

July., 2019



King County

Department of Local Services

35030 SE Douglas St. #210
Snoqualmie, WA 98065-9266

206-296-6600 TTY Relay 711

www.kingcounty.gov/permits.aspx

This permit reviewed to the requirements of:
 Seismic Design Category: D
 Wind Design Speed/Exposure 110 mph/
☐ Roof design snow load: _____ psf
☐ Ground snow load: _____ psf
 Site elevation: _____ ft.

Design Criteria

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 shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation.

R301.1

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 International 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).

Revised to the 2015 IRC and the 2015 WSEC as amended by KCC Title 16, 21a and WAC 51-51 effective on 7-1-2016

Instructions for use of this document:

- 1) The corrections, conditions or requirements indicated on the plans, correspond to the numbered items on the following pages of this document.
- 2) The numbered items correspond to code references from the 2015 International Residential Code (IRC), and 2015 Washington State Energy Code (WSEC) as supplemented or amended by state and county laws, ordinances or amendments.
- 3) Compliance is required to all numbered items noted on the plans, as well as code compliance to all unmarked portions of the plans.
- 4) Review of the plans and specifications, with authorization to proceed, does not permit the violation of any section of the governing codes, county ordinances, or state laws.
- 5) This document is part of the reviewed plans and shall remain attached to the reviewed plan set. The reviewed plans are required to be on the job site. **105.7, 106.3.1, 106.4 IRC/IBC**
- 6) The reviewed plans shall not be changed, modified or altered without authorization from the building official.
- 7) Useful reference website for additional clarification of Code requirements may be found at **<https://mybuildingpermit.com>**

Revisions or field modifications to issued building permits may require a separate permit with additional review. Permits for revisions require a submittal to the DLS Permit Service Center. Review fees and submittal fees will be based on the DLS current fee rate.

Scope of Coverage:

The provisions of the International Residential Code for One- and Two-family Dwellings shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition of detached one- and two-family dwellings and townhouses not more than three stories above-grade in height with a separate means of egress and their accessory structures less than 3000 sq.ft. in area.. Dwelling units may also include the following uses in spaces not exceeding 500 sq.ft.: offices, mercantile, food preparation for off-site consumption, personal care salons or similar uses conducted by occupants of dwelling. **R101.2**

Residences and accessory structures that do not meet this definition must comply with the International Building Code (IBC).

Table R301.2(1) as Adopted for Unincorporated King County
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA FOR KING COUNTY

Ground snow load	Wind speed		Seismic design category ²	Subject to damage from				Winter design temp.	Ice-shield required	Flood hazards	Air freezing index	Mean annual temp.
	Speed ⁶ V _{ult}	Topo effect		Weathering	Frost line depth	Termite	Decay					
Varies ¹	110 mph	Yes	D1 or D2	Moderate	Varies ³	Slight to Moderate	Slight to Moderate	22° F ⁵	No	Varies ⁴	100 to 250	50° F

1. Snow loads shall be determined in accordance with King County Rule: "Structural loading: Minimum Roof Snow Loads". The minimum roof design snow load shall be 25 pounds per square feet.
2. Seismic design category shall be D1 for areas of unincorporated King County to the east of the Snoqualmie River as it traverses from the King County—Snohomish County line to the city limits of Snoqualmie, east of the town of Snoqualmie, east of the Snoqualmie Parkway and the Echo Lake-Snoqualmie Cut-off SE as they run from the city limits of the town of Snoqualmie to State Highway 18 and to the south or east of State Highway 18. All other portions of unincorporated King County shall be seismic design category D2.
3. The frost line depth shall be considered to be 12 inches for sites up to an elevation of 1000 feet above sea level, 18 inches for sites greater than 1000 feet and up to an elevation of 2000 feet above sea level. Frost depths may be otherwise determined by specific site analysis, but shall not be less than 12 inches.
4. Flood hazard within King County varies. See the flood hazard code provisions of KCC 21A.24.
5. Outdoor design temperatures vary with site location. Consult 2015 WSEC Residential Compliance Form for recommended heating system design temperature.
6. If using nominal design, the wind speed is 85 mph (3 second gust.) Nominal wind speed may be used in accordance with exceptions 1-5 of I.B.C Section 1609.1.1

1. Exterior Siding Surfaces:

a. Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing as described in Section R703.4. The exterior wall envelope shall be designed and constructed in a manner that prevents the accumulation of water within the wall assembly by providing a water-resistant barrier behind the exterior veneer as required by Section R703.2 and a means of draining water that enters the assembly to the exterior. Protection against condensation in the exterior wall assembly shall be provided in accordance with Section R702.7. **R703.1 WAC**

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

b. Exterior Masonry Veneer: Stone and masonry veneer shall be installed in accordance with chapter 7, Table R703.3(1) and Figure R703.8. These veneers installed over a backing of wood or cold-formed steel shall be limited to the first story above-grade and shall not exceed 5 inches in thickness.

Exception: For detached one- or two-family dwellings in Seismic Design Categories D0, D1 and D2, exterior stone or masonry veneer, as specified in Table R703.8(2), with a backing of wood framing shall be permitted to the height specified in Table R703.8(2) above a noncombustible foundation (maximum 20 feet, with an additional 8 feet allowed at gable ends, in seismic zones D1 & D2). Wall bracing and hold downs at exterior and interior braced wall lines shall be in accordance with Sections R602.12, cripple walls shall not be permitted, and required interior braced wall lines shall be supported on continuous foundations. **R703.8**

Lintels: Masonry veneer shall not support any vertical load other than the dead load of the veneer above. Veneer above openings shall be supported on lintels of noncombustible materials and the allowable span shall not exceed the value set forth in Table R703.8.3.1. The lintels shall have a length of bearing not less than 4 inches. **R703.8.3**

Anchorage: Masonry veneer shall be anchored to the supporting wall with corrosion-resistant metal ties embedded in mortar or grout and extending into the veneer a minimum of 1 ½ inches with not less than 5/8 inch mortar or grout cover to outside face. Masonry veneer shall conform to Table R703.8.4.

Where veneer is anchored to wood backings by corrugated sheet metal ties, the distance separating the veneer from the sheathing material shall be a maximum of a nominal 1 inch.

Where the veneer is anchored to wood backings using metal strand wire ties, the distance separating the veneer from the sheathing material shall be a maximum of 4½ inches.

Where the veneer is anchored to cold-formed steel backings, adjustable metal strand wire ties shall be used, and the distance separating the veneer from the sheathing material shall be a maximum of 4½ inches.

Veneer ties around wall openings: Additional metal ties shall be provided around all wall openings greater than 16 inches in either dimension. Metal ties around the perimeter of openings shall be spaced not more than 3 feet on center and placed within 12 inches of the wall opening. **R703.8.4**

2. Roofing:

a. Roofing covering materials: Roofs shall be covered with materials as set forth in Sections R904 and R905. Class A, B or C roofing shall be installed in areas designated by law as requiring their use or when the edge of the roof is less than 3 feet from a property line. Classes A, B and C roofing required to be listed by this section shall be tested in accordance with UL 790 or ASTM E 108. Roof assemblies with coverings of brick, masonry, slate, clay or concrete roof tile, exposed concrete roof deck, ferrous or copper shingles or sheets, and metal sheets and shingles, shall be considered Class A roof coverings. **R902.1**

Fire-retardant-treated shingles and shakes: Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPA C1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be

labeled to identify the classification of the material in accordance with the testing required in Section R902.1, the treating company and the quality control agency. **R902.2**

b. Re-roofing: New roof coverings shall not be installed without first removing existing roof coverings where any of the following conditions occur:

1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.
4. For asphalt shingles, when the building is located in an area subject to moderate or severe hail exposure according to Figure R903.5. **R907.3**

c. Roof Drainage: Unless roofs are sloped to drain over the edges, roof drains shall be installed at each low point of the roof. Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet 2 inches above the low point of the roof drains and sized according to Section R903.4.1. Overflow drains shall discharge to an approved location. Minimum slope of roof to facilitate movement of water shall be ¼ inch vertical for 12 inches horizontal or as specified by roof covering material specifications of Section R905. **R903.4**

d. Photovoltaic panels: Building-integrated photovoltaic products installed as the roof covering, and Rooftop-mounted photovoltaic panels and modules installed on or above the roof covering shall be tested, listed and identified with a fire classification in accordance with UL 1703. Class A, B or C photovoltaic panels and modules shall be installed in jurisdictions designated by law as requiring their use or where the edge of the roof is less than 3 feet (914 mm) from a lot line. Rooftop-mounted photovoltaic panels or modules shall be installed in accordance with this section, Section R324, and NFPA 70. **R902.3 / 4**

3. Flashings shall be installed in a manner that prevents moisture from entering the wall and roof through joints in copings, through moisture permeable materials and at intersections with parapet walls and other penetrations through the roof plane. **R903.2**

Locations: Flashings shall be installed at wall and roof intersections, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than 0.019 inch (No. 26 galvanized sheet). **R903.2.1**

4. Sun Rooms: Sunrooms shall comply with AAMA/NPEA/NSA 2100. For the purpose of applying the criteria of AAMA/NPEA/NSA 2100 based on the intended use, sunrooms shall be identified as one of the following categories by the permit applicant, design professional or the property owner or owner's agent in the construction documents. Component and cladding pressures shall be used for the design of elements that do not qualify as main windforce-resisting systems. Main windforce-resisting system pressures shall be used for the design of elements assigned to provide support and stability for the overall sunroom.

Category I: A thermally isolated sunroom with walls that are open or enclosed with insect screening or 0.5 mm (20 mil) maximum thickness plastic film. The space is nonhabitable and unconditioned.

Category II: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The space is nonhabitable and unconditioned.

Category III: A thermally isolated sunroom with enclosed walls. The openings are enclosed with translucent or transparent plastic or glass. The sunroom fenestration complies with additional requirements for air infiltration resistance and water penetration resistance. The space is nonhabitable and unconditioned.

Category IV: A thermally isolated sunroom with enclosed walls. The sunroom is designed to be heated or cooled by a separate temperature control or system and is thermally isolated from the primary structure. The sunroom fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is nonhabitable and conditioned.

Category V: A sunroom with enclosed walls. The sunroom is designed to be heated or cooled and is open to the main structure. The sunroom fenestration complies with additional requirements for water penetration resistance, air infiltration resistance and thermal performance. The space is habitable and conditioned. **R301.2.1.1.1**

Foundation:

5. a. **Grades and footing depths:** Where the grade lines shown on the reviewed permit drawings do not reflect the actual grade lines, and where either it is requested by the DLS building inspector or where there is a four or more foot deviation between actual grade and the grade shown on the reviewed permit drawings **submit revised elevations** with corrected proposed grade for review and for authorization before proceeding with construction of the foundation. **Show existing and proposed grades on the site plans and footing depths on all exterior elevations.**
- b. **Drainage:** Lots shall be graded to drain surface water away from foundation walls. The grade shall fall a minimum of 6 inches within the first 10 feet. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection so as to not create a hazard. **R401.3**
- Exception:** Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, the water shall be directed to drains or swales to ensure drainage away from the structure. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.
- c. **Soil Bearing Capacity:** In lieu of a complete geotechnical evaluation, the load-bearing values in Table R401.4.1 shall be assumed.

TABLE R401.4.1 PRESUMPTIVE LOAD-BEARING VALUES OF FOUNDATION MATERIALS	
CLASS OF MATERIAL	LOAD-BEARING PRESSURE (pounds per square foot)
Crystalline bedrock	12,000
Sedimentary and foliated rock	4,000
Sandy gravel and/or gravel (GW and GP)	3,000
Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000
Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1500

6. Strength of Concrete: (Table R402.2)

- a. Strength of concrete shall be 2500 psi for concrete not exposed to weather.
- b. Strength of concrete shall be 3000 psi for concrete basement, foundation, exterior walls, and other vertical work exposed to weather; garage and carport floor slabs; and porches.

