R302.2.2. Heavy timber stair components supporting only the stair or landing dead load and the live load listed in Table R301.5 shall be constructed using the following minimum material thicknesses:
 - 3.1. Supporting posts for stairs shall be a minimum of 6-inch (152 mm) nominal thickness.
 - 3.2. Stair stringers shall be a minimum of 4-inch (102 mm) nominal thickness.
 - 3.3. Joists or beams supporting landings shall be a minimum of 4-inch (102 mm) nominal thickness.
 - 3.4. Stair treads and landing decking shall be a minimum of 2-inch (51 mm) nominal thickness.

Exceptions:

1. Stairs located within 3 feet (914 mm) of a common property line need not be fire-resistance-rated when they are not under cover and not over 30 inches (762 mm) above grade.
2. Stairs may be located within 3 feet (914 mm) of a common property line when constructed of noncombustible materials.

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

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

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

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

A parapet is not required for roofs complying with Section R302.2.4.

R302.2.3.1 Parapet construction. Parapets shall have the same fire-resistance rating as that required for the supporting wall or walls. On any side adjacent to a roof surface, the parapet shall have noncombustible faces for the uppermost 18 inches (457 mm), to include counterflashing and coping materials. Where the roof slopes toward a parapet at slopes greater than 2 units vertical in 12 units horizontal (16.7-percent slope), the parapet shall extend to the same height as any portion of the roof within a distance of 3 feet (914 mm), but in no case shall the height be less than 30 inches (762 mm).

R302.2.4 Roof construction. In addition to the requirements of Chapter 8 of this code, townhouse structures shall comply with this section for fire-resistance-rated roof/ceiling construction, roof/ceiling penetrations and cricket construction. Projections of eaves, cornices and similar components shall comply with Section R302.2.4.4.

R302.2.4.1 Fire-resistance rated roof/ceiling construction. Roof/ceiling assemblies intersecting fire-resistive rated exterior walls may be of nonrated construction. Roof/ceiling assemblies intersecting common fire-resistance-rated individual townhouse unit separation walls and privacy walls associated with porch covers and decks may comply with Section R302.2.3 or be constructed in accordance with this section.

1. A roof/ceiling assembly with framing oriented perpendicular to a 1-hour wall shall be constructed in accordance with Figure R302.2(a). The roof sheathing shall be either fire-retardant treated plywood or have a minimum of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board installed under the standard plywood sheathing for a minimum horizontal distance of 4 feet (1219 mm) from the common property line.
2. A roof/ceiling assembly with framing oriented parallel to a 1-hour wall shall be constructed in accordance with Figure R302.2(b).
3. A roof/ceiling assembly with framing oriented perpendicular to a “modified” 2-hour common wall shall be constructed in accordance with Figure R302.2(c). The roof sheathing shall be either fire-retardant-treated plywood or have a minimum of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board installed under the standard plywood roof sheathing for a minimum horizontal distance of 4 feet (1219 mm) from the common property line.

4. A roof/ceiling assembly with framing oriented parallel to a “modified” 2-hour common wall shall be constructed in accordance with Figure R302.2(d).
5. As an alternative to Items 1 through 4, the entire ceiling of the upper story shall be protected throughout with two layers of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board as required for a 1-hour fire-resistive roof/ceiling assembly. Where roof framing is parallel to a common townhouse separation wall, a 1-hour attic enclosure, “mushroom” may be constructed according to Figure R302.2.4.1 and the two layers of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board on the ceiling may terminate at the outside vertical edge of the “mushroom.”

R302.2.4.2 Roof/ceiling penetrations. Membrane penetrations of the fire-resistance-rated ceiling required by Section R302.2.4.1 shall be protected by an approved penetration firestop system in accordance with Section R302.3.1.1 and Sections 711 and 712 of the *Building Code*. Through penetrating items shall be enclosed within a shaft constructed in accordance with *Building Code*.

Skylights, mechanical and plumbing vents, attic vents, solar collectors and similar penetrations of the roof are not permitted within 4 feet (1219 mm) of the common property line.

Exceptions:

1. Chimneys may penetrate roofs within 4 feet (1219 mm) of a common property line when a spark arrestor is installed at the terminus. Where factory-built chimneys are located within 4 feet (1219 mm) of a common property line, they shall be enclosed within 1-hour rated shafts constructed in accordance with Section 707 of the *Building Code*. Such a shaft must extend from where the factory-built chimney first penetrates a fire-resistance-rated wall or ceiling and must continue to the upper most termination of the chimney.
2. Unprotected factory-built chimneys and other unprotected penetrations are allowed within 4 feet (1219 mm) of common property lines when parapets are provided in accordance with Section R302.2.3.

R302.2.4.3 Cricket construction. Where crickets are installed, one of the following methods of construction shall be used.

1. In the case where crickets are 30 inches (762 mm) or less in height, the common fire-resistive townhouse separation wall may terminate at the underlying roof sheathing. The underlying roof sheathing shall be protected with either fire-retardant-treated plywood or have a minimum of $\frac{5}{8}$ inch (15.9 mm) Type X gypsum board installed under the standard plywood roof sheathing for the full extent of the cricket, but not less than 4 feet

(1219 mm) measured horizontally from the common property line. There shall be no openings in the roof sheathing under the cricket [see Figures R302.2.4.3 (a) and (b)].

- In the case where crickets greater than 30 inches (762 mm) in height are provided, the common fire-resistive townhouse separation wall shall extend to the cricket roof sheathing, and the cricket roof sheathing shall be protected with either fire-retardant-treated plywood or have a minimum of 5/8 inch (15.9 mm) Type X gypsum board installed under the standard plywood roof sheathing for a minimum horizontal distance of 4-feet on each side of common property line. There shall be no openings in the cricket sheathing. See Figure R302.2.4.3(c).

R302.2.4.4 Eaves, cornices and similar projections.

Projections located less than 3 feet (914 mm) from a common property line shall be in accordance with this section. Structural projections such as enclosed eaves and cornices located within 3 feet (914 mm) of a common property line shall be constructed in accordance with the Table R302.2.4.4. In the case where projections extend beyond the common property line onto an adjacent property, appropriate easements and maintenance agreements shall be implemented as described in Section R302.2.1. Projections within 3 feet (914 mm) of an exterior common property line shall be in accordance with Section R302.1.

R302.2.5 Structural design approach. Townhouse structures shall be permitted to be designed as structurally dependent structures, structurally independent structures or a combination of both.

R302.2.5.1 Lateral force analysis. A lateral force analysis shall be submitted at the time of application when townhouses or the portions of townhouses are designed

according to the accepted engineering principles as either structurally independent or structurally dependent. Townhouse structures designed using only the prescriptive provisions of this code are exempt from this requirement. Building components providing lateral resistance shall be identified and detailed in the construction drawings.

R302.2.5.2 Structural independence. Townhouses designed and constructed structurally independent in accordance with the prescriptive provisions of this code are permitted to share the following elements.

- Foundations supporting *exterior walls* or common walls and monolithic grade beam footings.
- Structural roof and wall sheathing from each unit may fasten to the common wall framing. These elements shall be edge nailed at each side of the common property line.
- Nonstructural wall and roof coverings.
- Flashing at termination of roof covering over common wall.
- Modified 2-hour or a common 2-hour fire-resistance-rated wall as provided in Section R302.2.
- Soffit enclosures.
- Cricket framing.
- Roof covering.
- Gutters and down spouts.
- Porches and stairs.
- Porch coverings.

Portions of structurally independent townhouse structures designed in accordance with accepted engineering practice shall provide independent vertical and lateral load resisting systems for such designed portions.

**TABLE R302.2.4.4
STRUCTURAL PROJECTIONS WITHIN 3 FEET OF ANY PROPERTY LINE**

EAVES, RAKES, CORNICES & SIMILAR PROJECTIONS ^a	RELATIONSHIP OF FASCIA/BARGE TO PROPERTY LINE	EAVE VENTILATION PERMITTED	MAXIMUM LENGTH OF PROJECTION	PARAPET OR ROOF PROTECTION REQUIRED	MAXIMUM PROJECTION LENGTH BEYOND PROPERTY LINE	ONE-HOUR RATED PROTECTION REQUIRED
Enclosed with roof framing perpendicular to property line	Parallel	No	12" maximum	Yes	12" maximum	Yes
Unenclosed with roof framing perpendicular to property line	Parallel	No	12" maximum	Yes	12" maximum	No
Enclosed with roof framing parallel to property line	Perpendicular	No	24" maximum	No	12" maximum	Yes
Unenclosed with roof framing parallel to property line	Perpendicular	Yes	24" maximum	No	12" maximum	No

For SI: 1 inch = 25.4 mm.

a. Does not apply to exterior balconies

R302.2.5.3 Structural dependence. Structurally dependent townhouse structures shall be designed in accordance with the accepted engineering practice. Portions of structurally dependent townhouse structures are permitted to be constructed according to the prescriptive provisions of this code.

R302.2.6 Fire suppression system requirements. Nothing in this code shall require automatic fire suppression systems to be installed in townhouses. An automatic fire suppression system may be required by local ordinances pertaining to fire flow, fire department access, etc. When provided, fire suppression systems shall be installed in accordance with NFPA 13D.

R302.2.7 Fire-resistance-rated walls and cantilevers.

R302.2.7.1 Fire-resistance-rated construction due to location on property. Townhouse exterior walls, privacy walls, common townhouse separation walls, exterior stairways, porches, porch coverings, decks, roofs and projections located within 3 feet (914 mm) of a common or exterior property line shall be fire-resistance-rated and constructed in accordance with this section.

Exception: Walls oriented perpendicular to a common property line need not be fire-resistance-rated construction and may have unprotected openings.

R302.2.7.1.1 Firewall construction. Exterior walls, privacy walls, common townhouse separation walls shall be parallel to the common property line and be of fire-resistance-rated construction. Such walls shall be of the types listed in Section R302.2 or other listed, tested assemblies that provide an equivalent fire protection rating.

R302.2.7.2 Fire-resistive-rated protection for cantilevered living areas. Cantilevered living areas shall be protected by one of the following methods.

1. In the case where one cantilever is adjacent to another cantilever, and both are within 3 feet (914 mm) of the common property line, a single 1-hour fire-resistive-rated townhouse separation wall shall be provided for each cantilever. The townhouse separation walls shall extend out at least to the furthest point where the cantilevers are adjacent.
2. In the case where one cantilever abuts another adjacent cantilever at a common property line, either two 1-hour fire-resistive-rated walls or a "modified" 2-hour fire-resistive-rated common dwelling unit separation wall shall be provided. The townhouse separation wall shall extend out to the furthest point where both cantilevers are adjacent.
3. In the case where there is no adjacent cantilever, a 1-hour fire-resistive rated exterior wall shall be provided. The exterior wall shall extend out to the furthest point of the cantilever.

The fire-resistive-rated walls required in Items 1 through 3 shall be continuous from the foundation to the roof sheathing when the roof/ceiling assembly is con-

structed in accordance with Section R302.2.4.1. When the roof/ceiling assembly is not constructed in accordance with Section R302.2.4.1, the wall shall terminate in a parapet constructed in accordance with Section R302.2.3.

Exceptions:

1. Cantilevers may be unprotected when each individual townhouse is provided with a fire suppression system in accordance with NFPA 13D.
2. The extension of fire-resistance-rated walls beneath the cantilever may be omitted, providing the exterior wall perpendicular to the common property line is 1-hour fire-resistive-rated construction for a distance of 4 feet (1219 mm) each side of the common property line from foundation to the bottom of the cantilever. Foundation vents shall not be located within 4 feet (1219 mm) of the common property line. The soffit area under the cantilever shall have not less than 1-hour fire-resistive-rated protection for a distance of at least 4 feet (1219 mm) each side of common property line. Where the cantilever projects less than 4 feet (1219 mm) from the face of the building, the prohibition of openings and the fire-resistance-rated wall and soffit construction perpendicular to the common property line need only extend for a distance equal to the projection of the cantilever.

R302.2.7.3 Openings. Openings in fire resistive exterior walls, privacy walls, and individual townhouse separation walls are not permitted.

R302.2.8 Dwelling unit and garage separations. Townhouse dwelling units shall be separated from attached garages in accordance with Section R302.5.

R302.2.9 Interior duct and vent chase penetrations of floor/ceiling assemblies. Gas vents, ducts, piping and factory-built chimneys that extend through not more than two floors need not be enclosed provided the openings around the penetrations are firestopped at each floor.

Exception: BW gas vents installed in accordance with their listing.

R302.2.10 Foundation and footing construction. A single footing and foundation wall may be designed and constructed for common property line walls in accordance with this section, Figure R302.2.10 and Chapter 4. Through penetrations of the foundation across a common property line are not permitted. If required by local conditions, footing drains, rain drains and low point under-floor drainage shall be provided and drained to an approved location in accordance with the building and plumbing codes and local ordinances.

R302.2.11 Roof coverings. In addition to the requirements of Chapter 9, structurally independent townhouses shall be provided with a minimum Class C roof covering and struc-

turally dependent townhouses shall be provided with a minimum Class B roof covering.

Exceptions:

1. Structurally dependent townhouses may use Class C roof coverings when all of the following conditions are met:
 - 1.1. The building is not more than two stories in height; and
 - 1.2. The building does not have more than 6,000 square feet (557 m²) of projected roof area; and
 - 1.3. There is a minimum of 3 feet (914 mm) from the extremity of the roof to the exterior property line or an assumed property line on all sides except for street fronts.
2. As specified elsewhere in this code, townhouses located in areas determined by the jurisdiction to be "Wildfire Zones," the separation distances between vegetation and building shall be per local ordinance. Regardless of whether the dwelling units are designed independently or as a single building, the minimum roof covering classification shall be not less than Class B or as required by the ORS 215.730.

R302.2.12 Dwelling unit egress. Each individual townhouse shall have a means of egress system in compliance with Section R311. Such means of egress system shall be a structurally independent exit way, having a minimum clear width of 3 feet (914 mm).

R302.2.13 Adaptability/Accessibility. Where the project includes four or more contiguous individual townhouses, one or more of which is single story, the Fair Housing Act (FHA) and Chapter 11 of the *Building Code* requirements for adaptability apply. Ground-level, single-story townhouses shall be made adaptable. Any common use facilities, such as a pool, club house or management office shall be made accessible in accordance with Chapter 11 of the *Building Code*.

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

Exceptions:

1. A fire-resistance rating of 1/2 hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13D.
2. Wall assemblies need not extend through *attic* spaces when the ceiling is protected by not less than 5/8-inch (15.9 mm) Type X gypsum board and an *attic* draft stop constructed as specified in Section R302.12.1 is provided above and along the wall assembly separat-

ing the *dwellings*. The structural framing supporting the ceiling shall also be protected by not less than 1/2-inch (12.7 mm) gypsum board or equivalent.

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

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

R302.4.1 Through penetrations. Through penetrations in fire-resistive exterior walls, privacy walls, and individual townhouse separation walls are not permitted in townhouse structures. In other than a townhouse structure, through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2.

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

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

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

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

R302.4.2 Membrane penetrations. Membrane penetrations in townhouse structures shall comply with this section and Section R302.4.2.1. Membrane penetrations shall comply with Section R302.4.1. Where walls are required to have a

fire-resistance rating, recessed fixtures shall be installed so that the required fire-resistance rating will not be reduced.

Exceptions:

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m²) in area provided the aggregate area of the openings through the membrane does not exceed 100 square inches (0.0645 m²) in any 100 square feet (9.29 m²) of wall area. The space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm). Such boxes on opposite sides of the wall shall be separated by one of the following:
 - 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities;
 - 1.2. By a horizontal distance of not less than the depth of the wall cavity when the wall cavity is filled with cellulose loose-fill, rockwool or slag mineral wool insulation;
 - 1.3. By solid fire blocking in accordance with Section R302.11;
 - 1.4. By protecting both boxes with listed putty pads; or
 - 1.5. By other listed materials and methods.
2. Membrane penetrations by listed electrical boxes of any materials provided the boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm) unless listed otherwise. Such boxes on opposite sides of the wall shall be separated by one of the following:
 - 2.1. By the horizontal distance specified in the listing of the electrical boxes;
 - 2.2. By solid fireblocking in accordance with Section R302.11;
 - 2.3. By protecting both boxes with listed putty pads; or
 - 2.4. By other listed materials and methods.
3. The annular space created by the penetration of a fire sprinkler provided it is covered by a metal escutcheon plate.

R302.4.2.1 Additional townhouse membrane penetration requirements. Membrane penetrations in townhouse fire-resistive exterior walls, privacy walls, and individual townhouse separation walls are allowed as provided in Section R302.2.

Exceptions: Membrane penetrations in townhouse fire-resistive-rated walls:

1. Shall be protected with a listed penetration firestop system rated for a minimum of 2-hours when the penetration is in a common "modified" 2-hour fire-resistance-rated wall.
2. May have the minimum separation distance of 24 inches (610 mm) between electrical boxes reduced when installed in accordance with Figure R302.3.2.1, Detail C1 and C2.
3. For large boxes such as washer connections, electrical panels, and wall heaters may be installed where the fire protection extends behind the box in accordance with Figures R302.3.2.1, Detail B and C2.
4. Stair stringers shall be in accordance with Section R302.2.2.