7. Foundation Footings/Walls

- a. **Footings; general:** .All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, wood foundations, or other approved structural systems which shall be of sufficient design to accommodate all loads specified in Section R301 and to transmit the resulting loads to the supporting soil within the limitations determined from the characteristics of the soil. Footings shall be supported on undisturbed natural soil or engineered fill. Foundation walls complying with Section R404 or stem walls complying with Section 403 shall be permitted to support exterior walls, exterior braced wall lines and exterior braced wall panels provided they are supported by continuous footings. **R403.1**

Foundation Wall Size & Reinforcing (Seismic Zone D – IBC table 1805.5(6) / IRC table 404.1.2(8)) as revised by King County. **See Concrete Foundation Wall Table on sheet 24.**

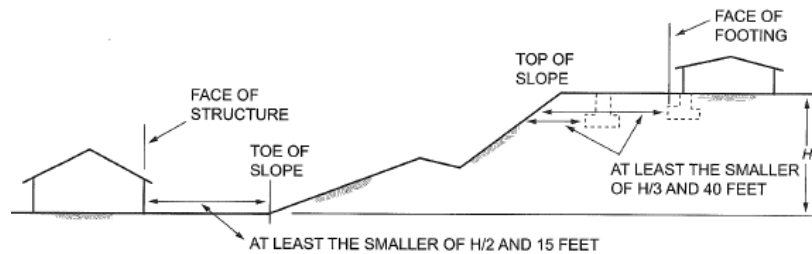
Minimum Foundation Footing Sizes for Stud Bearing Walls: Minimum sizes shall be as set forth in Table 403.1 and Figure 403.1(1) as revised by King County. **See Table on sheet 24.**

Sill Plate Anchorage: The wood sill plate shall be anchored to the foundation with anchor bolts spaced a maximum of 6 feet on center, or 4 feet on center for buildings over 2 stories in height. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches and not less than seven bolt diameters from each end of the plate. Bolts shall be at least ½” in diameter and shall extend a minimum of 7 inches into the concrete. **Plate washers a minimum of 0.229 inches by 3 inches by 3 inches shall be installed between the foundation sill plate and the nut at all braced wall locations. The hole in the plate washer is permitted to be diagonally slotted with a width up to 3/16 inch larger than the bolt diameter and a slot length not to exceed 1-3/4 inches, provided a standard nut washer is placed between the plate washer and the nut.** Properly sized cut washers shall be permitted for anchor bolts at locations not having braced walls. **R403.1.6, R602.11.1**

- b. **The size of footings supporting piers and columns** shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1 **R403.1.1.**
- c. **Post embedded support:** Post framed or pole buildings that employ posts or columns to resist the axial and lateral loads imposed upon the building do not meet the prescriptive building design provisions in the International Residential Code. Structural calculations and detailed plans are required and shall be stamped and signed by an engineer or architect licensed by the State of Washington. Construction of the building shall be in strict accordance with the engineered design details. **R301.1.3**
- Carports** designed per King County Standard Carport Design Details may not require engineering calculations under the discretion of the King County Building Official. **R104.11**

- d. **Footing Depth:** All exterior footings shall be placed at least 12 inches below the undisturbed ground surface and shall extend below the frost line specified in Table R301.2(1). **R403.1.4**
- e. **Stepped Footings – Slope:** The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footings or where the slope of the bottom surface of the footings will exceed one unit vertical in ten units horizontal (10-percent slope). **R403.1.5**

- f. **Footings on or adjacent to slopes:** The placement of buildings and structures on or adjacent to slopes steeper than 1 unit vertical in 3 units horizontal (33.3-percent slope) shall conform to Sections R403.1.7.1 through R403.1.7.4. **R403.1.7.**
- Building clearances from ascending slopes:** In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures. Except as provided in Section R403.1.7.4 and Figure R403.1.7.1, the following criteria will be assumed to provide this protection. Where the existing slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the toe of the slope shall be assumed to be at the intersection of a horizontal plane drawn from the top of the foundation and a plane drawn tangent to the slope at an angle of 45 degrees to the horizontal. Where a retaining wall is constructed at the toe of the slope, the height of the slope shall be measured from the top of the wall to the top of the slope.
- Footing setback from descending slope surfaces.** Footings on or adjacent to slope surfaces shall be founded in material with an embedment and setback from the slope surface sufficient to provide vertical and lateral support for the footing without detrimental settlement. Except as provided for in Section R403.1.7.4 and Figure R403.1.7.1, the following setback is deemed adequate to meet the criteria. Where the slope is steeper than one unit vertical in one unit horizontal (100-percent slope), the required setback shall be measured from an imaginary plane 45 degrees to the horizontal, projected upward from the toe of the slope.



g. Foundation Support for Braced Wall Panels: The braced wall panels at exterior and interior walls of buildings located in Seismic Design Categories D0, D1 and D2 shall be supported by continuous foundations and shall be constructed of masonry or concrete foundation walls in accordance with Sections R403 and R404.

Exception: In under floor spaces, cripple walls shall be permitted to substitute for masonry or concrete foundation walls provided they comply with the following:

- They are located directly below the interior braced wall panel above; AND
- They are braced in accordance with Sections R602.10.9 and R602.10.11 for cripple wall bracing; AND
- They are supported by footings complying with Sections R403 and R404.

h. Special Inspection of Compacted Fill Materials: Foundations bearing on compacted fill material less than 12 inches in depth need not comply with a geotechnical report investigation per IBC section 1803.2 but shall be compacted to a minimum of 90 percent Modified Proctor in accordance with ASTM D 1557. The compaction shall be verified by a qualified inspector approved by the building official in accordance with section 1705.6 I.B.C.

Section 1803.5.8 and 1804.6 I.B.C.

Post Frame Construction: The backfill around columns not embedded in poured concrete footings shall be by one of the following methods:

- Backfill shall be of concrete with a specified compressive strength of not less than 2,000 psi. The hole shall not be less than 4 inches larger than the diameter of the column at its bottom or 4 inches larger than the diagonal dimension of a square or rectangular column.
- Backfill shall be of granular aggregate: clean sand, sandy-gravel, sandy-silty-gravel, or silty-sand. The material shall be thoroughly compacted by tamping in layers not more than 8 inches in depth.
- Backfill shall be of controlled low-strength material (CLSM) prepared per geotechnical engineering soils report recommendations and placed under special inspection per IBC section 1705.6,

section 1803.5.9 I.B.C.

Foundations bearing on compacted fill material greater than 12 inches in depth require Special Inspections be provided as required by the approved soils report and/or geotechnical engineer's recommendations. Continuous inspection shall be provided to verify use of proper materials, densities and lift thicknesses during placement and compaction of controlled fill.

Periodically during the task listed the inspector shall:

- Verify materials below footings are adequate to achieve the design bearing capacity.
- Verify excavations are extended to proper depth and have reached proper material.
- Perform classification and testing of compacted fill materials.
- Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.
- Observe placement of fill materials, lift depths, and compaction of fill materials. **Section 1803.5.2 IBC**

8. Foundation Drainage and Dampproofing:

a. Foundation Drainage: Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drainage tiles, gravel or

crushed stone drains, perforated pipe or other approved systems or materials shall be installed at or below the area to be protected and shall discharge by gravity or mechanical means into an approved drainage system. Gravel or crushed stone drains shall extend at least 1 foot beyond the outside edge of the footing and 6 inches above the top of the footing and be covered with an approved filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper, and the drainage tiles or perforated pipe shall be placed on a minimum of 2 inches of washed gravel or crushed rock at least one sieve size larger than the tile joint opening or perforation and covered with not less than 6 inches of the same material.

Exception: A drainage system is not required when the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I Soils, as detailed in Table R405.1.

R405.1

b. Concrete and masonry foundation damp-proofing: Except where required by Section R406.2 to be waterproofed, foundation walls that retain earth and enclose interior spaces and floors below grade shall be damp-proofed from the top of the footing to the finished grade. Masonry walls shall have not less than 3/8 inch portland cement paring applied to the exterior of the wall. The paring shall be damp-proofed in accordance with one of the five methods described in Section **R406.1**

c. Concrete and masonry foundation waterproofing: In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below grade shall be waterproofed from the top of the footing to the finished grade. Walls shall be waterproofed in accordance with one of eight methods described in Section **R406.2**

9. Wood in proximity to Foundation:

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

Exceptions:

- Columns exposed to the weather or in basements when supported by concrete piers or metal pedestals projecting 1 inch above a concrete floor or 6 inches above exposed earth and the earth is covered by an approved impervious moisture barrier.
- 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 from exposed earth and the earth is covered by an impervious moisture barrier.

R317.1.4

b. Wood Column Restraints - Structural requirements: The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall not be less in nominal size than 4 inches by 4 inches and steel columns shall not be less than 3-inch-diameter Schedule 40 pipe or approved equivalent. **R 407.3**

c. Wood loads bearing on masonry: Beams, girders or other concentrated loads supported by a wall or column shall have a bearing of at least 3 inches in length measured parallel to the beam upon solid masonry not less than 4 inches in thickness, or upon a metal bearing plate of adequate design and dimensions to distribute the load safely, or upon a continuous reinforced masonry member projecting not less than 4 inches from the face of the wall. **R606.14**

d. Subterranean termite control methods: R318

In areas subject to damage from termites as indicated by Table R301.2(1), methods of protection shall be one of the following methods or a combination of these methods:

- Chemical termiticide treatment, as provided in Section R318.2.
- Termite baiting system installed and maintained according to the label.
- Pressure-preservative-treated wood in accordance with the AWPA standards listed in Section R317.1.
- Naturally termite-resistant wood.

- 5. Physical barriers as provided in Section R318.3.
- 6. Cold formed steel framing in accordance with Sections R505.2.1 and R603.2.1

e. Removal of Debris: Under floor grade shall be cleaned of all vegetation and organic material and construction debris prior to building being occupied or used for any purpose. **R408.5**

10. Under-Floor Ventilation: The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a basement) shall have ventilation openings through foundation walls or exterior walls. **R408.2,**

Openings for under-floor ventilation: The minimum net area of ventilation openings shall not be less than 1 square foot for each 300 square feet of under-floor area. Required openings shall be evenly placed to provide cross ventilation of the space except one side of the building shall be permitted to have no ventilation openings. Ventilation openings shall be covered for their height and width with any of the materials listed in R408.1 provided the least dimension of the covering shall not exceed 1/4 inch.

Ground Cover. The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil polyethylene vapor-retarder. The ground cover shall be lapped a minimum of 12 inches at joints and shall extend to all foundation walls enclosing the crawl space area.

Radon Control vent system required to be installed per IRC Appendix F (Radon) if under floor ventilation is less than 1/300 of under floor area, or operable louvered vents are installed. **R408.2 Washington State Amendment**

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

Fire Resistant Construction:

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

Exceptions:

1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.
2. Walls of dwellings and accessory structures located on the same lot.
3. Detached accessory structures with less than 200 sq ft floor area exempted from permits and separated from adjacent buildings by 3 feet from eave to eave 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 of a lot line are permitted to have roof eave projections not exceeding 4 inches.
5. Foundation vents installed in compliance with this code are permitted.

13. Garages and Carports:

a. Separation required: The garage shall be separated from the residence and its attic area by not less than ½-inch gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 5/8-inch Type X gypsum board or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall also be protected by not less than ½-inch gypsum board or equivalent. Garages located less than 3 feet from a dwelling unit on the same lot shall be protected with not less than ½-inch gypsum board applied to the interior side of exterior walls that are within this area. Openings in these walls shall be regulated by Section

R302.5. This provision does not apply to garage walls that are perpendicular to the adjacent dwelling unit wall. **R302.6**

b. Garage Openings: Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. **Other openings** between the garage and residence shall be equipped with solid wood doors not less than 1 3/8 inches in thickness, solid or honeycomb core steel doors not less than 13/8 inches thick, or 20-minute fire-rated doors equipped with self-closing device. **R302.5.1**

Duct penetration: Ducts in the garage and ducts penetrating the walls or ceilings separating the dwelling from the garage shall be constructed of minimum No. 26 gage sheet steel or other approved material and shall have no openings into the garage. **R302.5.2**

Other penetrations: Penetrations through the separation required in Section R302.5 shall be protected by filling the opening around the penetrating item with approved material to resist the free passage of flame and products of combustion. **R302.5.3, R302.11**

c. Automatic garage door openers: Automatic garage door openers, if provided, shall be listed and labeled in accordance with UL 325. **R309.4**

d. Garage floor surfaces shall be of *concrete* or an approved smooth 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. **R309.1**

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

1. Elevated to or above the design flood elevation as determined in Section R322; or
2. Located below the design flood elevation provided they are at or above grade on all sides, are used solely for parking, building access, or storage, meet the requirements of Section R322, and are otherwise constructed in accordance with this code. **R309.3**

e. Carports: (See typical carport design recommendations on sheet 28)

Carports shall be open on at least two sides. Carport floor surfaces shall be of *concrete* or an approved smooth noncombustible material. Carports not open on at least two sides shall be considered a garage and shall comply with the provisions 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 away from the vehicle parking area. **R309.2**

14. Family Child Day Care Facilities: Rooms or spaces containing a commercial type cooking kitchen, boiler, maintenance shop, janitor closet, laundry, woodworking shop, flammable or combustible storage, or painting operation shall be separated from the family child day care area by at least one hour fire-resistive construction. **R326 Washington State Amendment**

House Planning:

Definition: HABITABLE SPACE: A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.

Definition: CONDITIONED SPACE: An enclosed space including adjacent spaces separated by an uninsulated component(s) which is conditioned by a system capable of maintaining a temperature of 45°F at the design heating conditions or whose output is 8 Btu/(h*ft²) or one watt per square foot or greater.

15. Site Street Address: Buildings shall have approved address numbers or building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These address identification characters shall contrast with their background, be Arabic numbers or alphabetical letters, and be a minimum 4 inches high with a minimum stroke width of ½ inch. A monument, pole, or other sign or means shall be allowed if the site is accessed by a private road and address cannot be viewed from the public way and where

required by the Fire Marshall, address identification shall be place in additional location(s) to facilitate emergency response.

R319

16. Minimum Room Dimensions:

Minimum area: Habitable rooms shall have a floor area of not less than 70 square feet, except Kitchens.R304.2

Minimum height: Habitable rooms, hallways, corridors, bathrooms, toilet rooms, laundry rooms and basements shall have a ceiling height of not less than 7 feet. The required height shall be measured from the finish floor to the lowest projection from the ceiling.

R305.1

Ceilings in basements without habitable spaces may project to within 6 feet, 8 inches of the finished floor; and beams, girders, ducts or other obstructions may project to within 6 feet 4 inches of the finished floor.

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 and no portion of the required floor area may have a ceiling height of less than 5 feet.

Bathrooms shall have a minimum ceiling height above the fixture so that it is =capable of its intended purpose.

A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6 feet 8 inches above a minimum area 30 inches by 30 inches at the showerhead.

R305.1

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

R304.4

Hallways Minimum width: All hallways shall be not less than 3 feet. in width.

R311.6

17. Height of Building: King County Zoning regulations measure building height to highest point of structure from the average grade plane for the structure. Average grade is determined as the average of the four final grades measured at the center of the sides of a rectangle that encloses the building.

Maximum height shall not exceed _____ft. Finished floor level of lowest level shall be at elevation:_____ft.

18. Interior Access: All rooms comprising a dwelling unit (residence) shall have access through an interior door or opening to other parts of the dwelling unit.

KCC, Section 21A.06.345

19. Natural Light & Ventilation in Habitable Rooms:

a. Natural Light: All habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms.

R303.1

Exception: The glazed areas need not be installed in rooms where whole house ventilation per IRC M1507 is satisfied and artificial light is provided capable of producing an average illumination of 6 foot-candles over the area of the room at a height of 30 inches above the floor level.

b. Minimum Ventilation Performance: Each dwelling unit or guest room shall be equipped with local exhaust and whole house ventilation systems complying with Washington State Amendments to IRC sections M1507.1, M1507.3.4, M1507.3.5, M1507.3.6 or M1507.3.7.

See items V3 and V5, and attached Washington State Energy Code Compliance Form

20. Bathroom Requirements: (Refer to item #16 for ceiling height requirements)

a. Tub and Shower Requirements: 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 above the floor.

R307.2

Cement, fiber-cement and glass mat gypsum backers: Cement, fiber-cement or glass mat gypsum backers in compliance with ASTM C 1288, C 1325 or C 1178 and installed in accordance with manufacturers' recommendations shall be used as backers for wall tile in tub and shower areas and wall panels in shower areas.

R702.4.2.

Fire blocking: see item #48 for fire blocking requirements (applicable to tubs & showers).

b. Bathroom Fixture Clearances: Fixtures shall be spaced as per Figure R307.1: minimum 21" clear in front of lavatory sink, tub, and water closet; minimum 24" in front of shower openings, minimum 15" from center line to each side of water closet; and minimum 30" x 30" shower stall.

c. Maximum Flow and Water Conservation: water fixtures shall be equipped with flow control devices or specially manufactured shower-heads or aerators to limit the total water flow rate as set forth in Table P2903.2, as measured with both hot and cold faucets turned on to their maximum flow: sink and lavatory faucets maximum 2.2 gpm at 60 psi, shower head maximum 2.5 gpm at 80 psi, toilet maximum 1.6 gallons per flush cycle.

P2903.2

21. Egress: Emergency Escape and Rescue:

a. Basements, habitable attics, and every sleeping room (or napping room in Family Child Daycare Home) shall have at least one operable emergency egress and rescue

opening. Such egress and rescue openings shall open directly into a public street, public alley, yard or court. 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 measured from the finished the floor level to the bottom of the clear opening. 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 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.

R310.1

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

R310.1

Exception: Family Child Daycare Home sleeping or napping room having doors leading to two separate means of egress or a door leading directly to the exterior of the building

R326 WAC

Minimum opening area .All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet. **Exception:** Grade floor, or below grade openings shall have a minimum net clear opening of not less than 5 square feet.

Minimum opening height: The minimum net clear opening height shall be 24 inches.

Minimum opening width: The minimum net clear opening width shall be 20 inches.

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. Window opening control devices complying with ASTM F 2090 shall be permitted for use emergency escape and rescue opening.

R310.1.1.

b. Window wells: The minimum horizontal area of the window well shall be 9 square feet, with a minimum horizontal projection and width of 36 inches. The area of the window well shall allow the emergency escape and rescue opening to be fully opened. Ladder or steps required by Section R310.2.1 shall be permitted to encroach a maximum of 6 inches into the required dimensions of the window well.

Ladder and steps: Window wells with a vertical depth greater than 44 inches 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 R311.5 and R311.6. Ladders or rungs shall have an inside width of at least 12 inches, shall project at least 3 inches from the wall and shall be spaced not more than 18 inches on center vertically for the full height of the window well.

Drainage: Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by R405.1.

R310.2

c. 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.

R310.3

d. 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.

R310.4

e. Emergency escape windows under decks and porches: Emergency escape windows are allowed to be installed under decks, porches, roof overhangs, awnings, or similar projections provided the location allows the emergency escape window to be fully opened and provides a path not less than 36 inches in height and not less than 36 inches in width with a maximum unobstructed travel length directly to a yard or court based on 3:1, length to height ratio or as approved by the building official. This distance shall be measured from the edge of the window or if served by a window well from the edge of that window well. Exception: When the vertical height is 6'-8" or greater, the travel distance or length is unlimited.

KC amendment to IRC R310.2.4

22. Window Fall Protection: Where the top of the sill of an operable window opening is located less than 24 inches above the finished floor and greater than 72 inches above the finished grade or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable windows with openings that will not allow a 4-inch-diameter sphere to pass through the opening where the opening is in its largest opened position.
2. Operable windows that are provided with window fall prevention devices that comply with ASTM F 2090.
3. Operable windows that are provided with window opening control devices that after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the required emergency egress and rescue area.

R312.2

23. Smoke Alarms:

a. Smoke detection and notification:

All smoke alarms and combination smoke and carbon monoxide alarms shall be listed in accordance with UL 217 and UL 2034, and installed in accordance with the provisions of this code and the household fire warning equipment provisions of NFPA 72. 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 devise(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 maintained in accordance with NFPA 72.

R314.2

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

1. Within 30 ft. travel distance from any point in each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms, within 21 ft. of any door to a sleeping room and not within 3 ft. from a door to room with a shower or tub.
3. On each additional story of the dwelling, including basements and habitable attics but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
4. In each room used for napping within family child daycare home.

R314.3

Smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3.

1. Ionization smoke alarms shall not be installed less than 20 feet horizontally from a permanently installed cooking appliance.
2. Ionization smoke alarms with an alarm-silencing switch shall not be installed less than 10 feet horizontally from a permanently installed cooking appliance.
3. Photoelectric smoke alarms shall not be installed less than 6 feet horizontally from a permanently installed cooking appliance.

Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, 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 dwelling unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.

Exception: Interconnection of smoke alarms in existing areas shall not be required where alterations or repairs do not result in removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available that could provide access for interconnection without the removal of interior finishes.

R314.4

c. 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 over-current protection.

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 structure, unless there is an attic, crawlspace, or basement available which could provide access the hard-wiring and interconnection without the removal of interior finishes.

R314.6

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

Exceptions:

1. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt.
2. Installation, alteration or repairs of plumbing, electrical or mechanical systems are exempt.

R314.2.2

24. Carbon Monoxide Alarms:

a. Carbon Monoxide Alarms: Carbon monoxide detection systems that include carbon monoxide detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720-2015 are required when the building contains fuel-fired appliances or has garage with an opening to the dwelling unit. Carbon monoxide detectors shall be listed as complying with UL 2034 and UL 217 according to the type of alarm/detector. Where a household carbon monoxide detection system is installed, it shall become a permanent fixture of the occupancy. In buildings where tenancy exists, the tenant shall maintain the carbon monoxide alarm as specified by the manufacturer, including the replacement of batteries.

R315 WAC 51-51-0315

b. Location: Alarms shall be installed outside each separate sleeping area in the immediate vicinity of the bedrooms, and on each level of the dwelling per the manufacturer's installation instructions. : Alarms shall be installed inside each separate sleeping area if a fuel fired appliance is located in the bedroom or attached bathroom.

R315.2.1, R315.4 Washington State Amendment

c. Within Existing Dwellings: Existing dwellings shall be equipped with carbon monoxide alarms. Inspection of existing shall occur when alterations, repairs or additions requiring a permit occur, or when a sleeping room is added or created.

R315.2.2 Washington State Amendment

Exceptions:

1. Work involving only the exterior surfaces of dwellings, such as replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, or electrical permits.

2. Installation, alteration or repairs of non-fuel burning plumbing or mechanical systems.
3. Owner occupied single-family residences legally occupied before July 26, 2009. **RCW 19.27.530(2)(b)**

25. Guards (railings):

a. Required Locations: Open sided walking surfaces located more than 30 inches above the floor or grade below at any point within 36 inches horizontally from the edge of the walking surface shall have guards not less than 36 inches in height above the adjacent fixed seating or walking surface. Open sides of stairs with a total rise of more than 30 inches above the floor or grade below shall have guards not less than 34 inches in height measured vertically from the nosing of the treads. Where the top of the guard serves as a handrail on the open sides of stairs, the top of the guard shall be not less than 34 inches and not more than 38 inches as measured vertically from a line connecting the leading edges of the treads.

Porches and decks which are enclosed with insect screening shall be equipped with guards where the walking surface is located more than 30 inches above the floor or grade below. Insect screening shall not be considered as a guard. **R312.1, R312.2**

b. Guard opening limitations: Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches or more in diameter.

Exceptions:

1. The triangular openings formed by the riser, tread and bottom rail of a guard at the open side of a stairway shall not allow the passage of a sphere 6 inches in diameter.
2. Openings for guards on the sides of stairs shall not allow passage of a sphere 4 3/8 inches. **R312.2**

c. Guard Design Strength: Guards shall be designed to resist lateral force of a single 200 lbs. point load applied at any location along the top, and in-fill materials shall resist 50 lbs. applied over one square foot. See King County Standard Deck Details for acceptable railing attachment. **Table R301.5**

26. Exterior Doors and Landings:

a. Required Egress Door: Not less than one egress door shall be provided for each dwelling unit. The required egress door shall provide for direct access from the habitable portions of the dwelling to the exterior without requiring travel through a garage. Access to habitable levels not having a complying exit shall be by a ramp per Section R311.8 or a stairway per Section R311.7. **R311.1**

b. Door type and size: The egress door shall be side-hinged, and provide a minimum net clear width of 32 inches, and a minimum net clear height of not less than 78 inches. Other doors shall not be required to comply with these dimensions. Egress doors shall be readily openable from the inside without the use of a key or special knowledge or effort. **R311.2**

c. Landing at Exterior Doors: There shall be a floor or landing on each side of each exterior door, at least the width of the door, and shall be 36 inches minimum measured in the direction of travel. The landing or floor shall not be more than 1.5 inches lower than the top of the threshold. The landing shall be permitted to have a slope not to exceed 0.25 units vertical in 12 units horizontal (2-percent). **R311.3**

Exceptions:

1. Where a stairway of two or fewer risers is located on the exterior side of a door, other than the required egress door, a landing is not required for the exterior side of the door provided the door, other than an exterior storm or screen door does not swing over the stairway.
2. The exterior landing or floor level at an exterior doorway shall not be more than 7¾ inches below the top of the threshold, provided the door, other than an exterior storm or screen door does not swing over the landing.

27. Stairs:

a. Minimum Stair Dimensions:

Width: Stairways shall not be less than 36 inches in clear width at all points above the permitted handrail height and below the required headroom height. Handrails shall not project more than 4½ inches 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 31½ inches where a handrail is installed on one side and 27 inches where handrails are provided on both sides. **R311.7.1.**

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

Walkline: The walkline across winder treads shall be concentric to the curved direction of travel through the turn and located 12 inches from the side where the winders are narrower. The 12 inch 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 winders shall be used. **R311.7.4**

Riser height: The maximum riser height shall be 7¾ inches. The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch. **R311.7.5**

Tread Depth: The minimum tread depth shall be 10 inches. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch. Consistently shaped winder at the walkline shall be allowed within the same flight of stairs as rectangular treads and do not have to be within 3/8 inch of the rectangular tread depth. Winder treads shall have a minimum tread depth of 10 inches 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 at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walk line shall not exceed the smallest by more than 3/8 inch. **R311.7.2**

Profile: The radius of curvature at the leading edge of the tread shall be no greater than 9/16 inch. A nosing not less than ¾ inch but not more than 1¼ inch shall be provided on stairways with solid risers. The greatest nosing projection shall not exceed the smallest nosing projection by more than 3/8 inch between two stories, including the nosing at the level of floors and landings. Beveling of nosing shall not exceed ½ inch. Risers shall be vertical or sloped from the underside of the leading edge of the tread above at an angle not more than 30 degrees from the vertical. Open risers are permitted, provided that the opening between treads does not permit the passage of a 4-inch diameter sphere. **R311.7.5.3**

Exceptions:

1. A nosing is not required where the tread depth is a minimum of 11 inches.
2. The opening between adjacent treads is not limited on stairs with a total rise of 30 inches or less.

b. Landings for stairways: A floor or landing shall be at top and bottom of each stairway.

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.

A flight of stairs shall not have a vertical rise larger than 147 inches 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 measured in the direction of travel. **R311.7.6**

c. Stairway walking surface: The walking surface of treads and landings of stairways shall be sloped no steeper than one inch vertical in 48 inches horizontal (2-percent slope). **R311.7.7**

d. Handrails: Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers. **R311.7.8**

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

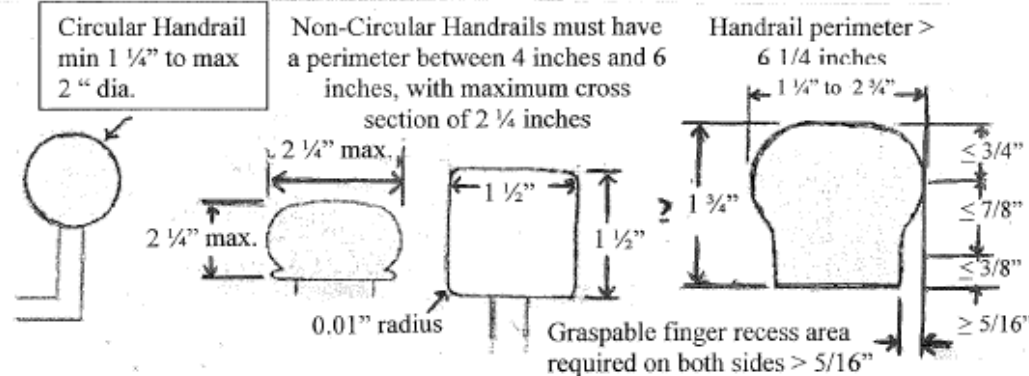
Continuity. Handrails for stairways shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1½ inch between the wall and the handrails. **R311.7.8.2**

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.

Handrail grip size: All required handrails shall be of one of the following types or provide equivalent graspability. **R311.7.8.3**

1. **Type I:** Handrails with a circular cross section shall have an outside diameter of at least 1¼ inches and not greater than 2 inches. If the handrail is not circular it shall have a perimeter dimension of at least 4 inches and not greater than 6¼ inches with a maximum cross section of dimension of 2¼ inches. Edges shall have a minimum radius of 0.01 inch.