R302.5 Dwelling/garage opening/penetration protection.

Openings and penetrations through the walls or ceilings separating the *dwelling* from the garage shall be in accordance with Sections R302.5.1 through R302.5.3.

R302.5.1 Prohibited opening. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted.

R302.5.1.1 Opening protection. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches (35 mm) in thickness, solid or honeycomb core steel doors not less than 1 3/8 inches (35 mm) thick, or 20-minute fire-rated doors.

Exception: Compliance with this section shall not be required when both the dwelling unit and garage are protected by an automatic fire sprinkler system installed in accordance with Appendix T, NFPA 13D or other approved sprinkler system.

R302.5.2 Duct penetration. Ducts in the garage and ducts penetrating the walls or ceilings separating the *dwelling* from the garage shall be constructed of a minimum 26 gage [0.0187 inch (0.4712 mm)] sheet steel or other *approved* material and shall have no openings into the garage. When a vibration isolator is used in the garage duct, it must be installed at least 18 inches (457 mm) from the penetration. Vibration isolators shall be installed in accordance with Section M1601.2.1.

R302.5.3 Other penetrations. Penetrations through the separation required in Section R302.6 shall be protected as required by Section R302.11, Item 4.

R302.6 Dwelling/garage fire separation. The garage shall be separated as required by Table R302.6. Openings in garage walls shall comply with Section R302.5.

R302.7 Under-stair protection. Enclosed accessible space under stairs shall have walls, under-stair surface and any soffits protected on the enclosed side with 1/2-inch (12.7 mm) gypsum board.

Exception: Under-stair protection shall not be required when both the dwelling unit and under-stair area are protected by an automatic fire sprinkler system installed in accordance with Appendix T, NFPA 13D or other approved sprinkler system.

**TABLE R302.6
DWELLING/GARAGE SEPARATION^a**

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage side
From all habitable rooms above the garage	Not less than 5/8-inch Type X gypsum board or equivalent, attached per Table R702.3.5, Footnote e
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

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

a. Separation not required when both the dwelling and garage are protected by an automatic sprinkler system installed in accordance with Appendix T, NFPA13D, or other approved equivalent sprinkler system.

R302.8 Foam plastics. For requirements for foam plastics see Section R316.

R302.9 Flame spread index and smoke-developed index for wall and ceiling finishes. Flame spread and smoke index for wall and ceiling finishes shall be in accordance with Sections R302.9.1 through R302.9.4.

R302.9.1 Flame spread index. Wall and ceiling finishes shall have a flame spread index of not greater than 200.

Exception: Flame spread index requirements for finishes shall not apply to trim defined as picture molds, chair rails, baseboards and handrails; to doors and windows or their frames; or to materials that are less than 1/28 inch (0.91 mm) in thickness cemented to the surface of walls or ceilings if these materials exhibit flame spread index values no greater than those of paper of this thickness cemented to a noncombustible backing.

R302.9.2 Smoke-developed index. Wall and ceiling finishes shall have a smoke-developed index of not greater than 450.

R302.9.3 Testing. Tests shall be made in accordance with ASTM E 84 or UL 723.

R302.9.4 Alternate test method. As an alternate to having a flame-spread index of not greater than 200 and a smoke developed index of not greater than 450 when tested in accordance with ASTM E 84 or UL 723, wall and ceiling finishes, other than textiles, shall be permitted to be tested in accordance with NFPA 286. Materials tested in accordance with NFPA 286 shall meet the following criteria:

During the 40 kW exposure, the interior finish shall comply with Item 1. During the 160 kW exposure, the interior finish shall comply with Item 2. During the entire test, the interior finish shall comply with Item 3.

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. During the 160 kW exposure, the interior finish shall comply with the following:
 - 2.1. Flame shall not spread to the outer extremity of the sample on any wall or ceiling.

2.2. Flashover, as defined in NFPA 286, shall not occur.

3. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 m².

R302.10 Flame spread index and smoke developed index for insulation. Flame spread and smoke developed index for insulation shall be in accordance with Sections R302.10.1 through R302.10.5.

R302.10.1 Insulation. Insulation materials, including facings, such as vapor retarders and vapor-permeable membranes installed within floor-ceiling assemblies, roof-ceiling assemblies, wall assemblies, crawl spaces and attics shall have a flame spread index not to exceed 25 with an accompanying smoke-developed index not to exceed 450 when tested in accordance with ASTM E 84 or UL 723.

Exceptions:

1. When such materials are installed in concealed spaces, the flame spread index and smoke-developed index limitations do not apply to the facings, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or wall finish.
2. Cellulose loose-fill insulation, which is not spray applied, complying with the requirements of Section R302.10.3, shall only be required to meet the smoke-developed index of not more than 450.

R302.10.2 Loose-fill insulation. Loose-fill insulation materials that cannot be mounted in the ASTM E 84 or UL 723 apparatus without a screen or artificial supports shall comply with the flame spread and smoke-developed limits of Section R302.10.1 when tested in accordance with CAN/ULC S102.2.

Exception: Cellulose loose-fill insulation shall not be required to be tested in accordance with CAN/ULC S102.2, provided such insulation complies with the requirements of Section R302.10.1 and Section R302.10.3.

R302.10.3 Cellulose loose-fill insulation. Cellulose loose-fill insulation shall comply with CPSC 16 CFR, Parts 1209 and 1404. Each package of such insulating material

shall be clearly *labeled* in accordance with CPSC 16 CFR, Parts 1209 and 1404.

R302.10.4 Exposed attic insulation. All exposed insulation materials installed on *attic* floors shall have a critical radiant flux not less than 0.12 watt per square centimeter.

R302.10.5 Testing. Tests for critical radiant flux shall be made in accordance with ASTM E 970.

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

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

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs, as follows:

- 1.1. Vertically at the ceiling and floor levels.

- 1.2. Horizontally at intervals not exceeding 10 feet (3048 mm).

Exception: Fireblocking is not required for furred spaces providing drainage as required in Section R703.1 where the space does not communicate with the wall cavity or attic space. The use of like sized furring or caulking installed horizontally directly below eave vents may be used to interrupt communication with the attic space.

2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R302.7.
4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an *approved* material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E 136 requirements.
5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
6. Fireblocking of cornices of a two-family *dwelling* is required at the line of *dwelling unit* separation.

R302.11.1 Fireblocking materials. Except as provided in Section R302.11, Item 4, fireblocking shall consist of the following materials.

1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25.4 mm) nominal lumber with broken lap joints.
3. One thickness of $2\frac{3}{32}$ -inch (18.3 mm) wood structural panels with joints backed by $2\frac{3}{32}$ -inch (18.3 mm) wood structural panels.

4. One thickness of $\frac{3}{4}$ -inch (19.1 mm) particleboard with joints backed by $\frac{3}{4}$ -inch (19.1 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.
6. One-quarter-inch (6.4 mm) cement-based millboard.
7. Batts or blankets of mineral wool or glass fiber or other *approved* materials installed in such a manner as to be securely retained in place.

R302.11.1.1 Batts or blankets of mineral or glass fiber. Batts or blankets of mineral or glass fiber or other *approved* nonrigid materials shall be permitted for compliance with the 10-foot (3048 mm) horizontal fireblocking in walls constructed using parallel rows of studs or staggered studs.

R302.11.1.2 Unfaced fiberglass. Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross section of the wall cavity to a minimum height of 16 inches (406 mm) measured vertically. When piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

R302.11.1.3 Loose-fill insulation material. Loose-fill insulation material shall not be used as a fireblock unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

R302.11.2 Fireblocking integrity. The integrity of all fireblocks shall be maintained.

R302.12 Draftstopping. In combustible construction where there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m²). Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below, draftstopping shall be provided in floor/ceiling assemblies under the following circumstances:

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

R302.12.1 Materials. Draftstopping materials shall not be less than $\frac{1}{2}$ -inch (12.7 mm) gypsum board, $\frac{3}{8}$ -inch (9.5 mm) wood structural panels or other *approved* materials adequately supported. Draftstopping shall be installed parallel to the floor framing members unless otherwise *approved* by the *building official*. The integrity of the draftstops shall be maintained.

SECTION R303 LIGHT, VENTILATION AND HEATING

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

The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

Exceptions:

1. The glazed areas need not be openable where the opening is not required by Section R310 and an *approved mechanical ventilation* system capable of producing 0.35 air change per hour in the room is installed or a whole-house mechanical *ventilation* system is installed capable of supplying outdoor *ventilation* air of 15 cubic feet per minute (cfm) (78 L/s) per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom.
2. The glazed areas need not be installed in rooms where Exception 1 above is satisfied and artificial light is provided capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.
3. Use of sunroom *additions* and patio covers, as defined in Section R202, shall be permitted for natural *ventilation* if in excess of 40 percent of the exterior sunroom walls are open, or are enclosed only by insect screening.

R303.2 Adjoining rooms. For the purpose of determining light and *ventilation* requirements, any room shall be considered as a portion of an adjoining room when at least one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room but not less than 25 square feet (2.3 m²).

Exception: Openings required for light and/or *ventilation* shall be permitted to open into a thermally isolated sunroom *addition* or patio cover, provided that there is an openable area between the adjoining room and the sunroom *addition* or patio cover of not less than one-tenth of the floor area of the interior room but not less than 20 square feet (2 m²). The minimum openable area to the outdoors shall be based upon the total floor area being ventilated.

R303.3 Toilet and bathing facilities ventilation.

R303.3.1 Rooms with bathing or spa facilities. Any room with a bathtub, shower or spa facility shall be provided with mechanical ventilation which shall be designed and installed in accordance with Section M1507.4.

R303.3.2 Rooms without bathing or spa facilities. Water closet compartments or toilet rooms without bathtub, shower or spa facilities shall be provided with aggregate glazing area of not less than 3 square feet (0.279 m²), one-half of which must be openable.

Exception: The glazed areas shall not be required where artificial light and a mechanical ventilation system are provided. The minimum ventilation rates shall be in accordance with Table M1507.3.

R303.4 Opening location. Outdoor intake and exhaust openings shall be located in accordance with Sections R303.4.1 and R303.4.2.

R303.4.1 Intake openings. Mechanical and gravity outdoor air intake openings shall be located a minimum of 10 feet (3048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots, gas meters and loading docks, except as otherwise specified in this code. Where a source of contaminant is located within 10 feet (3048 mm) of an intake opening, such opening shall be located a minimum of 2 feet (610 mm) below the contaminant source.

For the purpose of this section, the exhaust from *dwelling* unit toilet rooms, bathrooms and kitchens shall not be considered as hazardous or noxious.

R303.4.2 Exhaust openings. Exhaust air shall not be directed onto walkways.

R303.5 Outside opening protection. Air exhaust and intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles having a minimum opening size of 1/4 inch (6 mm) and a maximum opening size of 1/2 inch (13 mm), in any dimension. Openings shall be protected against local weather conditions. Outdoor air exhaust and intake openings shall meet the provisions for *exterior wall* opening protectives in accordance with this code.

R303.6 Stairway illumination. All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. For interior stairs the artificial light sources shall be capable of illuminating treads and landings to levels not less than 1 foot-candle (11 lux) measured at the center of treads and landings. Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to a *basement* from the outside *grade* level shall be provided with an artificial light source located in the immediate vicinity of the bottom landing of the stairway.

Exception: An artificial light source is not required at the top and bottom landing, provided an artificial light source is located directly over each stairway section.

R303.6.1 Light activation. Where lighting outlets are installed in interior stairways, there shall be a wall switch at each floor level to control the lighting outlet where the stairway has six or more risers. The illumination of exterior stairways shall be controlled from inside the *dwelling* unit.

Exception: Lights that are continuously illuminated or automatically controlled.

R303.7 Required glazed openings. Required glazed openings shall open directly onto a street or public alley, or a *yard* or court located on the same *lot* as the building.

Exceptions:

1. Required glazed openings may face into a roofed porch where the porch abuts a street, *yard* or court and the longer side of the porch is at least 65 percent unobstructed and the ceiling height is not less than 7 feet (2134 mm).

2. Eave projections shall not be considered as obstructing the clear open space of a *yard* or court.
3. Required glazed openings may face into the area under a deck, balcony, bay or floor cantilever provided a clear vertical space at least 36 inches (914 mm) in height is provided.

R303.7.1 Sunroom additions. Required glazed openings shall be permitted to open into sunroom *additions* or patio covers that abut a street, *yard* or court if in excess of 40 percent of the exterior sunroom walls are open, or are enclosed only by insect screening, and the ceiling height of the sunroom is not less than 7 feet (2134 mm).

R303.8 Required heating. Every *dwelling unit* shall be provided with heating facilities capable of maintaining a minimum room temperature of 68°F (20°C) at a point 3 feet (914 mm) above the floor and 2 feet (610 mm) from exterior walls in all habitable rooms at the design temperature. The installation of one or more portable space heaters shall not be used to achieve compliance with this section.

SECTION R304 MINIMUM ROOM AREAS

R304.1 Minimum area. Every *dwelling unit* shall have at least one habitable room that shall have not less than 120 square feet (11 m²) of gross floor area.

R304.2 Other rooms. Other habitable rooms shall have a floor area of not less than 70 square feet (6.5 m²).

Exception: Kitchens.

R304.3 Minimum dimensions. Habitable rooms shall not be less than 7 feet (2134 mm) in any horizontal dimension.

Exception: Kitchens.

R304.4 Height effect on room area. Portions of a room with a sloping ceiling measuring less than 5 feet (1524 mm) or a furred ceiling measuring less than 7 feet (2134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.

SECTION R305 CEILING HEIGHT

R305.1 Minimum height. *Habitable space*, hallways, bathrooms, toilet rooms, laundry rooms and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm).

Exceptions:

1. Beams and girders spaced not less than 4 feet (1219 mm) on center may project not more than 6 inches (152 mm) below the required ceiling height.
2. For rooms with sloped ceilings, at least 50 percent of the required floor area of the room must have a ceiling height of at least 7 feet (2134 mm) and no portion of

the required floor area may have a ceiling height of less than 5 feet (1524 mm).

3. Not more than 75 percent of the floor area of a bathroom or toilet room is permitted to have a sloped ceiling less than 7 feet (2134 mm) in height, provided an area of 21 inches by 24 inches (534 mm by 610 mm) in front of toilets and lavatories has a minimum of 6 feet, 4 inches (1931 mm) in height, measured from the finished floor. An area of 24 inches by 30 inches (610 mm by 762 mm) in front of and inside a tub or shower shall have a minimum of 6 feet, 4 inches (1931 mm) in height, measured from the standing surface of the fixture.

R305.1.1 Basements. Portions of *basements* that do not contain *habitable space*, hallways, bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exception: Beams, girders, ducts or other obstructions may project to within 6 feet 4 inches (1931 mm) of the finished floor.

SECTION R306 SANITATION

R306.1 Toilet facilities. Every *dwelling unit* shall be provided with a water closet, lavatory, and a bathtub or shower.

R306.2 Kitchen. Each *dwelling unit* shall be provided with a kitchen area and every kitchen area shall be provided with a sink.

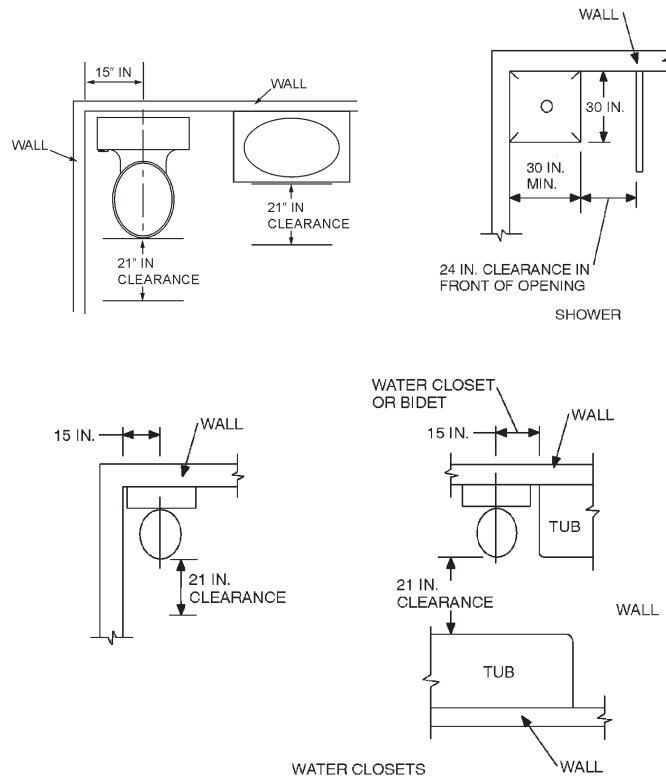
R306.3 Sewage disposal. All plumbing fixtures shall be connected to a sanitary sewer or to an *approved* private sewage disposal system.

R306.4 Water supply to fixtures. All plumbing fixtures shall be connected to an *approved* water supply. Kitchen sinks, lavatories, bathtubs, showers, bidets, laundry tubs and washing machine outlets shall be provided with hot and cold water.