2. **Type II:** Handrails with a perimeter greater than 6¼ inches shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of ¼ inch measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16 inch within 7/8 inch below the widest portion of the profile. This required depth shall continue for at least 3/8 inch to a level that is not less than 1¼ inches below the tallest portion of the profile. The minimum width of the handrail above the recess shall be 1¼ inches to a maximum of 2¾ inches. Edges shall have a minimum radius of 0.01 inch.

e. Illumination of stairs: All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. Stairway illumination shall receive primary power from the building wiring. 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 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. **R303.7**

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. **R303.7.1**

28. Under-stair protection: Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with ½-inch gypsum board. **R302.7**

29. Attachment of Exterior Stairways, Balconies: 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. **R311.5.1**

30. Special Stairs and Spiral Stairs:

a. Spiral stairways: Spiral stairways are permitted, provided the minimum width shall be 26 inches with each tread having a 7½-inches minimum tread depth at 12 inches from the narrower edge. All treads shall be identical, and the rise shall be no more than 9½ inches. Minimum headroom of 6 feet 6 inches shall be provided. **R311.7.10.1**

b. 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 maximum height from the basement finished floor level to grade adjacent to the stairway does not exceed 8 feet, and the grade level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other approved means. **R311.7.10.2.**

c. Ladder access: Areas within a dwelling not containing the primary bathroom or kitchen, and attic storage spaces less than 200 square feet may use stairs or ladders not conforming to stair provisions of Section R311.7 **Section R311.4 Washington State Amendment**

d. Alternate Tread Devices and Ships ladders: Alternating tread devices and Ships ladders shall not be used as an element of a means of egress unless the required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches

Alternating tread devices shall have a tread depth of not less than 5 inches, a projected tread depth of not less than 8 1/2 inches measured horizontally between the vertical planes of the foremost projections of adjacent treads, a tread width of not less than 7 inches, and a riser height of not more than 9 1/2 inches measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from the horizontal of between 50 and 70 degrees. The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

Ships ladder treads shall have a depth of not less than 5 inches. The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than 8 1/2 inches. The riser height shall be not more than 9 1/2 inches. Complying graspable Handrails shall be provided on both sides of ships ladders. Handrail height shall be uniform, not less than 30 inches, and not more than 34 inches. **R311.7.11 / .12**

31. Ramps: Ramps serving the egress door shall have a slope of not more than 1 unit vertical in 12 units horizontal (8.3-percent slope). All other ramps shall have a maximum slope of 1 unit vertical in 8 units horizontal (12.5 percent). **Exception:** Where it is technically infeasible to comply because of site constraints, ramps shall have a slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent). Landing is required at the top and bottom of each ramp, where doors open onto ramps, and where ramps change directions. The width of the landing perpendicular to the ramp slope shall be not less than 36 inches. Handrails shall be provided on not less than one side of ramps exceeding a slope of one unit vertical in 12 units horizontal (8.33-percent slope). Handrail height, measured above the finished surface of the ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches. 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 11/2 inches between the wall and the handrails. **R311.8**

32. Safety Glass:

a. 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. **R308.1**

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.
2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper designation.

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

1. Glazing in all fixed and operable panels of swinging, sliding and bi-fold doors.

Exceptions:

1. Glazed openings of a size through which a 3-inch diameter 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 arc of either vertical edge of the door in a closed position or where located in wall perpendicular to door in closed position and within 24 inch of the hinge side of the in-swinging door. and where the bottom exposed edge of the glazing is less than 60 inches 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 adjacent to a door where access through the door is to a closet or storage area 3 feet or less in depth shall comply with item 3 below.
 4. 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:
 1. The exposed area of an individual pane is larger than 9 square feet, and
 2. The bottom edge of the glazing is less than 18 inches above the floor; and
 3. The top edge of the glazing is more than 36 inches above the floor; and
 4. One or more walking surfaces are within 36 inches, 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 above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1 1/2 inches 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 or more above grade, a roof, walking surfaces or other horizontal or inclined within 45 degrees 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 walls, enclosures or fences containing or facing hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface.
- Exception:** Glazing that is more than 60 inches, measured horizontally and in a straight line, from the waters edge of a hot tub, whirlpool or bathtub.

6. Glazing where the bottom exposed edge of the glazing is less than 36 inches above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps and less than 36 inches measured horizontally from the walking surface.

Exception: When a guard is installed on the accessible side(s) of the glazing 34 to 38 inches above the walking surface. The guard shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1 1/2 inches in cross sectional height.

7. Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches above the landing and within 60 inches horizontally of the bottom tread

Exception: The glazing is protected by a guard complying with Section R312 and the plane of the glass is more than 18 inches from the guard.

33. Deck Framing: (See King County Standard Deck Design Details)

a. Deck attachment and uplift of cantilevered decks: Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both **vertical live load of 60 psf** and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections to exterior walls or other framing members, shall be designed and constructed to resist uplift resulting from the full live load acting on the cantilevered portion of the deck. **R507**

b. Deck Ledger Connection: The connection between a deck ledger of pressure-preservative-treated Southern Pine, incised pressure-preservative-treated Hem-Fir or approved decay-resistant species, and a 2-inch nominal lumber band joist bearing on a sill plate or wall plate shall be constructed with 1/2-inch lag screws or bolts with washers in accordance with Table R507.2. Lag screws, bolts and washers shall be hot-dipped galvanized or stainless steel. The lag screws or bolts in deck ledgers and band joists shall be placed in accordance with Table R507.2.1 and Figures R507.2.1(1) and R507.2.1(2).

(See sheet 28 for Ledger Detail)

R507.2

c. Deck Lateral Load Connection shall be permitted to be in accordance with Figure R507.2.3(1) or (2). Hold-down tension devices shall be installed in not less than two or four locations per deck, and each device shall have an allowable stress design capacity of not less than 1500 pounds or 750 pounds according to the type of tension device installed. **R507.2.3**

Lateral restraint of posts may be achieved by installation of knee bracing or embedded post illustrated on King County Standard Deck Details sheets or Details on sheet 28 of this document.

d. Deck Beam and Posts: Deck beams shall be attached to deck posts in accordance with Figure R507.7.1 or by other equivalent means capable to resist lateral displacement. Manufactured post-to-beam connectors shall be sized for the post and beam sizes. All bolts shall have washers under the head and nut. **R507.7**

Posts shall bear on footings in accordance with Section R403 and Figure R507.8.1. Posts shall be restrained to prevent lateral displacement at the bottom support. Such lateral restraint shall be provided by manufactured connectors installed in accordance with Section R507 and the manufacturers' instructions or a minimum post embedment of 12 inches in surrounding undisturbed native soils or concrete piers. **R507.8**

e. Drains at waterproofed decks (and roofs): Where roof drains are required, overflow drains having the same size as the roof drains shall be installed with the inlet flow line located 2 inches above the low point of the roof, or overflow scuppers having three times the size of the roof drains and having a minimum opening height of 4 inches shall be installed in the adjacent parapet walls with the inlet flow located 2 inches above the low point of the roof served.

Overflow drains shall discharge to an approved location and minimum 1/4 inch drop per 12 inch horizontal distance is required. **R903.4.1**

f. Deck Covering and Vents. Decks over enclosed spaces shall be covered with approved roof coverings secured to the building or structure and shall be designed and installed in accordance with this section R905 and the approved manufacturer's installation instructions such that the roof assembly shall serve to protect the building or structure. Enclosed spaces shall have **cross ventilation for each separate space** by ventilating openings protected against the entrance of rain or snow so that the total net free ventilating area shall not be less than 1/150 of the area of the space ventilated **R903.1 / R806.2**

34. Concrete Floors:

Concrete slab-on-ground floors shall be a minimum 3.5 inches thick. The specified compressive strength of concrete shall be a minimum 2500 psi or 3000 psi as set forth in Section R402.2. (See condition #6)

Fill material beneath the slab shall be free of vegetation and foreign material. The fill shall be compacted to assure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches for clean sand or gravel and 8 inches for earth.

Base Course of 4-inch-thick clean graded sand, gravel, crushed stone or crushed blast-furnace slag passing a 2-inch sieve shall be placed on the prepared subgrade when the slab is below grade.

A 6-mil polyethylene or approved vapor retarder with joints lapped not less than 6 inches shall be placed between the concrete floor slab and the base course or the prepared subgrade where no base course exists.

Exception: The vapor retarder may be omitted:

- 1.From garages, utility buildings and other unheated accessory structures.
- 2.For unheated storage rooms having an area of less than 70 square feet and carports.
- 3.From driveways, walks, patios and other flatwork not likely to be enclosed and heated at a later date.
- 4.Where approved by the building official, based on local site conditions.

Reinforcement support. Where provided in slabs on ground, reinforcement shall be supported to remain in place from the center to upper one third of the slab for the duration of the concrete placement. **R506**

35. Floor Framing:

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

b. Joists and beams: Cuts, Drilling, Notching: Structural floor members shall not be cut, bored or notched in excess of the following limitations as specified in R502.8 (see item #45) **R502.8**

c. Joists: Lateral restraints: Joists shall be supported laterally at the ends by full-depth solid blocking not less than 2 inches nominal in thickness; or by attachment to a full-depth header, band or rim joist, or to an adjoining stud or shall be otherwise provided with lateral support to prevent rotation.

Exception: In Seismic Design Categories D0, D1 and D2, lateral restraint shall also be provided at each intermediate support. **R502.7**

d. Joists: Bridging (joists >2x12's): Joists exceeding a nominal 2 inches by 12 inches shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1-inch-by-3-inch strip nailed across the bottom of joists perpendicular to joists at intervals not exceeding 8 feet. **R502.7.1**

36. Fire protection of floors. Floor assemblies, not required elsewhere in this code to be fire-resistance rated, shall be provided with a 1/2-inch gypsum wallboard membrane, 5/8-inch wood structural panel membrane, or equivalent on the underside of the floor framing member. Penetrations shall be permitted.

Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA13D, or other approved equivalent sprinkler system.

2. Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances.
3. Portions of floor assemblies can be unprotected when complying with the following:
 - 3.1. The aggregate area of the unprotected portions shall not exceed 80 square feet per story
 - 3.2. Fire blocking in accordance with Section R302.11.1 shall be installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance. **R302.13**

37. Basement wood floor joists construction: Pressure preservative treated-wood basement floors and floors on ground shall be designed to withstand axial forces and bending moments resulting from lateral soil pressures at the base of the exterior walls and floor live and dead loads. Joists in basement floors shall bear tightly against the narrow face of studs in the foundation wall or directly against a band joist that bears on the studs. Plywood subfloor shall be continuous over lapped joists or over butt joints between in-line joists. Blocking shall be provided between joists to transfer lateral forces at the base of the end walls into the floor system. **R504.1**

38. Floor and roof diaphragm construction: Floor and roof diaphragms shall be constructed of wood structural panels attached to wood framing in accordance with Table R602.3(1). **R503.2.3, R803.2.3**

39. Roof Framing:

a. Framing details: Rafters shall be frame not more than 1 1/2-inch offset from each other to ridge board or to each other with a gusset plate as a tie. Ridge board shall be at least 1-inch nominal thickness and not less in depth than the cut end of the rafter. All valley and hip rafters shall be not less than 2-inch nominal thickness and not less in depth than the cut end of the rafter. Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point. Where the roof pitch is less than three units vertical in 12 units horizontal (25-percent slope), structural members that support rafters and ceiling joists, such as ridge beams, hips and valleys, shall be designed as beams. **R802.3**

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

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

d. Collar ties or ridge straps to resist wind uplift shall be connected in the upper third of the attic space in accordance with Table R602.3(1). Collar ties shall be at least 1-inch by 4-inch, spaced not more than 4 feet on center with connections designed per accepted engineering practice. **R802.3.1**

e. Ceiling joists lapped: Ends of ceiling joists shall be lapped a minimum of 3 inches or butted over bearing partitions or beams and toenailed to the bearing member. When ceiling joists are used to provide resistance to rafter thrust, lapped joists shall be nailed together in accordance with Table R802.5.9(1) and butted joists shall be tied together in a manner to resist such thrust. **R802.3.2**

f. Allowable ceiling joist spans: Spans for ceiling joists shall be in accordance with Tables R802.4(1) and R802.4(2). For other grades and species and for other loading conditions, refer to the AF&PA Span Tables for Joists and Rafters. **R802.3.2**

g. Roof Tie downs. Roof assemblies with rafters and trusses spaced no more than 24 inches on center shall be attached to their supporting wall assemblies in accordance with Table R802.11 where the basic wind speed does not exceed 90 mph, the wind exposure is category B, and the uplift force does not exceed 200 pounds.

Truss uplift: Trusses shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as specified on the truss design drawings. Uplift forces shall be permitted to be determined as specified by Table R802.11, if applicable, or as determined by accepted engineering practice.