SECTION R307 TOILET, BATH AND SHOWER SPACES

R307.1 Space required. Fixtures shall be spaced in accordance with Figure R307.1, and in accordance with the requirements of the *Plumbing Code*.

R307.2 Bathtub and shower spaces. Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet (1829 mm) above the floor.



For SI: 1 inch = 25.4 mm.

FIGURE R307.1
MINIMUM FIXTURE CLEARANCES

SECTION R308
GLAZING

R308.1 Identification. Except as indicated in Section R308.1.1 each pane of glazing installed in hazardous locations as defined in Section R308.4 shall be provided with a manufacturer’s designation specifying who applied the designation, designating the type of glass and the safety glazing standard with which it complies, which is visible in the final installation. The designation shall be acid etched, sandblasted, ceramic-fired, laser etched, embossed, or be of a type which once applied cannot be removed without being destroyed. A *label* shall be permitted in lieu of the manufacturer’s designation.

Exceptions:

1. For other than tempered glass, manufacturer’s designations are not required provided the *building official* approves the use of a certificate, affidavit or other evidence confirming compliance with this code.
2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper designation.

R308.1.1 Identification of multiple assemblies. Multipane assemblies having individual panes not exceeding 1 square foot (0.09 m²) in exposed area shall have at least one pane in the assembly identified in accordance with Section R308.1. All other panes in the assembly shall be *labeled* “CPSC 16 CFR 1201” or “ANSI Z97.1” as appropriate.

R308.2 Louvered windows or jalousies. Regular, float, wired or patterned glass in jalousies and louvered windows shall be no thinner than nominal ³/₁₆ inch (5 mm) and no longer than 48 inches (1219 mm). Exposed glass edges shall be smooth.

R308.2.1 Wired glass prohibited. Wired glass with wire exposed on longitudinal edges shall not be used in jalousies or louvered windows.

R308.3 Human impact loads. Individual glazed areas, including glass mirrors in hazardous locations such as those indicated as defined in Section R308.4, shall pass the test requirements of Section R308.3.1.

Exceptions:

1. Louvered windows and jalousies shall comply with Section R308.2.
2. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.
3. Glass unit masonry complying with Section R610.

R308.3.1 Impact test. Where required by other sections of the code, glazing shall be tested in accordance with CPSC 16 CFR 1201. Glazing shall comply with the test criteria for Category I or II as indicated in Table R308.3.1(1).

Exception: Glazing not in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers shall be permitted to be tested in accordance with ANSI Z97.1. Glazing shall comply with the test criteria for Class A or B as indicated in Table R308.3.1 (2).

TABLE R308.3.1(1)
MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING CPSC 16 CFR 1201

EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE	GLAZING IN STORM OR COMBINATION DOORS (Category Class)	GLAZING IN DOORS (Category Class)	GLAZED PANELS REGULATED BY ITEM 7 OF SECTION R308.4 (Category Class)	GLAZED PANELS REGULATED BY ITEM 6 OF SECTION R308.4 (Category Class)	GLAZING IN DOORS AND ENCLOSURES REGULATED BY ITEM 5 OF SECTION R308.4 (Category Class)	SLIDING GLASS DOORS PATIO TYPE (Category Class)
9 square feet or less	I	I	NR	I	II	II
More than 9 square feet	II	II	II	II	II	II

For SI: 1 square foot = 0.0929 m².
 NR means "No Requirement."

TABLE R308.3.1(2)
MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING ANSI Z97.1

EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE	GLAZED PANELS REGULATED BY ITEM 7 OF SECTION R308.4 (Category Class)	GLAZED PANELS REGULATED BY ITEM 6 OF SECTION R308.4 (Category Class)	DOORS AND ENCLOSURES REGULATED BY ITEM 5 OF SECTION R308.4 ^a (Category Class)
9 square feet or less	No requirement	B	A
More than 9 square feet	A	A	A

For SI: 1 square foot = 0.0929 m².
 a. Use is permitted only by the exception to Section R308.3.1.

R308.4 Hazardous locations. The following shall be considered specific hazardous locations for the purposes of glazing:

1. Glazing in all fixed and operable panels of swinging, sliding and bifold doors.

Exceptions:

1. Glazed openings of a size through which a 3-inch diameter (76 mm) sphere is unable to pass.
2. Decorative glazing.
2. Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24-inch (610 mm) arc of the door in a closed position and whose bottom edge is less than 60 inches (1524 mm) above the floor or walking surface.

Exceptions:

1. Decorative glazing.
2. When there is an intervening wall or other permanent barrier between the door and the glazing.
3. Glazing in walls on the latch side of and perpendicular to the plane of the door in a closed position.
4. Glazing adjacent to a door where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth.
5. Glazing that is adjacent to the fixed panel of patio doors.
3. Glazing in an individual fixed or operable panel that meets all of the following conditions:
 - 3.1. The exposed area of an individual pane is larger than 9 square feet (0.836 m²); and

- 3.2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor; and
- 3.3. The top edge of the glazing is more than 36 inches (914 mm) above the floor; and
- 3.4. One or more walking surfaces are within 36 inches (914 mm), measured horizontally and in a straight line, of the glazing.

Exceptions:

1. Decorative glazing.
2. When a horizontal rail is installed on the accessible side(s) of the glazing 34 to 38 inches (864 to 965) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and be a minimum of 1½ inches (38 mm) in cross sectional height.
3. Outboard panes in insulating glass units and other multiple glazed panels when the bottom edge of the glass is 25 feet (7620 mm) or more above *grade*, a roof, walking surfaces or other horizontal [within 45 degrees (0.79 rad) of horizontal] surface adjacent to the glass exterior.
4. All glazing in railings regardless of area or height above a walking surface. Included are structural baluster panels and nonstructural infill panels.
5. Glazing in enclosures for or walls facing hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers where the bottom exposed edge of the glazing is less than 60

inches (1524 mm) measured vertically above any standing or walking surface.

Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the waters edge of a hot tub, whirlpool, saunas, steam rooms or bathtubs and showers.

6. Glazing in walls and fences adjacent to indoor and outdoor swimming pools, hot tubs and spas where the bottom edge of the glazing is less than 60 inches (1524 mm) above a walking surface and within 60 inches (1524 mm), measured horizontally and in a straight line, of the water's edge. This shall apply to single glazing and all panes in multiple glazing.
7. Glazing adjacent to stairways, landings and ramps within 36 inches (914 mm) horizontally of a walking surface when the exposed surface of the glazing is less than 60 inches (1524 mm) above the plane of the adjacent walking surface.

Exceptions:

1. When a rail is installed on the accessible side(s) of the glazing 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and be a minimum of 1½ inches (38 mm) in cross sectional height.
2. The side of the stairway has a guardrail or handrail, including balusters or in-fill panels, complying with Sections R311.7.7 and R312 and the plane of the glazing is more than 18 inches (457 mm) from the railing; or
3. When a solid wall or panel extends from the plane of the adjacent walking surface to 34 inches (863 mm) to 36 inches (914 mm) above the walking surface and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as a *guard*.
8. Glazing adjacent to stairways within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glazing is less than 60 inches (1524 mm) above the nose of the tread.

Exceptions:

1. The side of the stairway has a guardrail or handrail, including balusters or in-fill panels, complying with Sections R311.7.7 and R312 and the plane of the glass is more than 18 inches (457 mm) from the railing; or
2. When a solid wall or panel extends from the plane of the adjacent walking surface to 34 inches (864 mm) to 36 inches (914 mm) above the walking surface and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as a *guard*.

R308.5 Site built windows. Site built windows shall comply with Section 2404 of the *Building Code*.

R308.6 Skylights and sloped glazing. Skylights and sloped glazing shall comply with the following sections.

R308.6.1 Definitions.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Glazing materials in skylights, including unit skylights, solariums, sunrooms, roofs and sloped walls are included in this definition.

UNIT SKYLIGHT. A factory assembled, glazed fenestration unit, containing one panel of glazing material, that allows for natural daylighting through an opening in the roof assembly while preserving the weather-resistant barrier of the roof.

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

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

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

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

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

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

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

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

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

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

SECTION R309 GARAGES AND CARPORTS

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

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

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

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

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

R309.3 Flood hazard areas. For buildings located in flood hazard areas as established by the local jurisdiction, garage floors shall be:

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

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

SECTION R310 EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue required. *Basements*, and every sleeping room shall have at least one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches (1118 mm) above the floor. Where a door opening having a threshold below the adjacent ground elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section R310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Emergency escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

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

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

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

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

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

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

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

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

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

R310.3 Bulkhead enclosures. Bulkhead enclosures shall provide direct access to the *basement*. The bulkhead enclosure with

the door panels in the fully open position shall provide the minimum net clear opening required by Section R310.1.1. Bulkhead enclosures shall also comply with Section R311.7.8.2.

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

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

SECTION R311 MEANS OF EGRESS

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

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

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

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

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

Exception: The exterior landing or floor shall not be more than 8 inches (203 mm) below the top of the threshold provided the door does not swing over the landing or floor.

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

R311.3.2 Floor elevations for other exterior doors. Doors other than the required egress door shall be provided with landings or floors not more than 8 inches (203 mm) below the top of the threshold.

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

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

R311.4 Vertical egress. Egress from habitable levels including *basements* not provided with an egress door in accordance with Section R311.2 shall be by a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

R311.5 Construction.

R311.5.1 Attachment. Exterior landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

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

R311.7 Stairways.

R311.7.1 Width. Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. Handrails shall not project more than 4.5 inches (114 mm) on either side of the stairway and the minimum clear width of the stairway at and below the handrail height, including treads and landings, shall not be less than $31\frac{1}{2}$ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are provided on both sides.

Exceptions:

1. The width of spiral stairways shall be in accordance with Section R311.7.9.1.
2. Where a floor is served by more than one stairway, stairways other than the first stairway may have a clear width of not less than 30 inches (762 mm). Any handrail may encroach a maximum of 4.5 inches (102 mm) into the clear width.

R311.7.2 Headroom. The minimum headroom in all parts of the stairway shall not be less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

Exception: Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall be allowed

to project horizontally into the required headroom a maximum of $4\frac{3}{4}$ inches (121 mm).

R311.7.3 Walkline. The walkline across winder treads shall be concentric to the curved direction of travel through the turn and located 12 inches (305 mm) from the side where the winders are narrower. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface of the winder. If winders are adjacent within the flight, the point of the widest clear stair width of the adjacent winders shall be used.

R311.7.4 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section all dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.4.1 Riser height. The maximum riser height shall be 8 inches (203 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm).

R311.7.4.2 Tread depth. The minimum tread depth shall be 9 inches (229 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and do not have to be within $\frac{3}{8}$ inch (9.5 mm) of the rectangular tread depth.

Winder treads shall have a minimum tread depth of 9 inches (229 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than $\frac{3}{8}$ inch (9.5 mm).

R311.7.4.3 Profile. The radius of curvature at the nosing shall be no greater than $\frac{9}{16}$ inch (14 mm). A nosing not less than $\frac{3}{4}$ inch (19 mm) but not more than $1\frac{1}{4}$ inches (32 mm) shall be provided on stairways with solid risers. The greatest nosing projection shall not exceed the smallest nosing projection by more than $\frac{3}{8}$ inch (9.5 mm) between two stories, including the nosing at the level of floors and landings. Beveling of nosings shall not exceed $\frac{1}{2}$ inch (12.7 mm). Risers shall be vertical or sloped under the tread above from the underside of the nosing above at an angle not more than 30 degrees (0.51 rad) from the vertical. Open risers are permitted, provided that the opening between treads does not permit the passage of a 4-inch diameter (102 mm) sphere.

Exceptions:

1. A nosing is not required where the tread depth is a minimum of 10 inches (254 mm).

2. The opening between adjacent treads is not limited on stairs with a total rise of 30 inches (762 mm) or less.

R311.7.4.4 Exterior wood/plastic composite stair treads. Wood/plastic composite stair treads shall comply with the provisions of Section R317.4.

R311.7.4.5 Steps. The rise of a step or steps shall not be less than 4 inches (102 mm) or greater than 8 inches (203 mm).

R311.7.4.6 Slope. Where the top or bottom riser adjoins a sloping walk, garage floor or driveway, the top or bottom riser may be reduced to less than 4 inches (102 mm) in height with the variation height of the riser not to exceed 3 inches (76 mm) in ever 3 feet (904 mm) of walk or stairway width.

R311.7.5 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. A flight of stairs shall not have a vertical rise larger than 12 feet (3658 mm) between floor levels or landings. The width of each landing shall not be less than the width of the stairway served. Every landing shall have a minimum dimension of 36 inches (914 mm) measured in the direction of travel.

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

R311.7.6 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped no steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.7 Handrails. Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers. The continuous handrail required for winders shall be located on the side where the tread is narrower.

R311.7.7.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 30 inches (762 mm) and not more than 38 inches (965 mm).

Exceptions:

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. When handrail fittings or bendings are used to provide continuous transition between flights, the transition from handrail to guardrail, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed the maximum height.

R311.7.7.2 Continuity. Handrails for stairways shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall

have a space of not less than 1½ inch (38 mm) between the wall and the handrails.

Exceptions:

1. Handrails shall be permitted to be interrupted by a newel post at the turn.
2. The use of a volute, turnout, starting easing or starting newel shall be allowed over the lowest tread.

R311.7.7.3 Grip-size. All required handrails shall be of one of the following types or provide equivalent graspability.

1. Type I. Handrails with a circular cross section shall have an outside diameter of at least 1¼ inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6¼ inches (160 mm) with a maximum cross section of dimension of 2¼ inches (57 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).
2. Type II. Handrails with a perimeter greater than 6¼ inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of ¾ inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of at least ⅝ inch (8 mm) within ⅞ inch (22 mm) below the widest portion of the profile. This required depth shall continue for at least ¾ inch (10 mm) to a level that is not less than 1¾ inches (45 mm) below the tallest portion of the profile. The minimum width of the handrail above the recess shall be 1¼ inches (32 mm) to a maximum of 2¾ inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

R311.7.7.4 Exterior wood/plastic composite handrails. Wood/plastic composite handrails shall comply with the provisions of Section R317.4.

R311.7.8 Illumination. All stairs shall be provided with illumination in accordance with Section R303.6.

R311.7.9 Special stairways. Spiral stairways and bulkhead enclosure stairways shall comply with all requirements of Section R311.7 except as specified below.

R311.7.9.1 Spiral stairways. Spiral stairways are permitted, provided the minimum clear width at and below the handrail shall be 26 inches (660 mm) with each tread having a 7½-inch (190 mm) minimum tread depth at 12 inches (914 mm) from the narrower edge. All treads shall be identical, and the rise shall be no more than 9½ inches (241 mm). A minimum headroom of 6 feet 6 inches (1982 mm) shall be provided.

R311.7.9.2 Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside *grade* level to the *basement* shall be exempt from the requirements of Sections R311.3 and R311.7 where the maxi-

imum height from the *basement* finished floor level to *grade* adjacent to the stairway does not exceed 8 feet (2438 mm) and the *grade* level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other *approved* means.

R311.8 Ramps.

R311.8.1 Maximum slope. Ramps shall have a maximum slope of 1 unit vertical in 12 units horizontal (8.3 percent slope).

Exception: Where it is technically infeasible to comply because of site constraints, ramps may have a maximum slope of one unit vertical in eight horizontal (12.5 percent slope).

R311.8.2 Landings required. A minimum 3-foot-by-3-foot (914 mm by 914 mm) landing shall be provided:

1. At the top and bottom of ramps.
2. Where doors open onto ramps.
3. Where ramps change direction.

R311.8.3 Handrails required. Handrails shall be provided on at least one side of all ramps exceeding a slope of one unit vertical in 12 units horizontal (8.33-percent slope).

R311.8.3.1 Height. Handrail height, measured above the finished surface of the ramp slope, shall be not less than 30 inches (762 mm) and not more than 38 inches (965 mm).

R311.8.3.2 Grip size. Handrails on ramps shall comply with Section R311.7.7.3.

R311.8.3.3 Continuity. Handrails where required on ramps shall be continuous for the full length of the ramp. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1½ inches (38 mm) between the wall and the handrails.

**SECTION R312
GUARDS**

R312.1 Where required. *Guards* shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or *grade* below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a *guard*.

R312.2 Height. Required *guards* at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connecting the leading edges of the treads.

Exceptions:

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

be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.

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

Exceptions:

1. The triangular openings at the open side of a stair, formed by the riser, tread and bottom rail of a *guard*, shall not allow passage of a sphere 6 inches (153 mm) in diameter.
2. *Guards* on the open sides of stairs shall not have openings which allow passage of a sphere 5 inches (127 mm) in diameter. Opening limitations for required guardrails on open sides of stairways are applicable above the second riser of the stair.

ORS 479.250 through 479.300 are statutes relating to smoke alarms and are under the enforcement authority of the State Fire Marshal's Office.

ORS 479.297 is not part of this code but is reproduced here for the reader's convenience:

479.297 Smoke alarms; required equipment; exemptions.

(1) All ionization smoke alarms sold in this state that are solely battery-operated shall be packaged with a 10-year battery.