Rafter uplift: Individual rafters shall be attached to supporting wall assemblies by connections capable of resisting uplift forces as determined by Table R802.11 or as determined by accepted engineering practice. Connections for beams used in a roof system shall be designed in accordance with accepted engineering practice. **R802.11.1**

40. Attic Access: Buildings with combustible ceiling or roof construction shall have an attic access opening to attic areas that exceed 30 square feet and have a vertical height of 30 inches or more. The vertical height shall be measured from the tip of the ceiling framing member to the underside of the roof framing member. The rough-framed opening shall not be less than 22 inches by 30 inches and shall be located in a hallway or other readily accessible location. A 30-inch minimum unobstructed headroom in the attic space shall be provided at some point above the access opening. Attic areas with less than 30 inch clearance shall have other than blown-in insulation installed or provide means to inspect and verify required insulation installations in compliance with Washington State Energy Code section 105. **R807.1**

Attic storage areas less than 200 square feet may be accessed by fixed ladder in lieu of stairs. **R311.4**

41. Floor and Roof Truss Design Drawings: Truss design drawings, prepared in conformance to Sections R502.11.1 or R802.10.1, shall be provided to the building official and approved prior to installation. Truss design drawings shall include at a minimum the information specified in **R502.11.4/R802.10.1**

a. Design: Wood trusses shall be designed in accordance with accepted engineering practice. The design and manufacture of metal-plate-connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1. **R502.1.5/R802.10.2**

b. Applicability limits: The provisions of this section shall control the design of truss roof framing when snow controls for buildings not greater than 60 feet in length perpendicular to the joist, rafter or truss span, not greater than 36 feet in width parallel to the joist, rafter, or truss span, not more than three stories in height above grade plane, and roof slopes not smaller than 3:12 or greater than 12:12. Truss roof framing constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 110 miles per hour, Exposure A, B or C, and a maximum ground snow load of 70 psf. **Roof snow load is to be computed per King County Public Rule**

c. Bracing: Trusses shall be braced to prevent rotation and provide lateral stability in accordance with the requirements specified in the construction documents for the building and on the individual truss design drawings. In the absence of specific bracing requirements, trusses shall be braced in accordance with the Building Component Safety Information (BCSI 1-03) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses. **R502.11.2 / R802.10.3**

d. Alterations to trusses: Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without the approval of a registered design professional. Alterations resulting in the addition of load (mechanical or plumbing equipment) that exceeds the design load for the

truss shall not be permitted without verification that the truss is capable of supporting such additional. **R502.11.3 / R802.10.4**

e. Habitable attic and accessible attics with Limited attic storage: Trusses configured to provide accessible areas for living space or storage shall be designed to carry loads specified in Table R301.5. **Table R301.5 footnote b.**

f. Floor/Ceiling Draftstopping: When there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet. 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.

Draftstopping materials shall not be less than ½-inch gypsum board, 3/8-inch wood structural panels, 3/8-inch Type 2-M-W particleboard 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 all draftstops shall be maintained. **R302.12.1**

42. Roof Sheathing:

a. Lumber roof sheathing: Allowable spans for lumber used as roof sheathing shall conform to Table R803.1. Spaced lumber sheathing for wood shingle and shake roofing shall conform to the requirements of Sections R905.7 and R905.8. Spaced lumber sheathing is not allowed in Seismic Design Category D2. **R803.1**

b. Wood structural panel sheathing:

Identification and grade: Wood structural panels shall conform to DOC PS 1, DOC PS 2 or, when manufactured in Canada, CSA 0437, and shall be identified by a grade mark or certificate of inspection issued by an approved agency. Wood structural panels shall comply with the grades specified in Table R803.2.1. **R803.2.1**

Exposure durability: All wood structural panels, when designed to be permanently exposed in outdoor applications, shall be of an exterior exposure durability. Wood structural panel roof sheathing exposed to the underside may be of interior type bonded with exterior glue, identified as Exposure 1. **R803.2.1.1**

Fire-retardant-treated plywood: The allowable unit stresses for fire-retardant-treated plywood, including fastener values, shall be developed from an approved method of investigation that considers the effects of anticipated temperature and humidity to which the fire-retardant-treated plywood will be subjected, the type of treatment and re-drying process. The fire-retardant-treated plywood shall be graded by an approved agency. **R803.2.1.2**

Allowable spans: The maximum allowable spans for wood structural panel roof sheathing shall not exceed the values set forth in Table R503.2.1.1(1), or APA E30. **R803.2.1.3**

Installation: Wood structural panel used as roof sheathing shall be installed with joints staggered or not staggered in accordance with Table R602.3(1), or APA E30 for wood roof framing or with Table R804.3 for steel roof framing. **R803.2.1.4**

43. Roof Ventilation:

a. Cross-ventilation: Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have **cross ventilation for each separate space** by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall open directly to the outside air and covered with corrosion-resistant wire cloth screening, hardware cloth, or similar material with openings having a least dimension of 1/16 inch minimum and 1/4 inch maximum. **R806.1**

b. Minimum area: The total **net free** ventilating area shall not be less than 1/150 of the area of the space ventilated except that reduction of the total net free ventilating area to 1/300 is permitted, provided that a **minimum of 40 percent and not more than 50 percent** of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located no more than 3 feet below the ridge or highest point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. **R806.2**

c. Vent and insulation clearance: Where eave or cornice vents are installed, insulation shall not block the free flow of air. A minimum of a 1-inch space shall be provided between the insulation and the roof sheathing and at the location of the vent. **R806.3**

___” diameter, ___-holed eave vents (minimum ___ vent blocks) or ___ linear feet ___” continuous vent. with ___ ft. continuous 2” ridge vent, ___--___”X___” roof vents, ___--___”X___” Gable vents

44. Skylights:

- Skylights and sloped glazing (15 degrees or more from vertical) shall be of the following types of glazing:
- 1. Laminated glass with a minimum 0.015-inch polyvinyl butyral interlayer for glass panes 16 square feet or less in area located no more than 12 feet above a walking surface or other accessible area; for higher or larger sizes, the minimum interlayer thickness shall be 0.030 inch.
 - 2. Fully tempered glass.
 - 3. Heat-strengthened glass.
 - 4. Wired glass.
 - 5. Approved rigid plastics.

Screens, general: When in-board pane of multi glazing or skylight is fully tempered or heat-strengthened glass, a retaining screen capable of supporting twice the weight of the glazing, shall be firmly and substantially fastened to the framing members, and have a mesh opening of not more than 1 inch by 1 inch be installed below the glass. All other panes in the multiple glazing may be of any type listed above **R308.6.3, R308.6.4**

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 or less. Highest point of glass not more than 12 feet above a walking surface or other accessible area, nominal glass thickness not more than 3/16 inch, and (for multiple glazing only) the other pane or panes fully tempered, laminated or wired glass.
- 2. Glass area greater than 16 square feet. Glass sloped 30 degrees or less from vertical, and highest point of glass not more than 10 feet above a walking surface or other accessible area. **R308.6.5**

45. Lumber for Framing:

a. Identification: Load-bearing dimension lumber ...shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20. In lieu of a grade mark, a certification of inspection issued by a lumber grading or inspection agency meeting the requirements of these sections shall be accepted. **R502.1, R602.1, R802.1**

b. End-jointed lumber: Approved end-jointed lumber identified by a grade mark conforming to Section R602.1 may be used interchangeably with solid-sawn members of the same species and grade. **R502.1.1, R602.1.1, R802.1**

c. Structural glued laminated timbers: Glued laminated timbers shall be manufactured and identified as required in AITC A190.1 and ASTM D 3737. **R502.1.5, R602.1.2, R802.1.4**

d. Blocking and sub-floor: Blocking shall be a minimum of utility grade lumber. Sub-flooring may be a minimum of utility grade lumber or No. 4 common grade boards. Where used as sub-flooring or combination sub-floor under-layment, wood structural panels shall be of one of the grades specified in Table

R503.2.1.1(1). When sanded plywood is used as combination sub-floor under-layment, the grade shall be as specified in Table R503.2.1.1(2). **R503.2.1, R502.1.2**

e. Prefabricated wood I-joists: Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D 5055. **R502.1.4**

f. Structural log members: Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D 3957. Such structural log members shall be identified by the grade mark of an approved lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber-grading or inspection agency meeting the requirements of these sections shall be permitted to be accepted. **R502.1.7, R602.1.3**

g. Studs: Studs shall be a minimum No. 3, standard or stud grade lumber. **Exception:** Bearing studs not supporting floors and nonbearing studs may be utility grade lumber, provided the studs are spaced in accordance with Table R602.3(5). **R602.2**

h. Cutting, Drilling, Notching: Structural members shall not be cut, bored or notched in excess of the limitations specified in these sections: **R502.8.1, R602.6, R802.7**

Sawn lumber: Notches in solid lumber joists, rafters and beams shall not exceed one-sixth of the depth of the member, shall not be longer than one-third of the depth of the member and shall not be located in the middle one-third of the span. Notches at the ends of the member shall not exceed one-fourth the depth of the member. The tension side of members 4 inches (102 mm) or greater in nominal thickness shall not be notched except at the ends of the members. The diameter of holes bored or cut into members shall not exceed one-third the depth of the member. Holes shall not be closer than 2 inches (51 mm) to the top or bottom of the member, or to any other hole located in the member. Where the member is also notched, the hole shall not be closer than 2 inches (51 mm) to the notch.

Engineered wood products: Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated members or I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

Drilling and notching of studs: Notching. Any stud in an exterior wall or bearing partition may be cut or notched to a depth not exceeding 25 percent of its width. Studs in nonbearing partitions may be notched to a depth not to exceed 40 percent of a single stud width. Drilling. Any stud may be bored or drilled, provided that the diameter of the resulting hole is no more than 60 percent of the stud width, the edge of the hole is no more than 5/8 inch (16 mm) to the edge of the stud, and the hole is not located in the same section as a cut or notch. Studs located in exterior walls or bearing partitions drilled over 40 percent and up to 60 percent shall also be doubled with no more than two successive doubled studs bored. See Figures R602.6(1) and R602.6(2).

Drilling and notching of top plates: When piping or ductwork is placed in or partly in an exterior wall or interior load-bearing wall, necessitating cutting, drilling or notching of the top plate by more than 50 percent of its width, a galvanized metal tie not less than 0.054 inch thick (16 ga) and 1 1/2 inches wide shall be fastened across and to the plate at each side of the opening with not less than eight 10d having a minimum length of 1 1/2 inches at each side or equivalent. The metal tie must extend a minimum of 6 inches past the opening. See Figure R602.6.1.

46. Treated and Weather Resistant Lumber:

a. Location required: Protection 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 or wood girders when closer than 12 inches to the exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.

2. All wood framing members that rest on concrete or masonry exterior foundation walls and are less than 8 inches from the exposed ground.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 0.5 inch 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 from the ground.
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

b. 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. **R317.1.5**

c. Quality Mark (Identification of Treated Lumber):

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**

d. Exposed surfaces: Field cuts, notches, holes, and surfaces of preservative-treated wood . exposed during framing shall be retreated in the field in accordance with AWPA M4. **R317.1.1**

e. Fasteners: Fasteners for pressure-preservative and fire-retardant-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 diameter or larger 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
3. Plain carbon steel fasteners in SBX/DOT and zinc borate preservative-treated wood in an interior, dry environment shall be permitted..

R317.3.1

47. Wall Construction:

a. Requirements: Wall construction shall be capable of accommodating all loads imposed according to Section R301 and of transmitting loads to the supporting structural elements. **R601.2**

b. Design and construction: Exterior walls of wood-frame construction shall be designed and constructed in accordance with the provisions of chapter 6 and Figures R602.3(1) and R602.3(2) or in accordance with AWC NDS. Components of exterior walls shall be fastened in accordance with Tables R602.3(1) through R602.3(4). Wall sheathing shall be fastened directly to framing members and, when placed on the exterior side of an exterior wall, shall be capable of resisting the wind pressures listed in Table R301.2(2) adjusted for height and exposure using Table R301.2(3). Wood structural panel sheathing used for exterior walls shall conform to DOC PS 1, DOC PS 2 or, when manufactured in Canada, CSA O437 or

CSA O325. All panels shall be identified for grade, bond classification, and Performance Category by a grade mark or certificate of inspection issued by an approved agency and shall conform to the requirements of Table R602.3(3). Wall sheathing used for exterior wall covering purposes shall comply with Section R703.

Studs shall be continuous from support at the sole plate to a support at the top plate to resist loads perpendicular to the wall. The support shall be a foundation or floor, ceiling or roof diaphragm or shall be designed in accordance with accepted engineering practice. **R602.3**

Exception: Jack studs, trimmer studs and cripple studs at openings in walls that comply with Tables R602.7(1) and R602.7(2).

c. Stud size, height and spacing: The size, height and spacing of studs shall be in accordance with Table R602.3(5).

Exceptions:

1. Utility grade studs shall not be spaced more than 16 inches on center, shall not support more than a roof and ceiling, and shall not exceed 8 feet in height for exterior walls and load-bearing walls or 10 feet for interior nonload-bearing walls.
2. Where snow loads are less than or equal to 25 pounds per square foot (1.2 kPa), and the ultimate design wind speed is less than or equal to 130 mph (58.1 m/s), 2-inch by 6-inch (38 mm by 14 mm) studs supporting a roof load with not more than 6 feet (1829 mm) of tributary length shall have a maximum height of 18 feet (5486 mm) where spaced at 16 inches (406 mm) on center, or 20 feet (6096 mm) where spaced at 12 inches (304.8 mm) on center. Studs shall be minimum No. 2 grade lumber.

d. Top plate: Wood stud walls shall be capped with a double top plate installed to provide overlapping at corners and intersections with bearing partitions. End joints in top plates shall be offset at least 24 inches. Joints in plates need not occur over studs. Plates shall be not less than 2-inch nominal thickness and have a width at least equal to the width of the studs.

Exception: A single top plate used as an alternative to a double top plate shall comply with the following:

1. The single top plate shall be tied at corners, intersecting walls, and at in-line splices in straight wall lines in accordance with Table R602.3.2.
2. The rafters or joists shall be centered over the studs with a tolerance of not more than 1 inch (25 mm).
3. Omission of the top plate is permitted over headers where the headers are adequately tied to adjacent wall sections in accordance with Table R602.3.2..

R602.3.2

e. Bearing studs at spacing greater than 16 inches: Where joists, trusses or rafters are spaced more than 16 inches on center and the bearing studs below are spaced 24 inches on center, such members shall bear within 5 inches of the studs beneath.

Exceptions:

1. The top plates are two 2-inch by 6-inch or two 3-inch by 4-inch members.
2. A third top plate is installed.
3. Solid blocking equal in size to the studs is installed to reinforce the double top plate.

R602.3.3

f. Bottom (sole) plate: Studs shall have full bearing on a nominal 2-by or larger plate or sill having a width at least equal to the width of the studs. **R602.3.4**

g. Interior walls: Interior load-bearing walls shall be constructed, framed and fire blocked as specified for exterior walls. Interior nonbearing walls shall be permitted to be constructed with 2-inch-by-3-inch studs spaced 24 inches on center or, when not part of a braced wall line, 2-inch-by-4-inch flat studs spaced at 16 inches on center. Interior nonbearing walls shall be capped with at least a single top plate. Interior nonbearing walls shall be fireblocked in accordance with Section R602.8. **R602.4, R602.5**

h. Cripple walls: Foundation cripple walls shall be framed of studs not smaller than the studding above. When exceeding 4 feet in height, such walls shall be framed of studs having the size required for an additional story.

Cripple walls with a stud height less than 14 inches shall be continuously sheathed on at least one side with wood structural panels fastened to both the top and bottom plates in accordance with Table R602.3(1), or the cripple walls shall be constructed of solid blocking. Cripple walls shall be supported on continuous foundations.

R602.9

i. Interior coverings or wall finishes shall be installed in accordance with chapter 7 and Table R702.1(1), Table R702.1(2), Table R702.1(3) and Table R702.3.5. Interior masonry veneer shall comply with the requirements of Section R703.7.1 for support and Section R703.7.4 for anchorage, except an air space is not required. Class I or II vapor retarders are required on the interior side of framed walls. Interior finishes and materials shall have a flame spread index not to exceed 25, and smoke- developed index of not more than 450.

R702.1, R702.7

48. Fireblocking:

- a. Locations required:** 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.
 2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
 3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R302.7.
 4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.
 5. For the fireblocking of chimneys and fireplaces, see Section R1003.19.
 6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

R302.11

b. Materials: 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. Fireblocking shall consist of:

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 23/32-inch (18.3 mm) wood structural panels with joints backed by 23/32-inch (18.3 mm) wood structural panels.
4. One thickness of 3/4-inch (19.1 mm) particleboard with joints backed by 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.
8. Cellulose insulation installed as tested in accordance with ASTM E 119 or UL 263, for the specific application.

R302.11.1

49. Fasteners: See Table 602.3(1) on sheet 27 and Table 703.4 on sheet 26.

50. Lateral Bracing of Building: Buildings shall be braced in accordance with IRC section R602.10. Where a building, or portion thereof, does not comply with one or more of the prescriptive bracing requirements, those portions shall be designed and constructed in accordance with Section R301.1 by a licensed design professional. Method ABW and Method PFH braced wall panels constructed in accordance with Figure

R602.10.6.1 or Figure R602.10.6.2 shall be permitted to replace each 4 feet of braced wall panel as required by Section R602.10.5. The maximum height of ABW braced wall panels shall not exceed 10 feet.

See Prescriptive Bracing Requirements Informational Sheet if no engineered design attached. R602.10

Structural observation is the visual observation of the structural system by a registered design professional for general conformance to the approved construction documents at significant construction stages and at completion of the structural system. The owner shall employ a registered design professional as defined in Section 1703 to perform structural observations. Prior to the commencement of observations, the structural observer shall submit to the building official a written statement identifying the frequency and extent of structural observations. Deficiencies shall be reported in writing to the owner and the building official. At the conclusion of the work included in the permit, the structural observer shall submit to the Permitting Division/Building Inspection Unit a written statement that the site visits have been made and identify any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved.

Miscellaneous:

51. Fire Sprinklers: Automatic fire sprinkler system shall be designed and installed throughout entire building in accordance with NFPA 13D as adopted by King County ordinance fire provisions.

SEPARATE FIRE PERMIT REQUIRED TO BE OBTAINED FROM KING COUNTY FIRE MARSHAL OFFICE. This is an ancillary permit independent of the building permit. Allow for adequate review and approval time by the Fire Marshal's Staff.

52. Family Child Day Care Facilities:

(See supplemental sheets for DC## references, and inspection checklist)

53. Security: Please note: When a residential unit is leased or rented, the provisions of K.C.C. 16.10 "Building Security Code" apply: Provide security hardware, including view ports, strike plates, locking hardware and latching devices at doors, windows, sliding doors, and other openings as detailed in K.C.C. 16.10.010 – 16.10.030.

54. Swimming Pools and Hot Tubs: See additional conditions sheet

55. International Building Code Residential (IBC) Requirements:

a. Scope: Four story one and two family dwellings must comply with the provisions of the **2015 IBC**.

b. Automatic sprinkler systems are required for residential occupancies under the provisions of the IBC. **IBC 903.2.7**

c. IRC/IBC Similarities: IRC conditions and requirements that are identical or similar to those of the IBC, may be used for the purposes of permit approval. The IBC will prevail in case of discrepancies.

56. Adult Family Homes: Adult Family Home is defined as a dwelling in which a person or person(s) provide personal care, special care, room and board to more than one but no more than **six** adults who are not related by blood or marriage to the person or persons providing the services. Adult Family Homes licensed by the State of Washington after July 1, 2001 shall comply with Section R325 Washington State Amendment in addition to all provisions of the IRC.

(See supplemental sheets for AF## references, and inspection checklist)

Energy Requirements: 2015 Washington State Energy Code

E1. Compliance Form: Building thermal envelope and ventilation system shall comply with the options specified on attached Residential Construction Energy and Ventilation Compliance Form. Note that the Energy Credit Option chosen may require additional requirements from prescriptive design.

Energy Compliance Certificate: A permanent certificate shall be completed and posted within three feet of the electrical distribution panel by the builder or registered design professional. The certificate shall be completed by the builder or registered design professional and shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant installed insulation R-values within or on components of the building; the U-factors for fenestration and solar heat gain coefficient of openings; the efficiency and type of heating, cooling, and service water heating equipment; the test results from the air leakage and duct leakage tests including the test conditions. **WSEC R401, WSEC R406**

E2. Moisture Control, Envelope Seals, Weather-stripping for Air Leakage:

- a. Air Leakage:** The building thermal envelope shall be constructed to limit air leakage. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The components of the building thermal envelope shall be installed in accordance with the manufacturer's instructions and criteria listed in Table R402.4.1.1 (see sheet 30). **WSEC R402.4**
- Windows, skylights, and sliding glass doors** shall have an air infiltration rate of no more than 0.3 cfm per square foot and swinging doors no more than 0.5 cfm per square foot when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer. **WSEC R402.4.3**

- b. Air Leakage Testing:** The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances and sealing thereof. **During testing:**
1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather-stripping or other infiltration control measures;
 2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
 3. Interior doors, if installed at the time of the test, shall be open;
 4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
 5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
 6. Supply and return registers, if installed at the time of the test, shall be fully open. **WSEC R402.4.1.2**

E3. Floor Insulation: Floor insulation shall be installed to maintain permanent contact with the underside of the surface being insulated. Insulation supports shall be installed so spacing is no more than 24 inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

Exceptions: 1. When foundation vents are not placed so that the top of the vent is below the lower surface of the floor insulation, a permanently attached baffle shall be installed at an angle of 30° from horizontal, to divert air flow below the lower surface of the floor insulation.

2. Substantial contact with the surface being insulated is not required in enclosed floor/ceiling assemblies containing ducts where full depth insulation is installed between the duct and the exterior surface. **WSEC R402.2.7**

E4. Wall Insulation: Wall insulation shall fill the entire framed cavity. Exterior wall cavities isolated during framing shall be fully insulated to the levels of the surrounding walls. All faced insulation shall be face stapled to avoid compression. Class I or II vapor retarders are required on the interior side of framed walls. **WSEC R402.4.1.1, IRC R702.7**

E5. Ceiling Envelope:

- a. Roof/Ceiling Insulation:** Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge. Other than blown-in insulation is required where less than 30 inch clearance or provide means to inspect and verify required insulation installation. **WSEC R402.2.1.1**
- b. Ventilation baffles:** For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. When eave vents are installed, baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be rigid material, resistant to wind driven moisture. Requirements for baffles for ceiling insulation shall meet the IRC Section 806 for minimum ventilation requirements. When feasible, the baffles shall be installed from the top of the outside of the exterior wall, extending inward, to a point 6 inches vertically above the height of non-compressed batt insulation, and 12 inches vertically above loose fill insulation. **WSEC R402.2.3**
- c. Vaulted Ceiling Insulation:** When Section R402.1.1 would require R-49 in the ceiling, R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the U-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4. **WSEC R402.2.1**
- d. Recessed Lighting Fixtures:** When installed in the building thermal envelope, recessed lighting fixtures shall be Type IC rated and certified under ASTM E283 to have an air leakage rate no more than 2.0 cfm when tested at 75 Pascals or 1.57 lbs/sq.ft. pressure differential and shall have a label attached, showing compliance with this test method. Recessed lighting fixtures shall be sealed with a gasket or caulk between the fixture housing and interior wall or ceiling covering to prevent air leakage. **WSEC R402.4.4**

E6. Pipe Insulation: All hot water piping shall be thermally insulated to a minimum R-4 value. Cold water pipes outside the conditioned space shall be insulated in accordance with the Washington State Plumbing Code (Chapter 51-56 WAC). **WSEC R403.2.2**

E7. Slab-on-Grade Floor Insulation: The minimum R-value on the insulation around the perimeter on slab on grade floors shall be as specified in Table R402.1.1. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. Insulation located below grade shall extend downward from the top of the slab for the minimum distance specified in Table R402.1.1 or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance specified in Table R402.1.1. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches of soil. The entire area of a heated slab on grade floor shall be thermally isolated from the soil with a minimum R-10 value insulation. The insulation shall be approved product for its intended use. **WSEC R402.2.9**

E8. Below Grade Walls: Below grade walls shall be insulated on the exterior to a minimum thermal resistance level of R-10 from the top of the below grade wall to the top of the footing and shall be approved for below grade use. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications.

Protection of exposed foundation insulation: Insulation applied to the exterior of basement walls, crawlspace walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches below grade.

In lieu of exterior placed insulation: Insulation used on the interior as specified in WSEC Table R402.1.1 shall extend from the top of the below grade wall to the below grade floor level and shall include R-5 rigid board providing a thermal break between the concrete wall and slab floor. **WSEC R402.2.8**

E9. Insulation Identification. Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable upon inspection. **WSEC R303.1.2**

Alternately, the insulation installers shall provide a certification listing the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R-value of installed thickness shall be listed on the certification.

The insulation installer shall sign, date and post the certification in a conspicuous location on the job site. The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed R-value shall be listed on certification provided by the insulation installer. **WSEC R303.1.1**

E10 Attic & Crawl Access Doors: Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weather-stripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment which prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer must be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the loose fill insulation. **WSEC R402.2.4**

E11. Lighting: A minimum of 75 percent of permanently installed lamps in lighting fixtures shall be high-efficacy lamps. Fuel gas lighting systems shall not have continuously burning pilot lights. **WSEC R404.1**

E12. Insulation Flame Spread and Smoke Density Rating:

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. **Section R302.10.1**

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.
3. Foam plastics shall be permitted as interior finish and 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, FM 4880, UL 1040 or UL 1715, or fire tests related to actual end-use configurations. 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. **R316.6**

E13. Remodels and Alterations compliance.

- Unaltered portions of the existing building are not required to comply with the current Energy Code requirements.
- Remodels are exempt from Energy Credit Option Compliance
- All buildings and structures, and portions of shall be maintained in conformance with the Code edition when installed.
- Alterations shall be deemed in compliance where addition alone complies, where existing and alteration comply as single building, or where addition uses no more energy than existing unaltered building.

- Alterations shall be such that the existing building is no less conforming than it was before the alteration, and existing building with alteration does not use any more energy than the existing prior to the alteration.
- Conversion of non-conditioned space shall be treated as an addition and must comply as if new construction.
- Where wall cavities are exposed during construction, fill wall cavity to maximum extent possible: minimum R-15 batt insulation in 2x4 stud walls, R-21 in 2x6 studwalls.
- Where roof cavities are exposed during construction, fill rafter/ceiling cavity to R-38 or maximum extent possible and maintain 1" airspace above insulation for ventilation.
- Where floor framing cavities are exposed during construction, install R-30 insulation under exposed conditioned floor areas.
- All new windows and doors, and all relocated / reinstalled windows or doors shall have a weighted average U = 0.30
- All new mechanical equipment and system components shall comply with current Code provisions.
- When more than 50% of light fixtures are replaced, 75% of ALL LAMPS shall be high efficiency (LED or CFL).