(2) All ionization smoke alarms sold in this state shall include a "hush" mechanism that allows a person to temporarily disengage the alarm for a period of not more than 15 minutes.

(3) The provisions of this section do not apply to:

- (a) Smoke alarms specifically designed for hearing impaired persons;
- (b) Smoke alarms sold in this state for shipment out of state; or
- (c) Smoke alarms sold for installation in recreational vehicles, commercial vehicles, railroad equipment, aircraft, marine vessels or manufactured dwellings.

(4) The sale of a recreational vehicle, commercial vehicle, railroad equipment, aircraft, marine vessel or new manufactured dwelling containing a smoke alarm does not constitute sale of a smoke alarm.

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

SECTION R313

Not adopted by the State of Oregon

**SECTION R314
SMOKE ALARMS**

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

R314.2 Smoke detection systems. Household fire alarm systems installed in accordance with NFPA 72 that include

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

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

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

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

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

Required smoke alarms shall not be located within kitchens or garages, or in other spaces where temperatures can fall below 40°F (5°C). Ionization smoke alarms shall not be located closer than 3 feet (914 mm) horizontally from the following:

1. The door to a kitchen;
2. The door to a bathroom containing a tub or shower;
3. The supply registers of a forced air heating or cooling system, outside the airflow from those registers.

A smoke alarm installed within 20 feet (6096 mm) (direct linear path) of a cooking *appliance* shall be a *photoelectric*-type smoke alarm or the alarm shall have an *approved* alarm silencing means.

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

Exception: Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the *addition* or replacement of windows or doors, or the *addition* of a porch or deck, are exempt from the requirements of this section.

R314.4 Power source. Smoke alarms shall receive their primary power from the building wiring when such wiring is

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

Exceptions:

1. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power.
2. Interconnection and hard-wiring of smoke alarms in existing areas shall not be required where the *alterations* or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure.

SECTION R315 CARBON MONOXIDE ALARMS

R315.1 Carbon monoxide alarms. For new construction, approved single station carbon monoxide alarms or a household carbon monoxide detection system shall be installed.

R315.2 Installation location. Carbon monoxide alarms shall be located in each bedroom or within 15 feet (4572 mm) outside of each bedroom door. Bedrooms on separate floor levels in a structure consisting of two or more stories shall have separate carbon monoxide alarms serving each story.

R315.3 Alarm requirements.

R315.3.1 Single station alarm requirements. Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.

R315.3.2 Household carbon monoxide detection systems. Household carbon monoxide detection systems that include carbon monoxide detectors and audible notification appliances, installed in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be listed as complying with UL 2075.

R315.3.3 Combination smoke/carbon monoxide alarm requirements. Combination smoke/carbon monoxide alarms shall be listed as complying with UL 2034 and UL 217. Combination smoke/carbon monoxide detectors shall be listed as complying with ANSI/UL 2075 and ANSI/UL 268. See Section R314 for additional requirements specific to the installation of smoke alarms.

R315.4 Power source.

R315.4.1 Carbon monoxide alarms. Single station carbon monoxide alarms shall be battery operated, or may receive their primary power from the building wiring system. Plug in devices securely fastened to the structure and installed in accordance with the manufacturer's installation instructions are deemed to satisfy this requirement. Hard wired and plug-in carbon monoxide alarms shall be equipped with battery back up.

R315.4.2 Household carbon monoxide detection systems. Required power supply sources for household carbon

monoxide detection systems shall be in accordance with NFPA 720.

R315.4.3 Combination smoke/carbon monoxide alarms. Combination smoke/carbon monoxide alarms/detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke alarm features of combination smoke/carbon monoxide alarms/detectors shall be interconnected.

Exceptions: Interconnection and hard-wiring of combination smoke/carbon monoxide alarms/detectors in existing areas shall not be required where the alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure.

R315.5 Where required in existing dwellings. Where a new carbon monoxide source is introduced or work requiring a structural permit occurs in existing dwellings carbon monoxide alarms shall be provided in accordance with Section R315.1.

Exception: Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section.

SECTION R316 PLASTIC

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

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

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

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

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

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

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

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

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

1. *Attic* access is required by Section R807.1.
2. The space is entered only for purposes of repairs or maintenance.
3. The foam plastic insulation is protected against ignition using one of the following ignition barrier materials:
 - 3.1. 1 1/2-inch-thick (38 mm) mineral fiber insulation;
 - 3.2. 1/4-inch-thick (6.4 mm) wood structural panels;
 - 3.3. 3/8-inch (9.5 mm) particleboard;
 - 3.4. 1/4-inch (6.4 mm) hardboard;
 - 3.5. 3/8-inch (9.5 mm) gypsum board; or
 - 3.6. Corrosion-resistant steel having a base metal thickness of 0.016 inch (0.406 mm).

The above ignition barrier is not required where the foam plastic insulation has been tested in accordance with Section R316.6.

R316.5.4 Crawl spaces. The thermal barrier specified in Section R316.4 is not required where all of the following apply:

1. Crawlspace access is required by Section R408.4
2. Entry is made only for purposes of repairs or maintenance.
3. The foam plastic insulation is protected against ignition using one of the following ignition barrier materials:
 - 3.1. 1 1/2-inch-thick (38 mm) mineral fiber insulation;
 - 3.2. 1/4-inch-thick (6.4 mm) wood structural panels;
 - 3.3. 3/8-inch (9.5 mm) particleboard;
 - 3.4. 1/4-inch (6.4 mm) hardboard;
 - 3.5. 3/8-inch (9.5 mm) gypsum board; or
 - 3.6. Corrosion-resistant steel having a base metal thickness of 0.016 inch (0.406 mm).

The above ignition barrier is not required where the foam plastic insulation has been tested in accordance with Section R316.6.

R316.5.5 Foam-filled exterior doors. Foam-filled exterior doors are exempt from the requirements of Sections R316.3 and R316.4.

R316.5.6 Foam-filled garage doors. Foam-filled garage doors in attached or detached garages are exempt from the requirements of Sections R316.3 and R316.4.

R316.5.7 Foam backer board. The thermal barrier specified in Section R316.4 is not required where siding backer board foam plastic insulation has a maximum thickness of 0.5 inch (12.7 mm) and a potential heat of not more than 2000 Btu per square foot (22 720 kJ/m²) when tested in accordance with NFPA 259 provided that:

1. The foam plastic insulation is separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or
2. The foam plastic insulation is installed over existing *exterior wall* finish in conjunction with re-siding or
3. The foam plastic insulation has been tested in accordance with Section R316.6.

R316.5.8 Re-siding. The thermal barrier specified in Section R316.4 is not required where the foam plastic insulation is installed over existing *exterior wall* finish in conjunction with re-siding provided the foam plastic has a maximum thickness of 0.5 inch (12.7 mm) and a potential heat of not more than 2000 Btu per square foot (22 720 kJ/m²) when tested in accordance with NFPA 259.

R316.5.9 Interior trim. The thermal barrier specified in Section R316.4 is not required for exposed foam plastic interior trim, provided all of the following are met:

1. The minimum density is 20 pounds per cubic foot (320 kg/m³).
2. The maximum thickness of the trim is 0.5 inch (12.7 mm) and the maximum width is 8 inches (204 mm).

3. The interior trim shall not constitute more than 10 percent of the aggregate wall and ceiling area of any room or space.
4. The flame spread index does not exceed 75 when tested per ASTM E 84. The smoke-developed index is not limited.

R316.5.10 Interior finish. Foam plastics shall be permitted as interior finish where *approved* in accordance with Section R316.6. Foam plastics that are used as interior finish shall also meet the flame spread index and smoke-developed index requirements of Sections R302.9.1 and R302.9.2.

R316.5.11 Sill plates and headers. Foam plastic shall be permitted to be spray applied to a sill plate and header without the thermal barrier specified in Section R316.4 subject to all of the following:

1. The maximum thickness of the foam plastic shall be $3\frac{1}{4}$ inches (83 mm).
2. The density of the foam plastic shall be in the range of 0.5 to 2.0 pounds per cubic foot (8 to 32 kg/m³).
3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke developed index of 450 or less when tested in accordance with ASTM E 84.

R316.5.12 Sheathing. Foam plastic insulation used as sheathing shall comply with Section R316.3 and Section R316.4. Where the foam plastic sheathing is exposed to the *attic* space at a gable or kneewall, the provisions of Section R316.5.3 shall apply.

R316.6 Specific approval. Foam plastic not meeting the requirements of Sections R316.3 through R316.5 shall be specifically *approved* on the basis of one of the following *approved* tests: NFPA 286 with the acceptance criteria of Section R302.9.4, FM4880, UL 723, UL 1040 or UL 1715, or fire tests related to actual end-use configurations. The specific approval shall be based on the actual end use configuration and shall be performed on the finished foam plastic assembly in the maximum thickness intended for use. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use.

R316.7 Plastic panels and panel systems general. The provisions of this section shall be limited to detached one- and two-family dwellings and shall govern the quality, methods and expanded use of plastic panels and panel systems classified as CC-1 plastics in accordance with ASTM D635-03 and this section. Plastic panels and panel systems installed in detached one- and two-family dwellings and meeting the requirements of this section may be of unlimited area.

R316.7.1 Approval for use. The *building official* shall require that sufficient technical data be submitted to substantiate that the proposed plastic material is satisfactory for the intended use.

R316.7.1.1 Identification. Each unit or package of plastic panels and panel systems shall be identified with a mark or decal satisfactory to the *building official*, which includes identification as to the material classification.

R316.7.1.2 Standards of quality. The standards listed below are listed in Chapter 43 of this code.

1. UL Standard 790.
2. ASTM D2843-99.
3. ASTM D1929-96.
4. ASTM D635-03.
5. NFPA 285.
6. Factory Mutual Research Corporation (FMRC) Approval Standard 4470, Section 5.5 for Foot Traffic.
7. Factory Mutual Research Corporation (FMRC) Approval Standard 4471 for the Test Method for Wind Uplift.
8. Factory Mutual Research Corporation (FMRC) Approval Standard 4880, Section 5.4, 25-foot and 50-foot High Corner Tests.

R316.7.2 Definitions.

PLASTIC PANELS as used in this section are classified as CC-1 in accordance with ASTM D 635.

PLASTIC PANEL SYSTEM is construction in whole or in part of plastic panels and component structural parts that create a wall or roof panel capable of supporting the appropriate design loads for the building element.

WALL PANELS as used in this section are *approved* plastic materials that are not classified as plastic glazing and are used as an element of wall construction.

R316.7.3 Design and installation structural requirements.

Plastic materials and their assembly shall be of adequate strength and durability to withstand the design loads as prescribed elsewhere in this code. Technical data shall be submitted to establish stresses, maximum unsupported spans and such other information for the various thicknesses and forms used as may be deemed necessary by the *building official*.

R316.7.3.1 Fastening. Fastening shall be adequate to withstand design loads as prescribed elsewhere in this code. Proper allowance shall be made for expansion and contraction of plastic materials to protect the structural integrity of the installation in accordance with accepted data on coefficient of expansion of the material and other material in conjunction with which it is employed. Listed assemblies shall be installed according to manufacturers' specifications. Corrosion-resistant or other *approved* fastening systems shall be used.

R316.7.3.2 Water resistance. Plastic panels and panel systems shall resist water penetration and provide weather protection for the building.

R316.7.4 Wall panels and panel systems. *Approved* plastic panels and panel systems may be installed in exterior walls provided the walls are not required to have a fire-resistive rating.

Exception: Plastic panels *approved* as fire-resistive construction or as a fire assembly.

For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section R302.

R316.7.5 Roof panels and panel systems. *Approved* plastic roof panels and panel systems may be installed in roofs of buildings not required to have a fire-resistive rating. Roof panels or units shall not be installed within that portion of a roof located within a distance to property line or public way where openings in exterior walls are prohibited or required to be protected.

Exception: Plastic panels *approved* as fire-resistive construction or as a fire assembly.

Plastic roof panels and panel systems shall slope at least 2 units vertical in 12 units horizontal (16.6-percent slope). When used as roof covering, the panels or panel systems shall have at least a Class C rating.

R316.7.6 Energy conservation. Alternative building systems and equipment design may be *approved* by the *building official* for detached one- and two-family dwellings. Applicants shall demonstrate that the whole building annual energy consumption will not exceed that used by a similar building using similar forms of energy designed in accordance with the prescriptive requirements of this chapter. Compliance under this section allows trade-offs between the performance requirements in all sections of Chapter 11.

R316.7.6.1 Documentation. The applicant shall submit documents showing compliance with the requirements of this chapter. This documentation shall be in a manner *approved* by the administrator of the Building Codes Division.

SECTION R317 PROTECTION OF WOOD AND WOOD BASED PRODUCTS AGAINST DECAY

R317.1 Location required. Protection of wood and wood based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1 for the species, product, preservative and end use. Preservatives shall be listed in Section 4 of AWPA U1.

1. Wood joists or the bottom of a wood structural floor when closer than 18 inches (457 mm) or wood girders when closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. All wood framing members and sill plates in contact with concrete or masonry foundation walls.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 1/2 inch (12.7 mm) on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152

mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs, and similar horizontal surfaces exposed to the weather.

6. Wood structural members supporting moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below *grade* except where an *approved* vapor retarder is applied between the wall and the furring strips or framing members.

R317.1.1 Field treatment. Field-cut ends, notches and drilled holes of preservative-treated wood shall be treated in the field in accordance with AWPA M4.

R317.1.2 Ground contact. All wood in contact with the ground, embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather that supports permanent structures intended for human occupancy shall be *approved* pressure-preservative-treated wood suitable for ground contact use, except untreated wood may be used where entirely below groundwater level or continuously submerged in fresh water.

R317.1.3 Geographical areas. In geographical areas where experience has demonstrated a specific need, *approved* naturally durable or pressure-preservative-treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances when those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members may include:

1. Horizontal members such as girders, joists and decking.
2. Vertical members such as posts, poles and columns.
3. Both horizontal and vertical members.

R317.1.4 Wood columns. Wood columns shall be *approved* wood of natural decay resistance or *approved* pressure-preservative-treated wood.

Exceptions:

1. Columns exposed to the weather or in *basements* when supported by concrete piers or metal pedestals projecting 1 inch (25.4 mm) above a concrete floor or 6 inches (152 mm) above exposed earth and the earth is covered by an *approved* impervious moisture barrier.
2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building when supported by a concrete pier or metal pedestal at a height more than 8 inches (203mm) from exposed earth and the earth is covered by an impervious moisture barrier.

R317.1.5 Exposed glued-laminated timbers. The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative-treated wood.

R317.2 Quality mark. Lumber and plywood required to be pressure-preservative-treated in accordance with Section R317.1 shall bear the quality *mark* of an *approved* inspection agency that maintains continuing supervision, testing and inspection over the quality of the product and that has been *approved* by an accreditation body that complies with the requirements of the American Lumber Standard Committee treated wood program.

R317.2.1 Required information. The required quality *mark* on each piece of pressure-preservative-treated lumber or plywood shall contain the following information:

1. Identification of the treating plant.
2. Type of preservative.
3. The minimum preservative retention.
4. End use for which the product was treated.
5. Standard to which the product was treated.
6. Identity of the *approved* inspection agency.
7. The designation “Dry,” if applicable.

Exception: Quality *marks* on lumber less than 1 inch (25.4 mm) nominal thickness, or lumber less than nominal 1 inch by 5 inches (25.4 mm by 127 mm) or 2 inches by 4 inches (51 mm by 102 mm) or lumber 36 inches (914 mm) or less in length shall be applied by stamping the faces of exterior pieces or by end labeling not less than 25 percent of the pieces of a bundled unit.

R317.3 Fasteners and connectors in contact with preservative-treated and fire-retardant-treated wood. Fasteners and connectors in contact with preservative-treated wood and fire-retardant-treated wood shall be in accordance with this section. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153.

R317.3.1 Fasteners for preservative-treated wood. Fasteners for preservative-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Coating types and weights for connectors in contact with preservative-treated wood shall be in accordance with the connector manufacturer’s recommendations. In the absence of manufacturer’s recommendations, a minimum of ASTM A 653 type G185 zinc-coated galvanized steel, or equivalent, shall be used.

Exceptions:

1. One-half-inch (12.7 mm) diameter or greater steel bolts.
2. Fasteners other than nails and timber rivets shall be permitted to be of mechanically deposited zinc coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

R317.3.2 Fastenings for wood foundations. Fastenings for wood foundations shall be as required in AF&PA PWF.

R317.3.3 Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations. Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Fasteners other than nails and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

R317.3.4 Fasteners for fire-retardant-treated wood used in interior applications. Fasteners for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer’s recommendations. In the absence of the manufacturer’s recommendations, Section R317.3.3 shall apply.

R317.4 Wood/plastic composites. Wood/plastic composites used in exterior deck boards, stair treads, handrails and guard-rail systems shall bear a *label* indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032.

R317.4.1 Wood/plastic composites shall be installed in accordance with the manufacturer’s instructions.