Mechanical Systems Requirements:

M1. Dryer exhaust: Domestic clothes dryers shall be exhausted in accordance with the manufacturer's instructions. **M1502.1**

General: Dryer exhaust systems shall be independent of all other systems, and shall convey the moisture to the outdoors. Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy the exhaust duct shall be capped or plugged in the space in which it originates and identified and marked "future use." **M1502.2, M1502.4..6**

Exception: This section shall not apply to listed and labeled condensing (ductless) clothes dryers. **M1502.2**

Duct termination: Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be in accordance with the dryer manufacturer's installation instructions. Exhaust ducts shall terminate not less than 3 feet in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination. **M1502.3**

Transition ducts: Transition ducts shall not be concealed within construction. Flexible transition ducts used to connect the dryer to the exhaust duct system shall be limited to single lengths, not to exceed 8 feet and shall be listed and labeled in accordance with UL 2158A. **M1502.4.3**

Duct size and construction: Exhaust ducts shall be 4 inch nominal in dimension and constructed of minimum 0.0157-inch-thick metal ducts, having smooth interior surfaces with joints running in the direction of air flow. Exhaust ducts shall be supported at intervals not to exceed 12 feet and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed in accordance with Section M1601.4.1 and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude more than 1/8 inch into the inside of the duct. **M1502.4**

Duct length: The maximum length of the exhaust duct shall be 35 feet from the connection to the transition duct from the dryer to the outlet terminal. Where fittings are used, the maximum length of the exhaust duct shall be reduced in accordance with Table M1502.4.5.1. The maximum length of the exhaust duct does not include the transition duct. Where the exhaust duct equivalent length exceeds 35 feet, the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet of the exhaust duct connection. **M1502.4.5, M1502.4.6**

Manufacturer's instructions: The size and maximum length of the exhaust duct shall be determined by the dryer manufacturer's installation instructions. The code official shall be provided with a copy of the installation instructions for the make and model of the dryer at the concealment inspection. In the absence of fitting equivalent length calculations from clothes dryer manufacturer, Table M1502.4.5.1 shall be used. **M1502.4.5.2**

M2. Range exhaust: **General:** Range hoods shall discharge to the outdoors through a R-4 insulated duct constructed of galvanized steel, stainless steel or copper; shall have a smooth interior surface, shall be air tight and shall be equipped with a backdraft damper. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building. **Exception:** Where installed in accordance with the manufacturer's installation instructions, and where mechanical or natural ventilation is otherwise provided. **M1503**

Overhead Exhaust Hoods: Household cooking appliances shall have a vertical clearance above the cooking top of not less than 30 inches to combustible material and metal cabinets. A minimum clearance of 24 inches is permitted where one of the following is installed: **G2447.5**

1. The underside of the combustible material or metal cabinet above the cooking top is protected with not less than 1/4-inch insulating millboard covered with sheet metal not less than 0.0122 inch thick.
2. A metal ventilating hood constructed of sheet metal not less than 0.0122 inch thick is installed above the cooking top with a clearance of not less than 1/4 inch between the hood and the underside of the combustible material or metal cabinet. The hood shall have a width not less than the width of the appliance and shall be centered over the appliance.
3. A listed cooking appliance or microwave oven is installed over a listed cooking appliance and in compliance with the terms of the manufacturer's installation instructions for the upper appliance.

Domestic open-top broiler units shall have a metal exhaust hood, having a minimum thickness of 0.0157-inch (No. 28 gage) with 1/4 inch clearance between the hood and the underside of combustible material or cabinets. A clearance of at least 24 inches shall be maintained between the cooking surface and the combustible material or cabinet. The hood shall be at least as wide as the broiler unit, extend over the entire unit, discharge to the outdoors and be equipped with a backdraft damper or other means to control infiltration/exfiltration when not in operation. Domestic open-top broiler units permanently installed outside the building envelope and having a cooking surface at least five feet below a one-hour fire resistance rated ceiling, need not have an exhaust hood. **M1505.1**

Kitchen exhaust rates: Where domestic kitchen cooking appliances are equipped with ducted range hoods or down-draft exhaust systems, the fans shall be sized per Table M1507.4 **M1503.3**

Make-up air required Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute shall be mechanically or naturally provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not less than one damper. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be accessible for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or replaced. Kitchen exhaust makeup air shall be discharged into the same room in which the exhaust system is located or into rooms or duct systems that communicate through one or more permanent openings with the room in which such exhaust system is located. Such permanent openings shall have a net cross-sectional area not less than the required area of the makeup air supply openings. **M1503.4**

M3. Water Heaters and Boilers:

a. General: Water heaters shall be installed in accordance with the manufacturer's installation instructions and the requirements of this code. Water heaters shall be anchored against movement and overturning in accordance with M1307.2. Water heaters installed in an attic shall conform to the requirements of Section M1305.1.3. Gas-fired water heaters shall conform to the requirements in Chapter 24. Domestic electric water heaters shall comply with UL 174. Oiled-fired water heaters shall comply with UL 732. Thermal solar water heaters shall comply with Chapter 23 and UL 174. Solid-fuel-fired water heaters shall comply with UL 2523.. **M2005.1.**

Prohibited locations: Fuel-fired water heaters shall not be installed in a room used as a storage closet. Water heaters located in a bedroom or bathroom shall be installed in a sealed enclosure so that combustion air will not be taken from the living space. Installation of direct-vent water heaters within an enclosure is not required. **M2005.2.**

Water heater access: Access to water heaters that are located in an attic or underfloor crawl space is permitted to be through a closet located in a sleeping room or bathroom where required room ventilation is provided. **M2005.2.1.**

Electric water heaters: Electric water heaters shall also be installed in accordance with the applicable provisions of Chapters 34 through 43. **M2005.3**

b. Supplemental water-heating devices: Potable water heating devices that use refrigerant-to-water heat exchangers shall be approved and installed in accordance with the manufacturer's installation instructions. **M2005.4.**

c. Water Heaters, Storage Tanks and Boilers - Performance Efficiency: . All electric water heaters in unheated spaces or on concrete floors shall be placed on an incompressible, insulated surface with a minimum thermal resistance of R-10. **WSEC R403.5.5**

For combination space and service water heaters with a principal function of providing space heat, the Combined Annual Efficiency (CAE) may be calculated by using ASHRAE Standard 124-1991. Storage water heaters used in combination space heat and water heat applications shall have either an Energy Factor (EF) or a Combined Annual Efficiency (CAE) of not less than the following:

	Energy Factor (EF)	Combined Annual Efficiency (CAE)
< 50 gallon storage	0.58	0.71
50 to 70 gallon storage	0.57	0.71
> 70 gallon storage	0.55	0.70

M4. Ventilation Openings:

a. Mechanical and gravity outdoor air intake openings shall be located a minimum of 10 feet from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code. The 10 feet separation is not required if the intake opening is located a minimum of 3 feet 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. **R303.5.1**

b. Exhaust air ducts shall be insulated to a minimum R-4, shall terminate outside the building, shall have the terminal elements at least the equivalent net free area of the duct work, and air shall not be directed onto walkways. **R303.5.2**

c. 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 and a maximum opening size of 1/2 inch, 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**

M5. Heating Systems:

a. Required heating: Every dwelling unit shall be provided with heating facilities capable of maintaining a minimum room temperature of 68°F at a point 3 feet above the floor and 2 feet 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. **R303.9**

Primary heating sources shall not be dependent upon wood stoves or appliances. **R303.9.2 WAC**

Calculation procedure: Heating and cooling design loads for the purpose of sizing HVAC systems are required and shall be calculated in accordance with accepted engineering practice, including infiltration and ventilation according to requirements in IRC Section M1405.3. Heating and cooling equipment shall be sized in accordance with ACCA Manual S or other approved sizing method based on building loads

calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.

M1401.3

b. Required labeling: Appliances shall be listed and labeled for the application in which they are installed and used, unless otherwise approved in accordance with Section R104.11.

M1302.1

Label information: A permanent factory-applied nameplate(s) shall be affixed to appliances on which shall appear, in legible lettering, the manufacturer's name or trademark, the model number, a serial number and the seal or mark of the testing agency. A label shall also include the following:

1. Electrical appliances. Electrical rating in volts, amperes and motor phase; identification of individual electrical components in volts, amperes or watts and motor phase; and in Btu/h (W) output and required clearances.

2. Absorption units. Hourly rating in Btu/h (W), minimum hourly rating for units having step or automatic modulating controls, type of fuel, type of refrigerant, cooling capacity in Btu/h (W) and required clearances.

3. Fuel-burning units. Hourly rating in Btu/h (W), type of fuel approved for use with the appliance and required clearances.

4. Electric comfort heating appliances. Name and trademark of the manufacturer; the model number or equivalent; the electric rating in volts, amperes and phase; Btu/h (W) output rating; individual marking for each electrical component in amperes or watts, volts and phase; required clearances from

5. Maintenance instructions. Required regular maintenance actions and title or publication number for the operation and maintenance manual for that particular model and type of product.

M1303.1

c. Required thermostats, One- and Two-Family Dwellings: At least one thermostat for regulation of space temperature shall be provided for each separate heating and cooling system. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each zone or floor.

WSEC R403.1

d. Thermostat controls: Where the primary heating system is a forced-air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. The thermostat shall allow for at a minimum a 5-2 day programmable schedule (weekdays/weekends) and be capable of providing at least two programmable setback periods per day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F or up to 85°F. The thermostat shall initially be programmed by the manufacturer with a heating temperature set point no higher than 70°F and a cooling temperature set point no lower than 78°F. The thermostat and/or control system shall have an adjustable deadband of not less than 10°F.

WSEC R403.1.1

Unitary air cooled heat pumps shall include controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means such as LED indicators. Heat pumps equipped with supplementary heaters shall be installed with controls that prevent supplemental heater operation above 40°F. At final inspection the auxiliary heat lock out control shall be set to 35°F or less.

WSEC R403.1.2.

M6. Installation of Appliances:

a. Install per listing: Equipment and appliances shall be installed as required by the terms of their approval, in accordance with the conditions of listing, the manufacturer's instructions and this code. Manufacturers' installation instructions shall be available on the job site at the time of inspection. The manufacturer's operating and installation instructions shall remain attached to the appliance.

M1307.1

Where a code provision is less restrictive than the conditions of the listing of the equipment or appliance or the manufacturer's installation instructions, the conditions of the listing and the manufacturer's installation instructions shall apply.

Unlisted appliances approved in accordance with Section R104.11 shall be limited to uses recommended by the manufacturer and shall be installed in accordance with the manufacturer's instructions, the provisions of this code and the requirements determined by the code official.

G2404.3

Appliances installed in outdoor locations shall be either listed for outdoor installation or provided with protection from outdoor environmental factors that influence the operability, durability and safety of the appliance.

G2406.3

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). 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.

R322.1.6

Anchorage of appliances: Appliances designed to be fixed in position shall be fastened or anchored in an approved manner. Thermal storage units, water heaters shall be anchored or strapped to resist horizontal displacement caused by earthquake motion. Strapping and anchorage shall be designed to resist a horizontal force equal to one-third of the operating weight of the water storage tank, acting in any direction, Or shall be in accordance with the appliance manufacturer's recommendations.

M1307.2

WAC

b. Prohibited installation locations.

G2406.2.

Appliances shall not be located in sleeping rooms, bathrooms, toilet rooms, storage closets or surgical rooms, or in a space that opens only into such rooms or spaces, except where the installation complies with one of the following:

1. The appliance is a direct-vent appliance installed in accordance with the conditions of the listing and the manufacturer's instructions.
2. Vented room heaters, wall furnaces, vented decorative appliances, vented gas fireplaces, vented gas fireplace heaters and decorative appliances for installation in vented solid fuel-burning fireplaces are installed in rooms that meet the required volume criteria of Section G2407.5.
3. A single wall-mounted unvented room heater is installed in a bathroom and such unvented room heater is equipped as specified in Section G2445.6 and has an input rating not greater than 6,000 Btu /h (1.76 kW). The bathroom shall meet the required volume criteria of Section G2407.5.
4. A single wall-mounted unvented room heater is installed in a bedroom and such unvented room heater is equipped as specified in Section G2445.6 and has an input rating not greater than 10,000 Btu /h (2.93 kW). The bedroom shall meet the required volume criteria of Section G2407.5.
5. The appliance is installed in a room or space that opens only into a bedroom or bathroom, and such room or space is used for no other purpose and is provided with a solid weather-stripped door equipped with an approved self-closing device. All combustion air shall be taken directly from the outdoors in accordance with Section G2407.6.

c. Elevation of ignition source. Equipment and appliances having an ignition source shall be elevated such that the source of ignition is not less than 18 inches above the floor in hazardous locations and public garages, private garages, repair garages, motor fuel-dispensing facilities and parking garages.

For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

In residential garages where appliances are installed in a separate, enclosed space having access only from outside of the garage, such appliances shall be permitted to be installed at floor level, provided that the required combustion air is taken from the exterior of the garage.

G2408.2.1

Appliances located in a garage or carport shall be protected from impact by automobiles. Appliances located in private garages shall be installed with a minimum clearance of 6 feet above the floor

unless the appliances are protected from motor vehicle impact and installed such that the source of ignition is not less than 18 inches above the floor. **G2408.2**

d. Appliance access for inspection service, repair and replacement:

Appliances shall be accessible for inspection, service, repair and replacement without removing permanent construction, other appliances, or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space at least 30 inches deep and 30 inches wide shall be provided in front of the control side to service an appliance. Installation of room heaters shall be permitted with at least an 18-inch working space. A platform shall not be required for room heaters. **M1305.1**

e. Appliances installed in a compartment, alcove, basement or similar space

shall be accessed by an opening or door and an unobstructed passageway measuring not less than 24 inches wide and large enough to allow removal of the largest appliance in the space, provided there is a level service space of not less than 30 inches deep and the height of the appliance, but not less than 30 inches, at the front or service side of the appliance with the door open. **M1305.1.2**

Furnaces and air handlers within compartments or alcoves shall have a minimum working space clearance of 3 inches along the sides, back and top with a total width of the enclosing space being at least 12 inches wider than the furnace or air handler. Furnaces having a firebox open to the atmosphere shall have at least a 6-inch working space along the front combustion chamber side. Combustion air openings at the rear or side of the compartment shall comply with the requirements of Chapter 17. **M1305.1.1**

Exception: This section shall not apply to replacement appliances installed in existing compartments and alcoves where the working space clearances are in accordance with the equipment or appliance manufacturer's installation instructions.

f. Appliances in Attics and under Floors: Attics and under floor spaces containing appliances shall be provided with an opening and a clear and unobstructed passageway large enough to allow removal of the largest appliance, but not less than 30 inches high and 22 inches wide and not more than 20 feet long measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring in accordance with Chapter 5 not less than 24 inches wide. If the under floor passageway or the service space depth exceeds 12 inches below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry extending 4 inches above the adjoining grade in accordance with Chapter 4. A level service space at least 30 inches deep and 30 inches wide shall be present along all sides of the appliance where access is required. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches, and large enough to allow removal of the largest appliance.

Exceptions:

1. The passageway and level service space are not required where the appliance can be serviced and removed through the required opening.
2. Where the passageway is unobstructed and not less than 6 feet high and 22 inches wide for its entire length, the passageway shall be not more than 50 feet long.

Lighting: A luminaire controlled by a switch located at the required passageway opening and a receptacle outlet shall be installed at or near the appliance location in accordance with Chapter 39.