SECTION R318 MOISTURE CONTROL

R318.1 Vapor retarders. In all framed walls, floors and roof/ceilings comprising elements of the building thermal envelope, a vapor retarder shall be installed on the warm-in-winter side of the insulation.

Exceptions:

1. In construction where moisture or freezing will not damage the materials.
2. Where the framed cavity or space is ventilated to allow moisture to escape.

R318.2 Moisture content. Prior to the installation of interior finishes, the *building official* shall be notified in writing by the general contractor that all moisture-sensitive wood framing members used in construction have a moisture content of not more than 19 percent of the weight of dry wood framing members.

SECTION R319 SITE ADDRESS

R319.1 Address numbers. 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. Where access is by means of a private road and the building address cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure.

SECTION R320 ACCESSIBILITY

R320.1 Scope. Dwelling units required to be accessible by ORS 447.231 shall comply with Chapter 11 of the *Building Code* as applicable.

SECTION R321 ELEVATORS AND PLATFORM LIFTS

R321.1 Elevators. Where provided, passenger elevators, limited-use/limited-application elevators or private residence elevators shall comply with ASME A17.1.

R321.1.1 Permits. Pursuant to the Elevator Safety Laws, ORS Chapter 460, an application, plan review and permit for elevators, dumbwaiters, vertical and inclined wheelchair lifts, and stairway chair lifts, installed in private residences, must be obtained from Building Codes Division, Elevator Safety Program (ORS 460.035).

R321.2 Platform lifts. Where provided, platform lifts shall comply with ASME A18.1.

R321.3 Accessibility. Elevators or platform lifts in covered multifamily dwellings shall comply with Chapter 11 of the *Building Code*.

SECTION R322 FLOOD-RESISTANT CONSTRUCTION

R322.1 General. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as identified by the local jurisdiction shall be designed and constructed in accordance with the provisions contained in this section.

Exception: Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R322.1.1 Alternative provisions. As an alternative to the requirements in Section R322.3 for buildings and structures located in whole or in part in coastal high-hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R322.1.2 Structural systems. All structural systems of all buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement resulting from hydrodynamic and hydrostatic loads and stresses, including the effects of buoyancy.

R322.1.3 Flood-resistant construction. All buildings and structures erected in areas prone to flooding shall be constructed by methods and practices that minimize flood damage.

R322.1.4 Establishing the design flood elevation. The design flood elevation shall be used to define areas prone to flooding. At a minimum, the design flood elevation is the higher of:

1. The base flood elevation at the depth of peak elevation of flooding (including wave height) which has a 1

percent (100-year flood) or greater chance of being equaled or exceeded in any given year, or

2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the local jurisdiction, or otherwise legally designated.

R322.1.4.1 Determination of design flood elevations. If design flood elevations are not specified, the *building official* is authorized to require the applicant to:

1. Obtain and reasonably use data available from a federal, state or other source; or
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered *design professional* who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

R322.1.4.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with all other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

R322.1.5 Lowest floor. The lowest floor shall be the floor of the lowest enclosed area, including *basement*, but excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section.

R322.1.6 Protection of mechanical and electrical systems. Electrical systems, *equipment* and components; heating, ventilating, air conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall be located at or above the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones). If replaced as part of a substantial improvement, electrical systems, *equipment* and components; heating, ventilating, air conditioning and plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* shall meet the requirements of this section. Systems, fixtures, and *equipment* and components shall not be mounted on or penetrate through walls intended to break away under flood loads.

Exception: Locating electrical systems, *equipment* and components; heating, ventilating, air conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment* is permitted below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) provided that they are designed and installed to prevent water from entering or accumulating

within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in accordance with ASCE 24. Electrical wiring systems are permitted to be located below the required elevation provided they conform to the provisions of the *Electrical Code* for wet locations.

R322.1.7 Protection of water supply and sanitary sewage systems. New and replacement water supply systems shall minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New and replacement sanitary sewage systems shall minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing provisions of this code.

R322.1.8 Flood-resistant materials. Building materials used below the elevation required in Section R322.2 (flood hazard areas including A Zones) or R322.3 (coastal high-hazard areas including V Zones) shall comply with the following:

1. All wood, including floor sheathing, shall be pressure-preservative-treated in accordance with AWP A U1 for the species, product, preservative and end use or be the decay-resistant heartwood of redwood, black locust or cedars. Preservatives shall be listed in Section 4 of AWP A U1.
2. Materials and installation methods used for flooring and interior and *exterior walls* and wall coverings shall conform to the provisions of FEMA/FIA-TB-2.

R322.1.9 Manufactured homes. New or replacement *manufactured homes* shall be elevated in accordance with Section R322.2 or Section R322.3 in coastal high-hazard areas (V Zones). The anchor and tie-down requirements of Sections AE101 and AE102 of Appendix E shall apply. The foundation and anchorage of *manufactured homes* to be located in identified floodways shall be designed by a *registered design professional* and constructed in accordance with ASCE 24.

R322.1.10 As-built elevation documentation. A registered *design professional* shall prepare and seal documentation of the elevations specified in Section R322.2 or R322.3.

R322.2 Flood hazard areas (including A Zones). All areas that have been determined to be prone to flooding but not subject to high velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1½ feet (457 mm) and 3 feet (914 mm) shall be designated as Coastal A Zones. All building and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

R322.2.1 Elevation requirements. For the purposes of Section R322, required elevations shall be a minimum of 1 foot (305 mm) above the design flood elevation unless increased by the local jurisdiction under the authority of

National Flood Insurance Program (NFIP) incorporated in 423 U.S.C. 40001-4128.

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated at least 1 foot above the design flood elevation.
2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or to the design flood elevation, whichever is higher.
3. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including *basement*) elevated at least as high above the highest adjacent *grade* 1 foot above as the depth number specified in feet on the FIRM, or at least 3 feet (915 mm) if a depth number is not specified.
4. Basement floors that are below *grade* on all sides shall be elevated at least 1 foot above the design flood elevation.

Exception: Enclosed areas below the design flood elevation, including *basements* whose floors are not below *grade* on all sides, shall meet the requirements of Section R322.2.2.

5. The finished ground level of an under-floor space such as a crawl space shall be equal to or higher than the outside finished ground level.

Exception: Under-floor spaces that meet the requirements of FEMA/FIA-TB-11.

R322.2.2 Enclosed area below design flood elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria:
 - 2.1. There shall be a minimum of two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings on exterior walls.
 - 2.2. The total net area of all openings shall be at least 1 square inch (645 mm²) for each square foot (0.093 m²) of enclosed area, or the openings shall be designed and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.6.2.2 of ASCE 24.
 - 2.3. The bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.

- 2.4. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
- 2.5. Any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.
- 2.6. Openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this section.

R322.2.3 Foundation design and construction. Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4.

Exception: Unless designed in accordance with Section R404:

1. The unsupported height of 6-inch (152 mm) plain masonry walls shall be no more than 3 feet (914 mm).
2. The unsupported height of 8-inch (203 mm) plain masonry walls shall be no more than 4 feet (1219 mm).
3. The unsupported height of 8-inch (203 mm) reinforced masonry walls shall be no more than 8 feet (2438 mm).

For the purpose of this exception, unsupported height is the distance from the finished *grade* of the under-floor space and the top of the wall.

R322.3 Coastal high-hazard areas (including V Zones). Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. Buildings and structures constructed in whole or in part in coastal high-hazard areas shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.6.

R322.3.1 Location and site preparation.

1. New buildings and buildings that are determined to be substantially improved pursuant to Section R105.3.1.1, shall be located landward of the reach of mean high tide.
2. For any alteration of sand dunes and mangrove stands the *building official* shall require submission of an engineering analysis which demonstrates that the proposed *alteration* will not increase the potential for flood damage.

R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:
 - 1.1. Located at least 1 foot (305 mm) above the design flood elevation, if the lowest horizontal structural member is oriented parallel to the

direction of wave approach, where parallel shall mean less than or equal to 20 degrees (0.35 rad) from the direction of approach, or

- 1.2. Located at the base flood elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees (0.35 rad) from the direction of approach.

2. Basement floors that are below *grade* on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

Exception: Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

R322.3.3 Foundations. Buildings and structures erected in coastal high-hazard areas shall be supported on pilings or columns and shall be adequately anchored to those pilings or columns. Pilings shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

R322.3.4 Walls below design flood elevation. Walls and partitions are permitted below the elevated floor, provided that such walls and partitions are not part of the structural support of the building or structure and:

1. Electrical, mechanical, and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
2. Are constructed with insect screening or open lattice; or
3. Are designed to break away or collapse without causing collapse, displacement or other structural damage

to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a design safe loading resistance of not less than 10 (479 Pa) and no more than 20 pounds per square foot (958 Pa); or

4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), the *construction documents* shall include documentation prepared and sealed by a registered *design professional* that:
 - 4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the design flood.
 - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on all building components (structural and nonstructural). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code.

R322.3.5 Enclosed areas below design flood elevation.

Enclosed areas less than 1 foot (305 mm) above the design flood elevation shall be used solely for parking of vehicles, building access or storage.

R322.3.6 Construction documents. The *construction documents* shall include documentation that is prepared and sealed by a registered *design professional* that the design and methods of construction to be used meet the applicable criteria of this section.

SECTION R323 STORM SHELTERS

R323.1 General. This section applies to the construction of storm shelters when constructed as separate detached buildings or when constructed as safe rooms within buildings for the purpose of providing safe refuge from storms that produce high winds, such as tornados and hurricanes. In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC/NSSA-500.

SECTION R324 WILDFIRE HAZARD MITIGATION

R324.1 Purpose. The purpose of this section is to provide minimum standards for dwellings and their accessory structures located in or adjacent to vegetated areas subject to wildfires, to reduce or eliminate hazards presented by such fires.

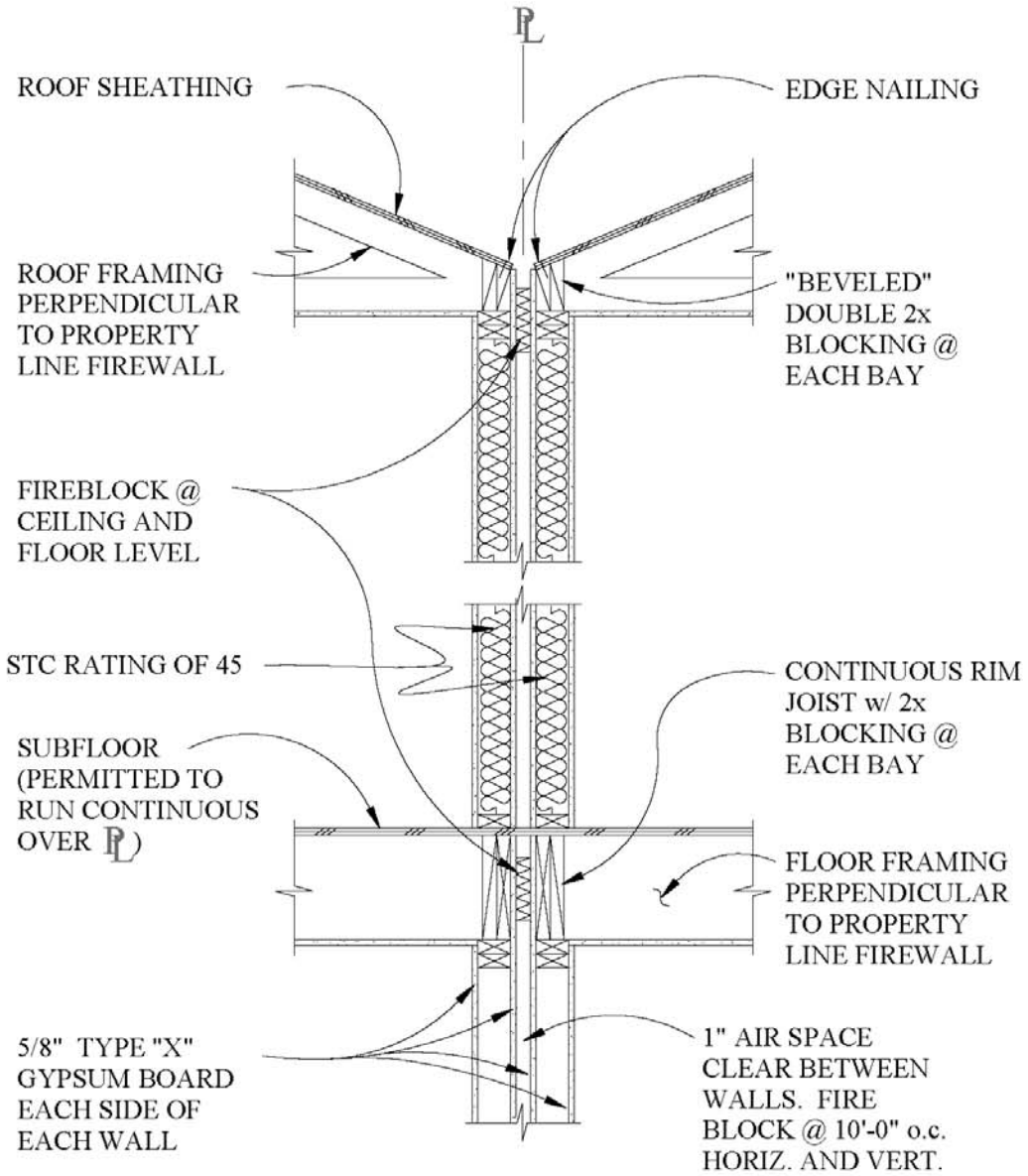
R324.2 Scope. The provisions of this section shall apply to dwellings required to be protected against wildfire by a jurisdiction which has adopted wildfire zoning regulations.

R324.3 Wildfire hazard zone. A wildfire hazard zone is an area legally determined by a jurisdiction to have special hazards caused by a combination of combustible natural fuels, topography and climatic conditions that result in a significant hazard of catastrophic fire over relatively long periods each year. Wildfire hazard zones shall be determined using criteria established by the Oregon Department of Forestry.

R324.3.1 Wildfire hazard zone requirements. Dwellings and their accessory structures shall be protected against wildfire by the following requirement in addition to other requirements of this code.

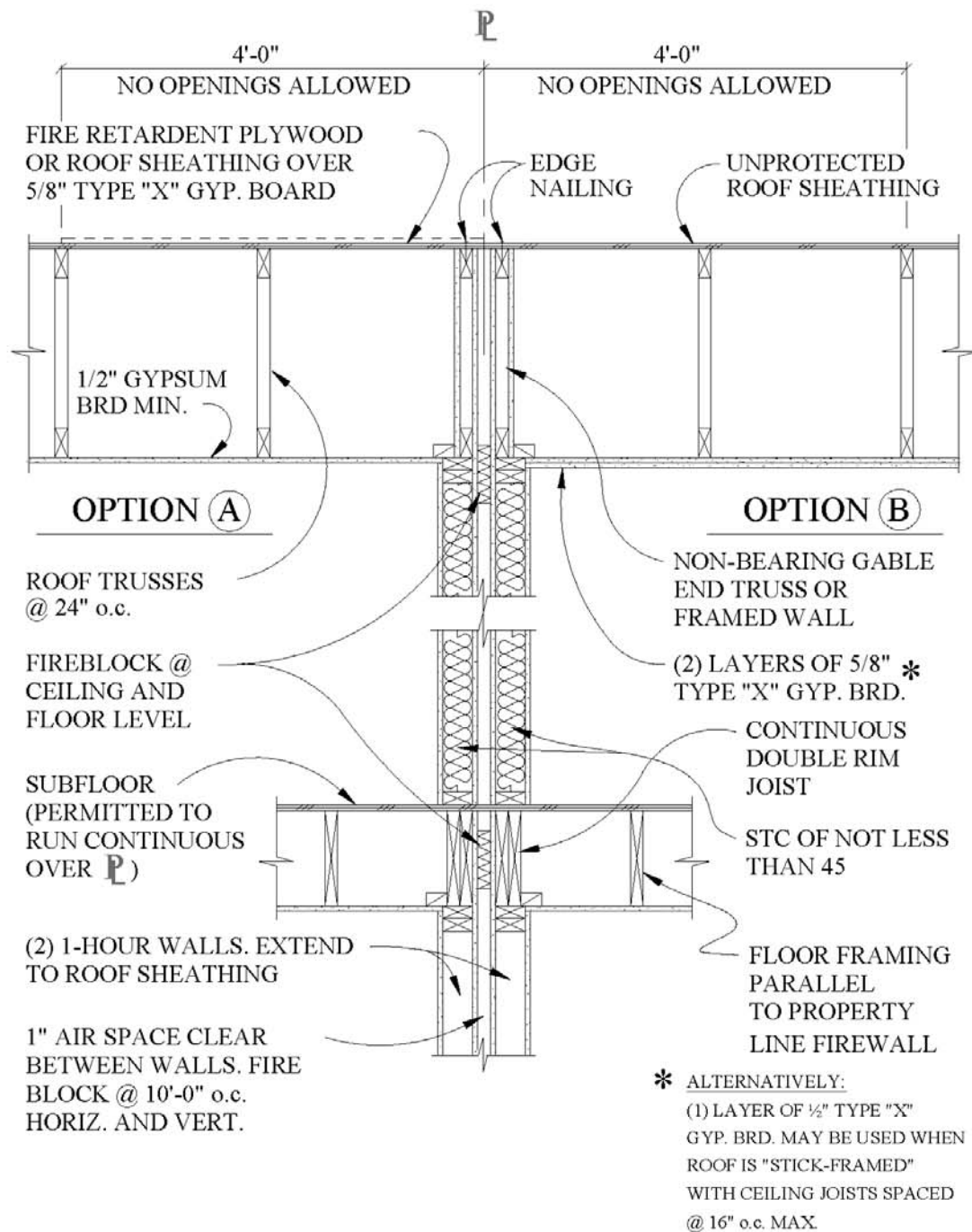
R324.3.1.1 Roofing. Roofing shall be asphalt shingles in accordance with Section R905.2, slate shingles in accordance with Section R905.6, metal roofing in accordance with Section R905.4, tile, clay or concrete shingles in accordance with Section R905.3 and other approved roofing which is deemed to be equivalent to a minimum Class C rated roof covering. Untreated wood shingle and shake roofs are not permitted when the construction site is in a wildfire hazard zone as determined by Section R324.3.

R324.3.1.2 Reroofing or repair of roofing of existing buildings. When 50 percent or more of the roof covering of any building is repaired or replaced within one year, the roof covering shall be made to comply with this section and attic ventilation shall be made to comply with this code. Ventilation openings shall be protected with corrosion-resistant wire mesh, not greater than $\frac{1}{2}$ -inch (12.7 mm) or less than $\frac{1}{8}$ -inch (3.2 mm) in any dimension.



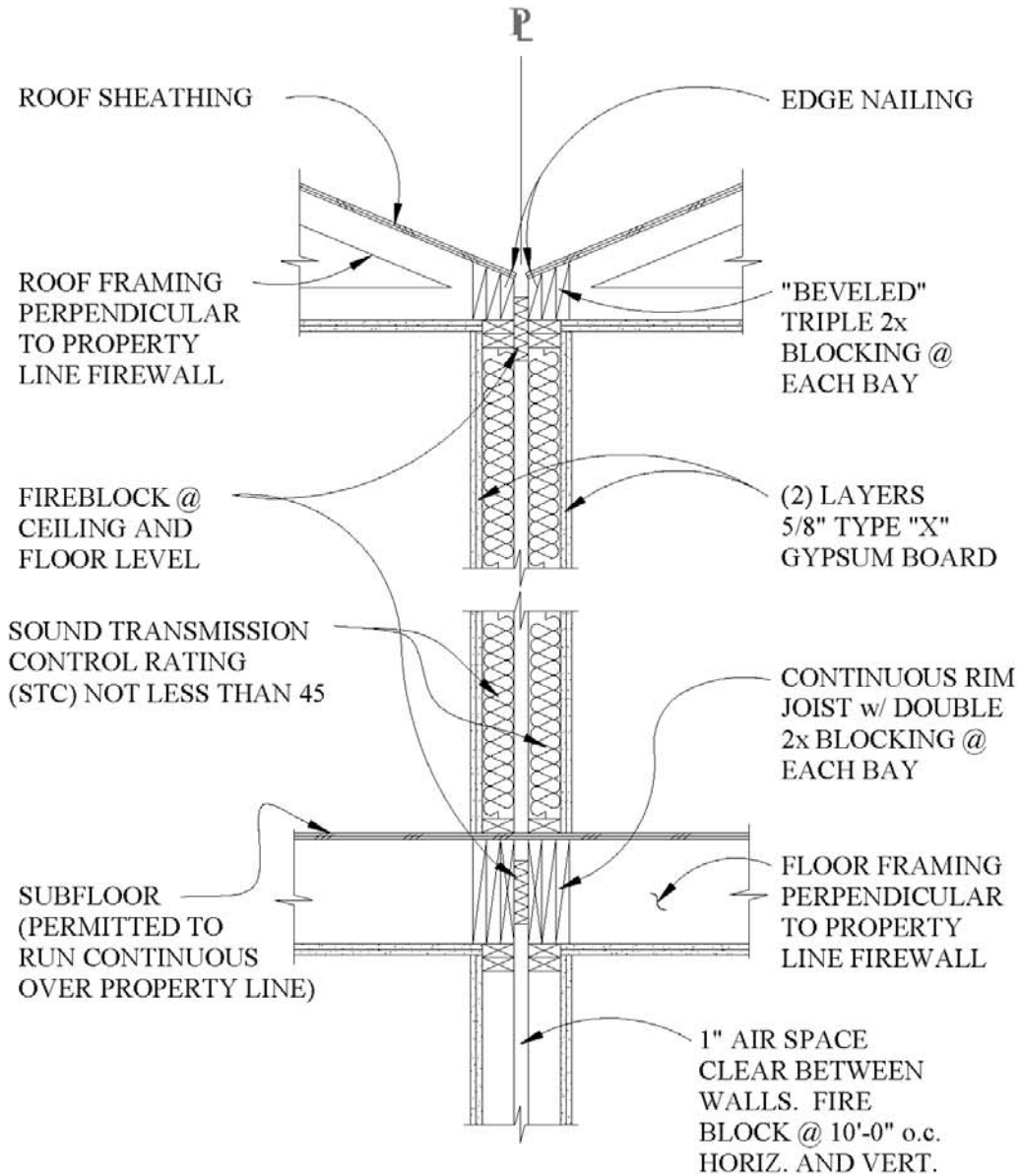
For SI: 1 inch = 25.4 mm.

FIGURE R302.2 (a)
TWO 1-HOUR FIREWALLS PERPENDICULAR TO COMMON PROPERTY LINE



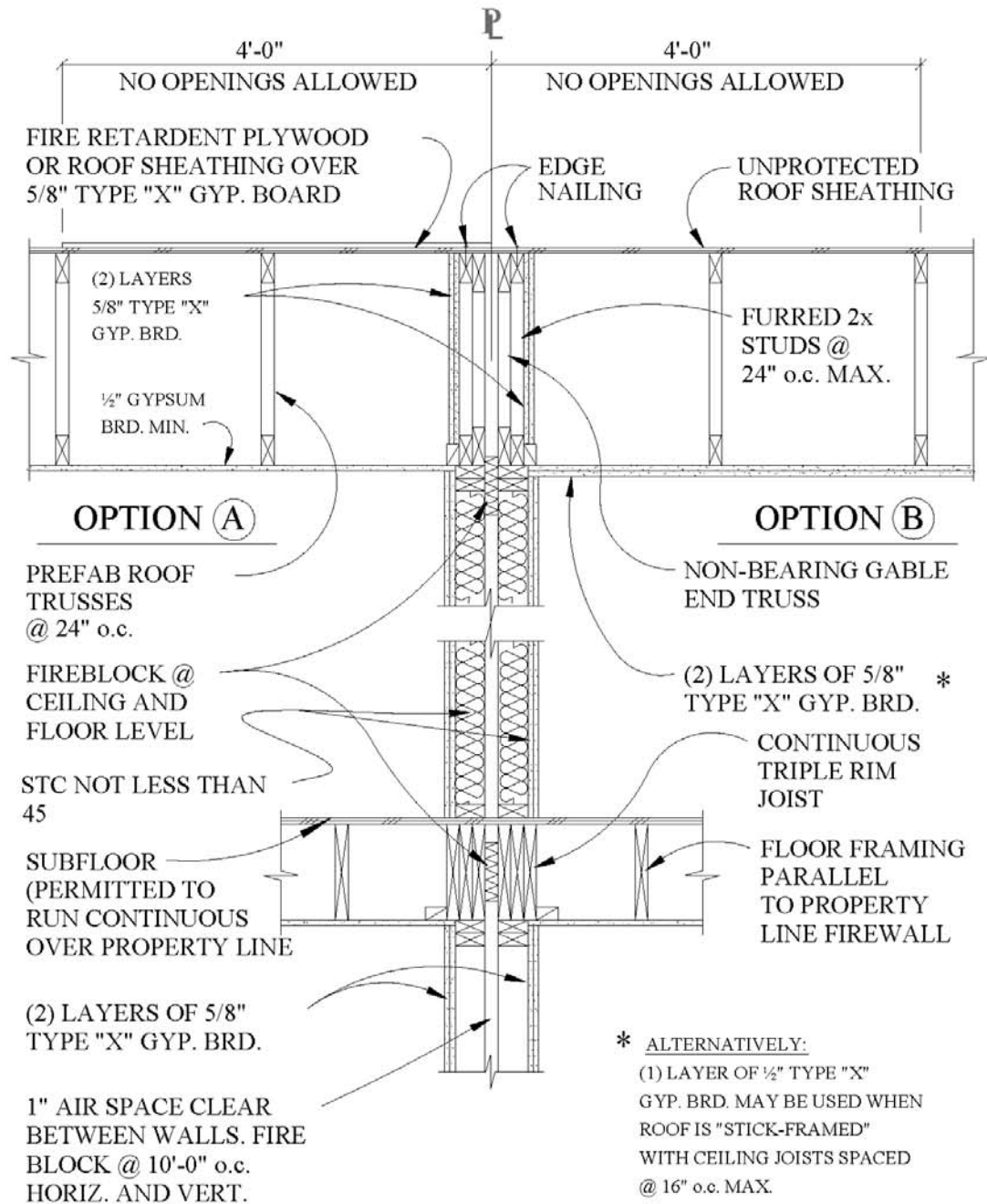
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R302.2 (b)
TWO 1-HOUR FIREWALLS PARALLEL TO COMMON PROPERTY LINE



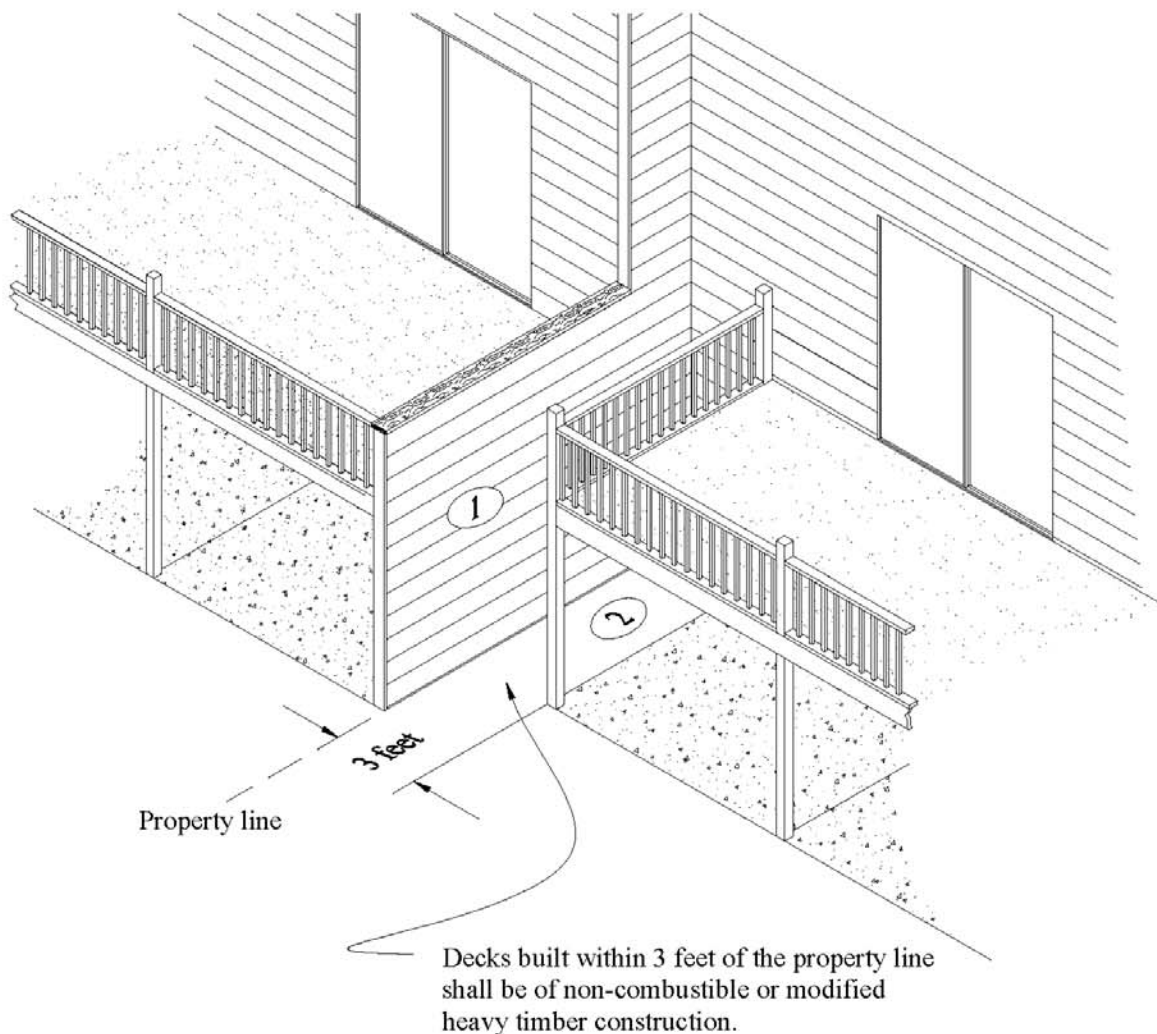
For SI: 1 inch = 25.4 mm.

FIGURE R302.2 (c)
"MODIFIED" 2-HOUR FIREWALL PERPENDICULAR TO COMMON PROPERTY LINE



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

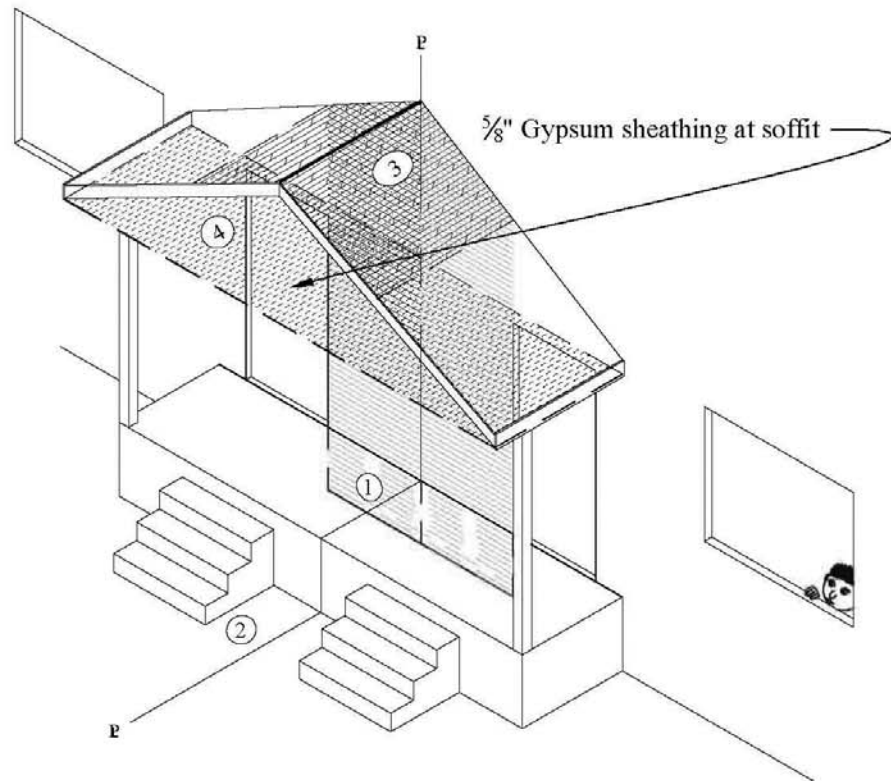
FIGURE R302.2 (d)
 "MODIFIED" 2-HOUR FIREWALL PERPENDICULAR TO COMMON PROPERTY LINE



- ① Decks built within 3 feet of a property line are to be protected at the property line with one-hour walls that extend from grade level to a minimum height of 36 inches above the deck, or the height of the guardrail, whichever is greater.
- ② Decks built at least 3 feet away from the property line may be non-rated construction.

For SI: 1 foot = 304.8 mm.

FIGURE R302.2.2.1
DECK CONSTRUCTION WITHIN THREE FEET OF COMMON PROPERTY LINE

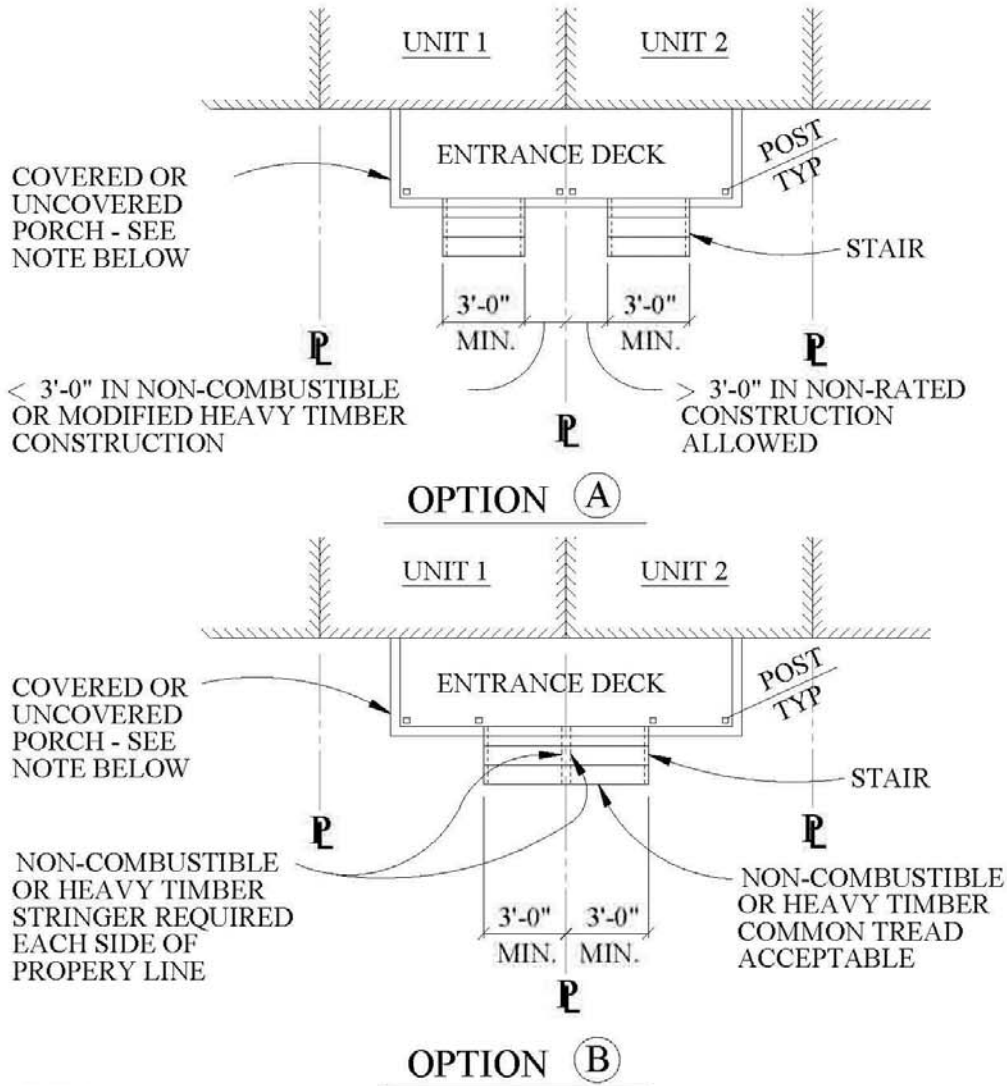


NOTES:

- ① One-hour wall, without openings, continuing from common property line, extending 4 feet perpendicularly from the property line, across the front of the dwelling unit. This wall is to extend from the foundation of the dwelling unit to the upper most roof sheathing of the porch.
- ② Stairways which are closer than 3 feet to the property line shall be of one-hour, modified heavy timber, or non-combustible construction. (See Figure R302.2.2.3)
- ③ roof construction shall be as for property line construction.
- ④ If a porch soffit is provided, the soffit shall be of $\frac{5}{8}$ " type "x" gypsum sheathing, without openings, for its full depth and width.

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

**FIGURE R302.2.2.2
COVERED PORCH AT COMMON PROPERTY LINE**

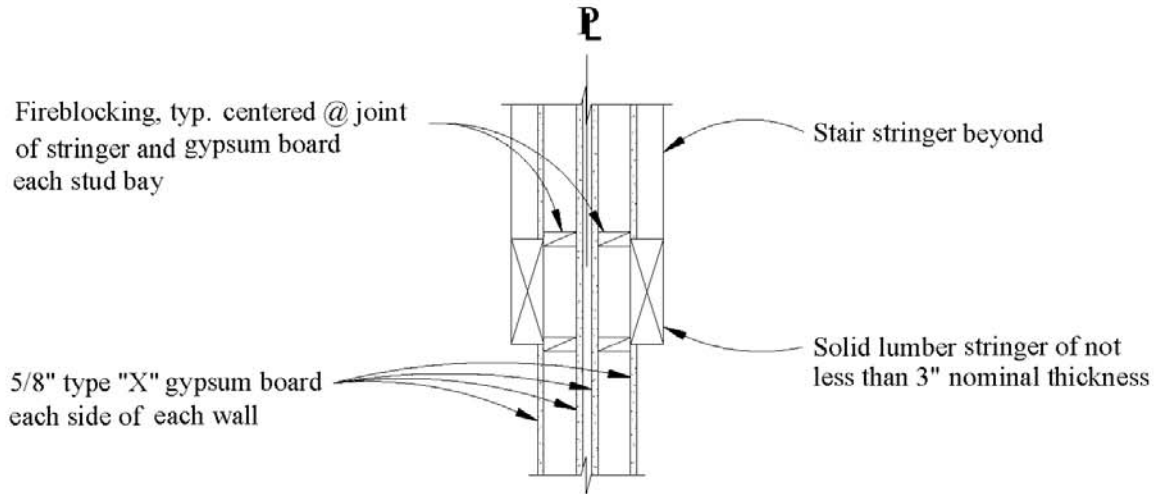


NOTE:

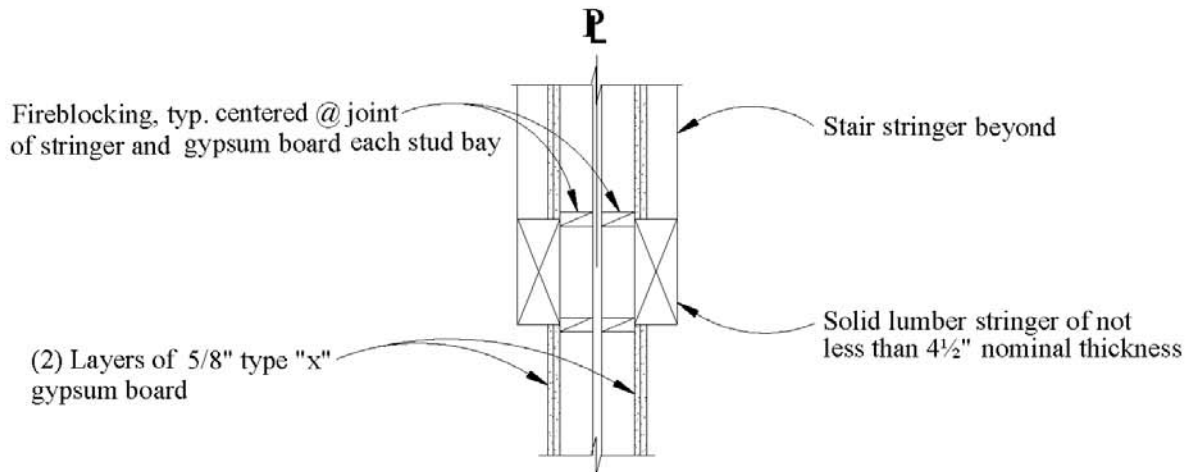
FOR UNCOVERED PORCHES SERVING NO MORE THAN TWO UNITS, A COMMON STAIR MAY BE PROVIDED WITH A MINIMUM WIDTH OF 44 INCHES AND BE OF NON-COMBUSTIBLE OR HEAVY TIMBER CONSTRUCTION.

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

**FIGURE R302.2.2.3
EXTERIOR STAIRWAY**



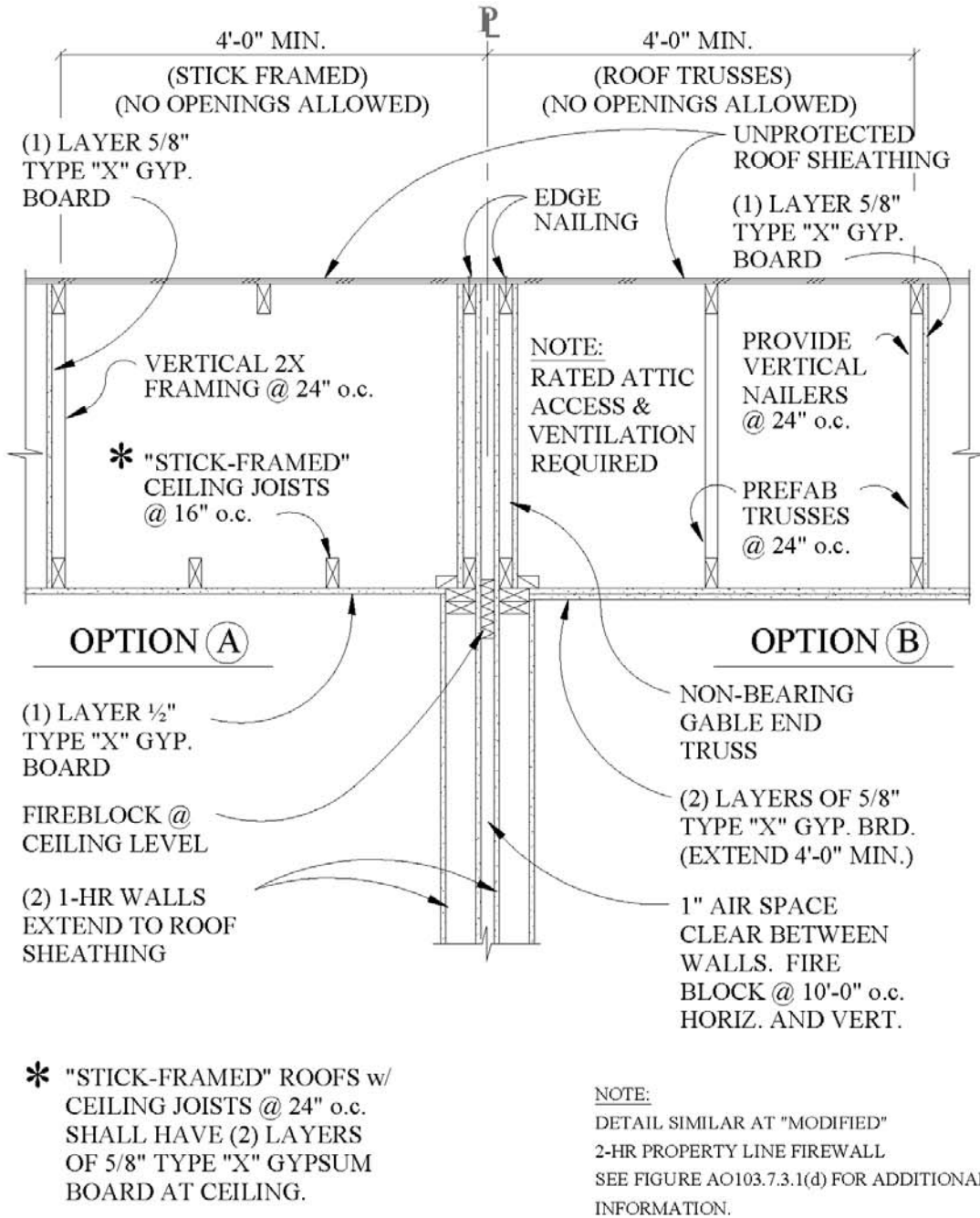
A TWO 1-HOUR WALLS



B "MODIFIED" 2-HOUR WALL

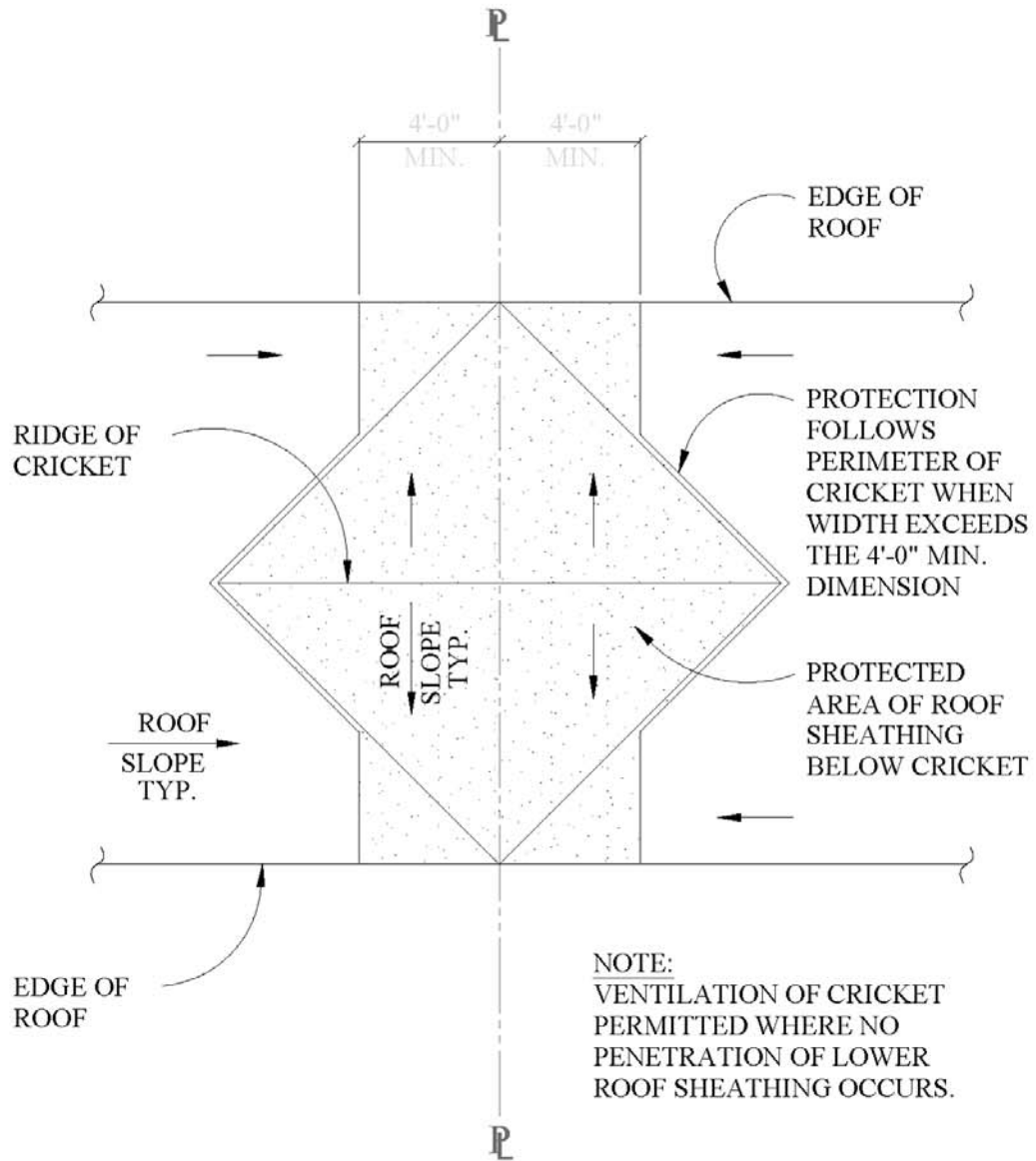
For SI: 1 inch = 25.4 mm.

FIGURE R302.2.2
STRINGER PENETRATIONS OF FIREWALL AT COMON PROPERTY LINE



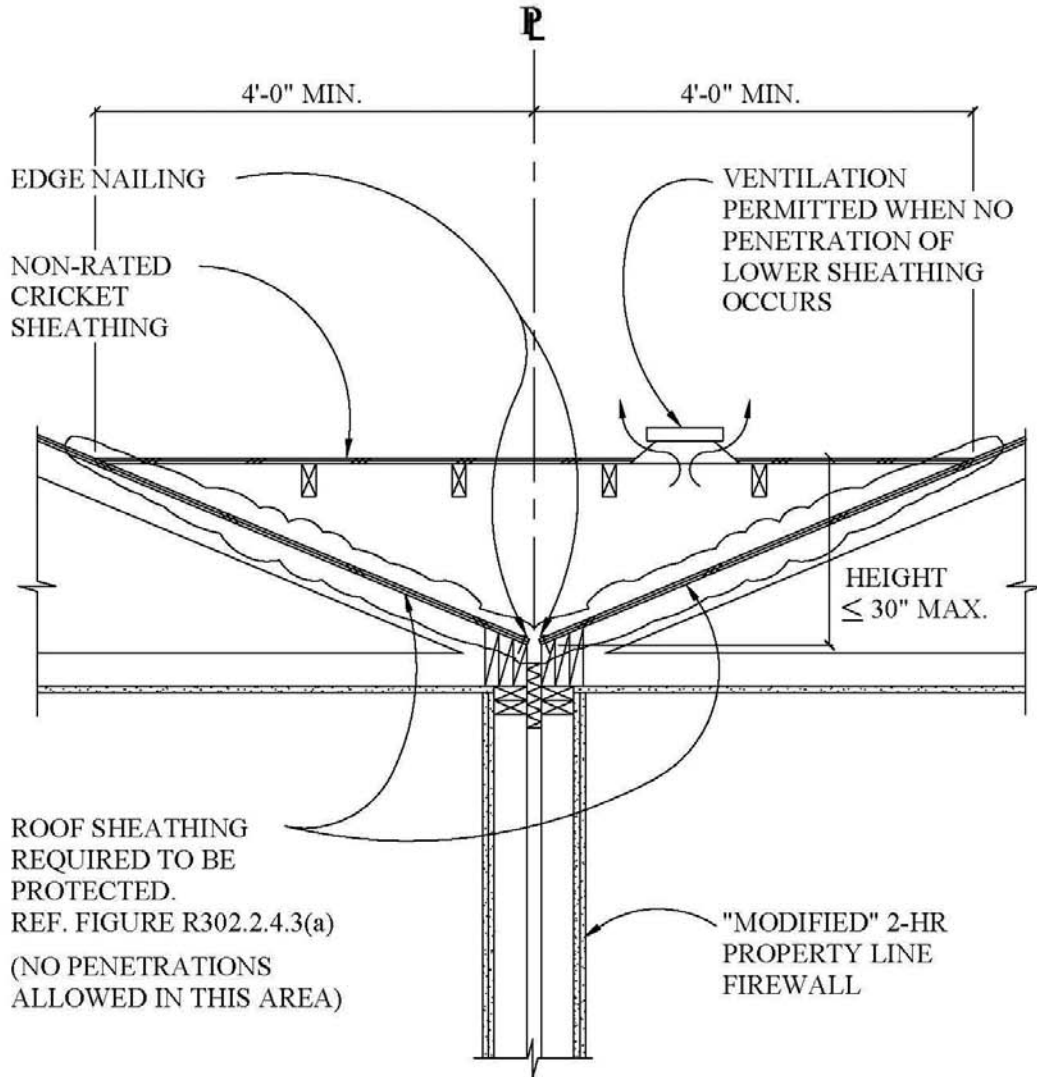
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R302.2.4.1
FIRE-RESISTANCE-RATED ROOF/CEILING CONSTRUCTION-
"MUSHROOM" ATTIC ENCLOSURE FRAMING PARALLEL TO COMMON PROPERTY LINE



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

FIGURE R302.2.4.3(a)
UNRATED CRICKET LESS THAN OR EQUAL TO 30 INCHES

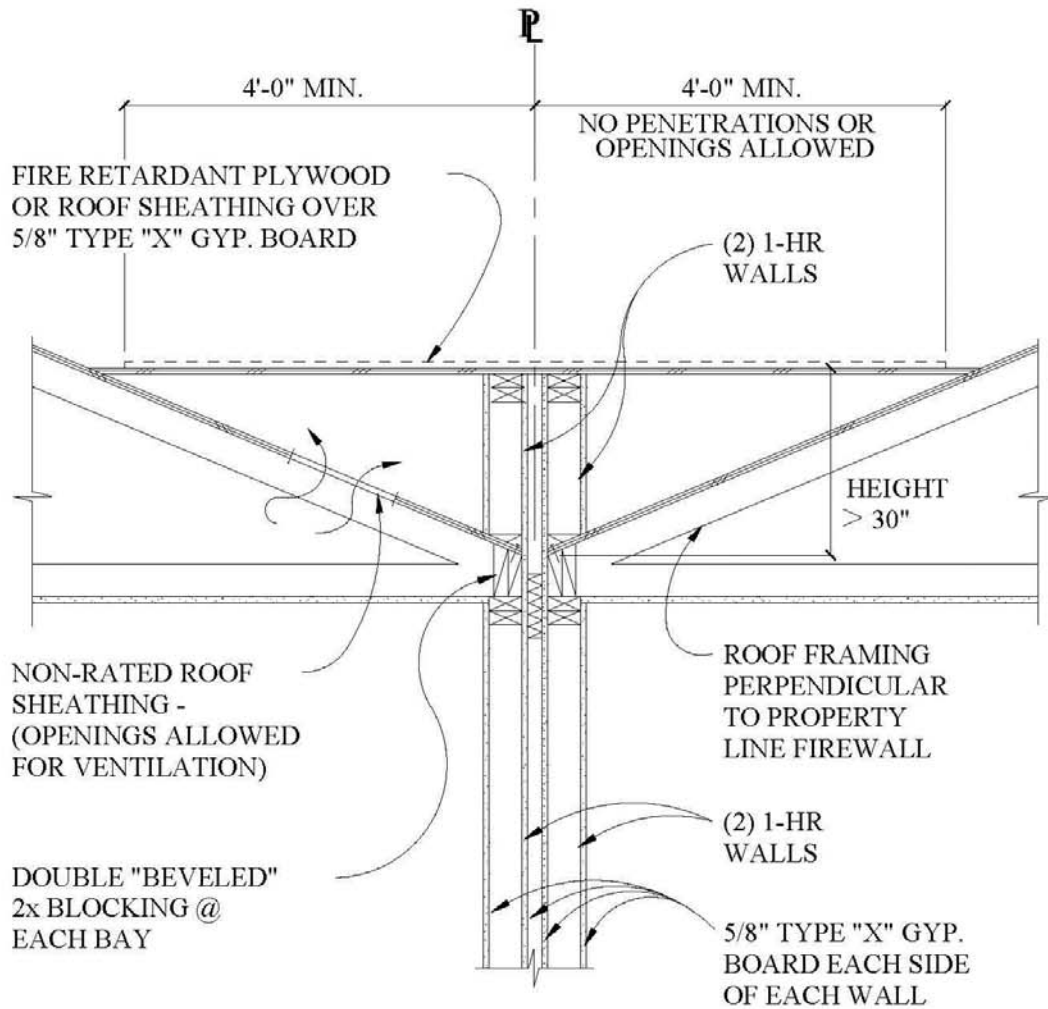


NOTES:

1. DETAIL IS SIMILAR WHEN A (2) 1-HR PROPERTY LINE FIREWALL IS USED.
2. SEE FIGURE R302.2(c) FOR ADDITIONAL INFORMATION.

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

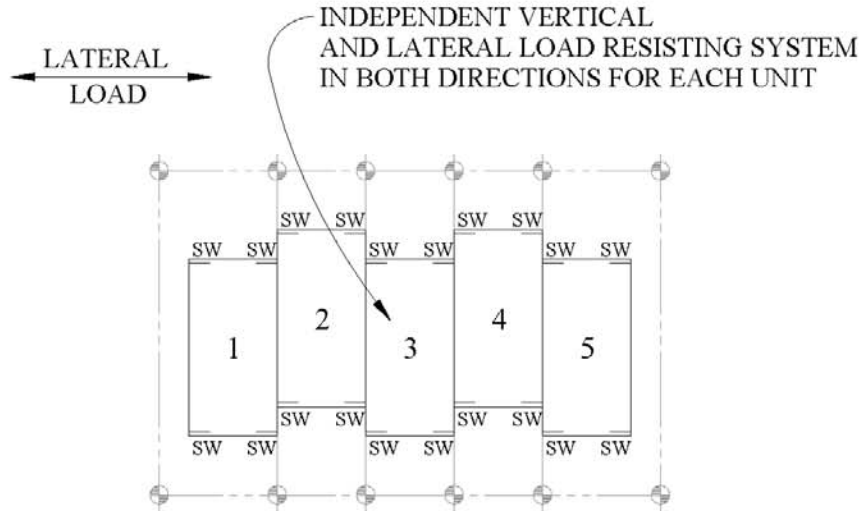
**FIGURE R302.2.4.3 (b)
UNRATED CRICKET LESS THAN OR EQUAL TO 30 INCHES**



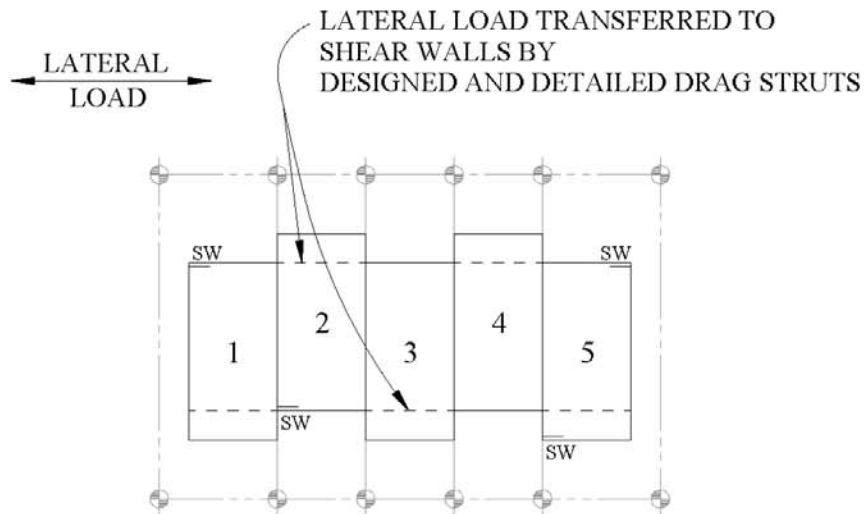
NOTES:

1. DETAIL IS SIMILAR WHEN A "MODIFIED" 2-HOUR PROPERTY LINE FIREWALL IS USED.
2. SEE FIGURE R302.2(a) FOR ADDITIONAL INFORMATION.

**FIGURE R302.2.4.3 (c)
RATED CRICKET GREATER THAN 30 INCHES**



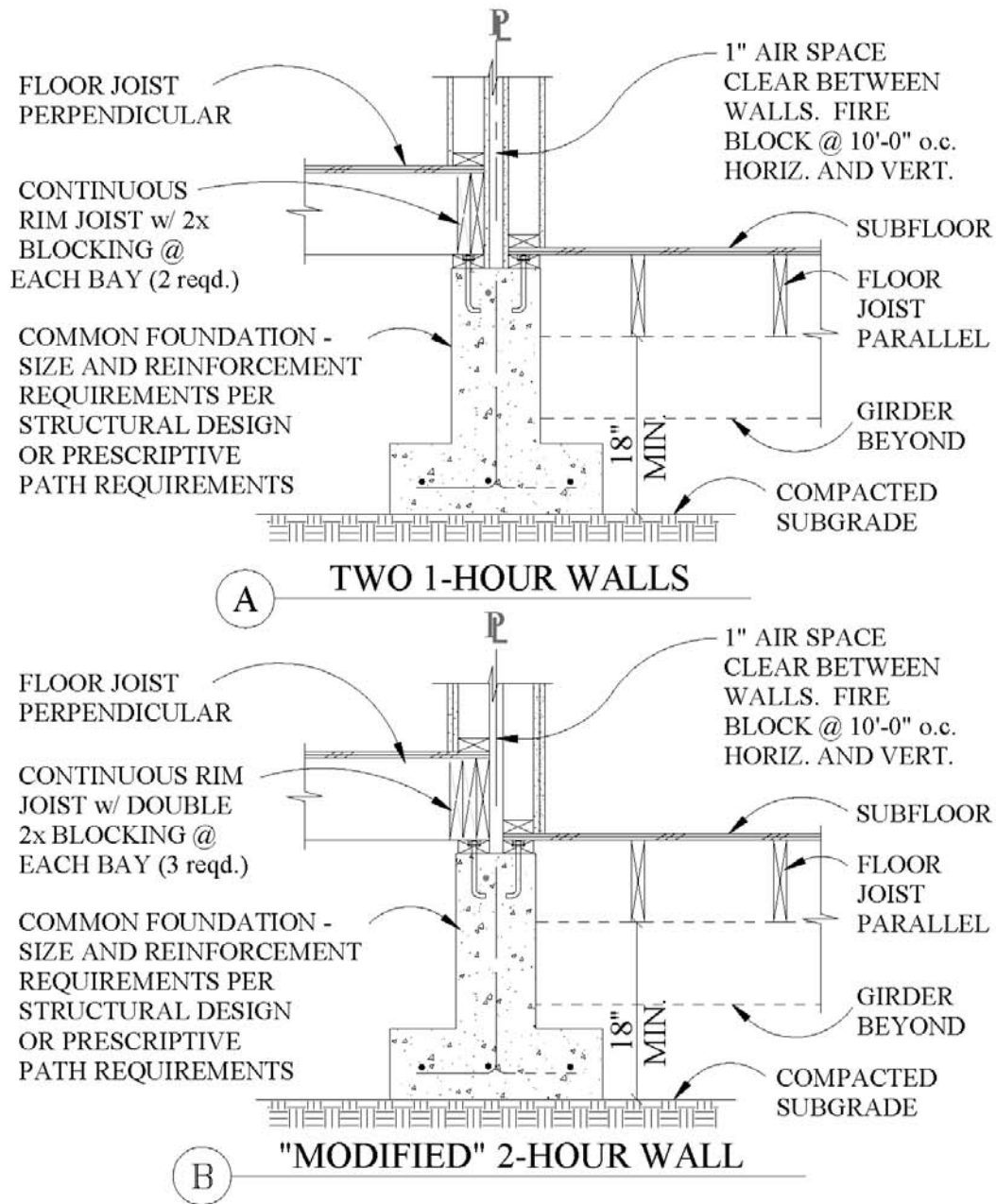
A STRUCTURALLY "INDEPENDENT" EXAMPLE



B STRUCTURALLY "DEPENDENT" EXAMPLE

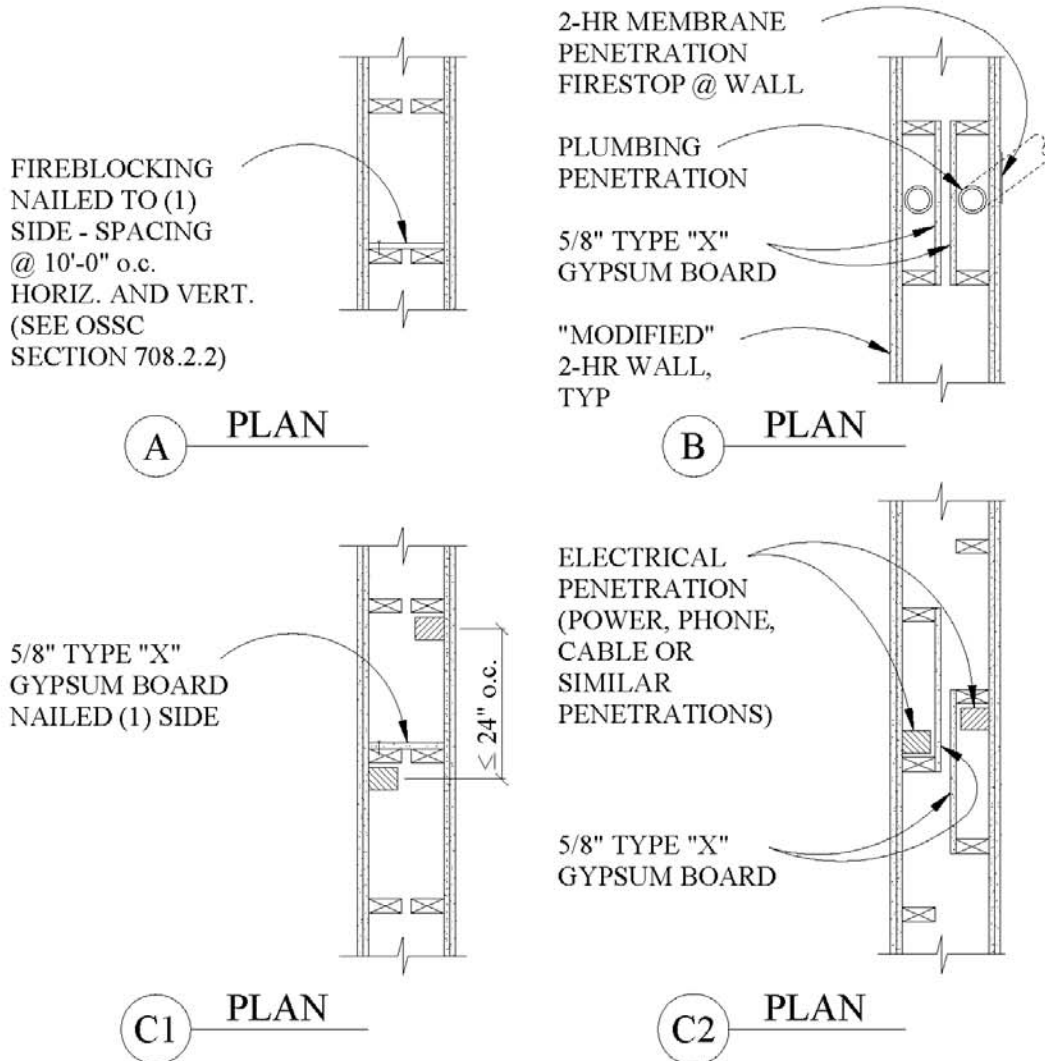
SW = Possible shear wall location

FIGURE R302.2.5
STRUCTURAL DESIGN APPROACH



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

FIGURE R302.2.10
FOUNDATION AND FOOTING CONSTRUCTION



NOTE: (C1) AND (C2) REFER TO ELECTRICAL PENETRATIONS ON OPPOSITE SIDES OF THE WALL SPACED LESS THAN OR EQUAL TO 24" o.c.

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

FIGURE R302.3.2.1
MEMBRANE PENETRATIONS FOR MODIFIED 2-HOUR WALLS