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

M1305.1.4.1

M7. Electric Radiant Heating: Electric baseboard convectors and/or electric radiant heating systems shall be installed in accordance with the manufacturer's installation instructions. Finish materials installed over radiant heating panels or systems shall be installed in accordance with the manufacturer's instructions. Surfaces shall be secured so that nails or other fastenings do not pierce the radiant heating elements. **M1406**

M8. Ducted Heating Systems:

a. Duct systems, general: Duct systems serving heating, cooling and ventilation equipment shall be fabricated in accordance with the provisions of this section and ACCA Manual D or other approved methods. **M1601.1** Installation of ducts in exterior walls, floors, or ceilings shall not displace or compress required envelope insulation. Building cavities may not be used as ducts. **WSEC R403**

Factory-made air ducts shall not be installed in or on the ground, in tile or metal pipe, or within masonry or concrete. Ducts shall be installed with at least 4 inches separation from earth. **M1601.4.6 / M1601.4.7**

Above-ground duct systems shall conform to the following:

1. Equipment connected to duct systems shall be designed to limit discharge air temperature to a maximum of 250°F .
2. Factory-made air ducts or duct material shall be approved for the use intended, and shall be installed in accordance with the manufacturer's installation instructions. Each portion of a factory-made air duct system shall bear a listing and label indicating compliance with UL 181 and UL 181A or UL 181B.
3. Fibrous duct construction shall conform to the SMACNA Fibrous Glass Duct Construction Standards or NAIMA Fibrous Glass Duct Construction Standards.
4. Field-fabricated and shop-fabricated metal and flexible duct constructions shall conform to the SMACNA HVAC Duct Construction Standards—Metal and Flexible except as allowed by Table M1601.1.1. Galvanized steel shall conform to ASTM A 653.
5. Use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F and exposed surfaces are not subject to condensation.
6. Duct systems shall be constructed of materials having a flame spread index not greater than 200.
7. Stud wall cavities and the spaces between solid floor joists shall not be used as a duct or an air plenum in new construction. For **existing systems**, stud wall cavities and the spaces between solid floor joists to be used as air plenums shall comply with the following:
 1. these cavities or spaces shall not be used as a supply air plenum.
 2. these cavities or spaces shall be a part of a required fire resistance rated assembly.
 3. stud wall cavities shall not convey air from more than one floor level.
 4. stud wall cavities and joist space plenums shall be isolated from adjacent concealed spaces by tight fitting fire blocking in accordance with section R602.8.
 5. stud wall cavities in the outside walls of the building envelope assemblies shall not be utilized as air plenums.

M1601.1.1 Washington State Amendment

b. Duct seams and joints: Longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards—Metal and Flexible and NAIMA Fibrous Glass Duct Construction Standards. Joints, longitudinal and transverse seams, and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants or tapes.

Tapes and mastics used to seal fibrous glass ductwork shall be listed and labeled in accordance with UL 181A and shall be marked “181A-P” for pressure-sensitive tape, “181 A-M” for mastic or “181 A-H” for heat-sensitive tape. Tapes and mastics used to seal metallic and flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181 B-FX” for pressure-sensitive tape or “181 BM” for mastic.

Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metallic ducts shall have a contact lap of not less than 1 inch and shall be mechanically fastened by means of not less than three sheet-metal screws or rivets equally spaced around the joint.

c. Duct sealing and leakage testing: All ducts, air handlers, filter boxes, and building cavities used as ducts shall be sealed. Joints and seams shall comply with IRC Section M1601.4 Closure systems used to seal all ductwork shall be installed per the manufacturers' instructions.

Exceptions:

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

Duct lap: Crimp joints for round and oval metal ducts shall be lapped not less than 1 inch (25 mm) and the male end of the duct shall extend into the adjoining duct in the direction of airflow. **M1601.4**

Ducts shall be leak tested in accordance with RS-33, using the maximum duct leakage rates specified in WSEC Section 403.3.3 **WSEC R403.3.2**

d. Duct tightness testing shall be conducted by a qualified technician to verify that the ducts are sealed. A signed affidavit documenting the test results shall be provided to the jurisdiction having authority by the testing agent. When required by the building official, the test shall be conducted in the presence of department staff. **WSEC R403.3.3**

Duct tightness shall be verified by either of the following:

1. Post-construction test: Leakage to outdoors shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area or a total leakage less than or equal to 4 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascals) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

2. Rough-in test: Total leakage shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascals) across the roughed-in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm per 100 square feet of conditioned floor area.

Exceptions: The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope. Ducts located in the crawlspace do not qualify for this exception. **WSEC R403.3.4.**

e. Duct support: Factory-made ducts listed in accordance with UL 181 shall be supported in accordance with the manufacturer's installation instructions. Field- and shop-fabricated fibrous glass ducts shall be supported in accordance with the SMACNA Fibrous Glass Duct Construction Standards or the NAIMA Fibrous Glass Duct Construction Standards. Field- and shop-fabricated metal and flexible ducts shall be supported in accordance with the SMACNA HVAC Duct Construction Standards—Metal and Flexible.

M1601.4.4, M1601.4.7, M1601.4.8

f. Duct insulation. Duct insulation shall have a total thermal resistance of at least R-8 per WSEC section R403.2.1 unless located entirely within the building thermal envelope and be installed in accordance with the following requirements:

1. A vapor retarder having a maximum permeance of 0.05 perm in accordance with ASTM E 96, or aluminum foil with a minimum thickness of 2 mils, shall be installed on the exterior of insulation on cooling supply ducts that pass through unconditioned spaces conducive to condensation except where the insulation is spray polyurethane foam with a maximum water vapor permeance of 3 perm per inch at the installed thickness.
2. Exterior duct systems shall be protected against the elements.
3. Duct coverings shall not penetrate a fireblocked wall or floor. **M1601.4.5, WSEC R403.3.1**

M9. Combustion Based Heating Systems: COMBUSTION AIR

a. Combustion air supply: Solid-fuel-burning appliances shall be provided with combustion air in accordance with the appliance manufacturer's installation instructions. Oil-fired appliances shall be provided with combustion air in accordance with NFPA 31.

Direct-vent appliances, gas appliances of other than natural draft design, vented gas appliances not designated as Category I and appliances equipped with power burners, shall be provided with combustion, ventilation and dilution air in accordance with the appliance manufacturer's instructions, or as specified in IRC Chapter 24. Fireplaces shall comply with Section 1001. **M1701.1**

Makeup air provisions: Where exhaust fans, clothes dryers and kitchen ventilation systems interfere with the operation of appliances, makeup air shall be provided. **G2407.4**

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

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

Where directly communicating with the outdoors, or where communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/h of total input rating of all appliances in the enclosure [see Figures G2407.6.1(1) and G2407.6.1(2)].

Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of not less than 1 square inch per 2,000 Btu/h of total input rating of all appliances in the enclosure [see Figure G2407.6.1(3)].

G2407.6.2 One-permanent-opening method: One permanent opening, commencing within 12 inches of the top of the enclosure, shall be provided. The appliance shall have clearances of at least 1 inch from the sides and back and 6 inches from the front of the appliance. The opening shall directly communicate with the outdoors or through a vertical or horizontal duct to the outdoors, or spaces that freely communicate with the outdoors (see Figure G2407.6.2) and shall have a minimum free area of 1 square inch per 3,000 Btu/h of the total input rating of all appliances located in the enclosure and not less than the sum of the areas of all vent connectors in the space.

b. Louvers and grilles. The required size of openings for combustion, ventilation and dilution air shall be based on the net free area of each opening. Where the free area through a design of louver, grille or screen is known, it shall be used in calculating the size opening required to provide the free area specified. Where the design and free area of louvers and grilles are not known, it shall be assumed that wood louvers will have 25-percent free area and metal louvers and grilles will have 75-percent free area. Screens shall have a mesh size not smaller than 1/4 inch. Nonmotorized louvers and grilles shall be fixed in the open position. Motorized louvers shall be interlocked with the appliance so that they are proven to be in the full open position prior to main burner ignition and during main burner operation. Means shall be provided to prevent the main burner from igniting if the louvers fail to open during burner start-up and to shut down the main burner if the louvers close during operation. **G2407.10**

c. Combustion air ducts shall comply with all of the following per Section **G2407.11:**

1. Ducts shall be constructed of galvanized steel complying with Chapter 16 or of a material having equivalent corrosion resistance, strength and rigidity.

Exception: Within dwellings units, unobstructed stud and joist spaces shall not be prohibited from conveying combustion air, provided that not more than one required fireblock is removed.

2. Ducts shall terminate in an unobstructed space allowing free movement of combustion air to the appliances.

3. Ducts shall serve a single enclosure.

4. Ducts shall not serve both upper and lower combustion air openings where both such openings are used. The separation between ducts serving upper and lower combustion air openings shall be maintained to the source of combustion air.

5. Ducts shall not be screened where terminating in an attic space.

6. Horizontal upper combustion air ducts shall not slope downward toward the source of combustion air.

7. The remaining space surrounding a chimney liner, gas vent, special gas vent or plastic piping installed within a masonry, metal or factory-built chimney shall not be used to supply combustion air.

Exception: Direct-vent gas-fired appliances designed for installation in a solid fuel-burning fireplace where installed in accordance with the manufacturer's instructions.

8. Combustion air intake openings located on the exterior of a building shall have the lowest side of such openings located not less than 12 inches vertically from the adjoining finished ground level.

d. Separation from conditioned space: Where open combustion air ducts provide combustion air to open combustion, space conditioning fuel burning appliances, the appliances and combustion air openings shall be located outside the building thermal envelope or enclosed in a room sealed and insulated per WSEC Table R402.1.1, isolated from inside the thermal envelope. Combustion air ducts shall be insulated to minimum R-8 where it passes through conditioned space. **WSEC R402.4.4**

M10 Venting of appliances.

a. Venting per manufacturer listing: Fuel-burning appliances shall be vented to the outside in accordance with their listing and label and manufacturer's installation instructions except appliances listed and labeled for unvented use. Venting systems shall consist of approved chimneys or vents, or venting assemblies that are integral parts of labeled appliances. Gas-fired appliances shall be vented in accordance with Chapter 24. **M1801.1**

b. Vent requirements.

Installation general. Gas vents shall be installed in accordance with the terms of their listings and the manufacturer's instructions. **G2427.6.1**

A Type B-W gas vent shall have a listed capacity not less than that of the listed vented wall furnace to which it is connected. **G2427.6.2**

Venting systems shall be adequately supported for the weight of the material used. **M1801.7**

Draft requirements. A venting system shall satisfy the draft requirements of the appliance in accordance with the manufacturer's installation instructions, and shall be constructed and installed to develop a positive flow to convey combustion products to the outside atmosphere. **M1801.2**

Existing chimneys and vents. Where an appliance is permanently disconnected from an existing chimney or vent, or where an appliance is connected to an existing chimney or vent during the process of a new installation, the chimney or vent shall comply with Sections M1801.3.1 to M1801.3.4. **M1801.3**

Size. The chimney or vent shall be resized as necessary to control flue gas condensation in the interior of the chimney or vent and to provide the appliance, or appliances served, with the required draft. For the venting of oil-fired appliances to masonry chimneys, the resizing shall be done in accordance with NFPA 31. **M1801.3.1**

Flue passageways. The flue gas passageway shall be free of obstructions and combustible deposits and shall be cleaned if previously used for venting a solid- or liquid-fuel-burning appliance or fireplace. The flue liner, chimney inner wall or vent inner wall shall be continuous and free of cracks, gaps, perforations, or other damage or deterioration that would allow the escape of combustion products, including gases, moisture and creosote. **M1801.3.2**

c. Venting termination: Vent termination shall comply with Sections **M1804.2.1 to M1804.2.6**,

Natural draft appliances: Vents for natural draft appliances shall terminate at least 5 feet above the highest connected appliance outlet, and natural draft gas vents serving wall furnaces shall terminate at an elevation at least 12 feet above the bottom of the furnace. **M1804.2.3**

Direct vent terminations: Vent terminals for direct-vent appliances shall be installed in accordance with the manufacturer's installation instructions. **M1804.2.5**

Mechanical draft systems: Mechanical draft systems shall be installed in accordance with their listing, the manufacturer's installation instructions and, except for direct vent appliances, the following requirements:

1. The vent terminal shall be located not less than 3 feet above a forced air inlet located within 10 feet.
2. The vent terminal shall be located not less than 4 feet below, 4 feet horizontally from, or 1 foot above any door, window or gravity air inlet into a dwelling.

3. The vent termination point shall not be located closer than 3 feet to an interior corner formed by two walls perpendicular to each other.
4. The bottom of the vent terminal shall be located at least 12 inches above finished ground level.
5. The vent termination shall not be mounted directly above or within 3 feet horizontally of an oil tank vent or gas meter.
6. Power exhauster terminations shall be located not less than 10 feet from lot lines and adjacent buildings.
7. The discharge shall be directed away from the building. **M1804.2.6**

Gas Vent termination. A gas vent shall terminate in accordance with one of the following:

1. Gas vents that are 12 inches or less in size and located not less than 8 feet from a vertical wall or similar obstruction shall terminate above the roof in accordance with Figure G2427.6.3.
2. Gas vents that are over 12 inches in size or are located less than 8 feet from a vertical wall or similar obstruction shall terminate not less than 2 feet above the highest point where they pass through the roof and not less than 2 feet above any portion of a building within 10 feet horizontally.
3. As provided for direct-vent systems in Section G2427.2.1.
4. As provided for appliances with integral vents in Section G2427.2.2.
5. As provided for mechanical draft systems in Section G2427.3.3.

Decorative shrouds shall not be installed at the termination of gas vents except where such shrouds are listed for use with the specific gas venting system and are installed in accordance with manufacturer's installation instructions. **G2427.6.3.1**

A Type B or L gas vent shall terminate at least 5 feet (1524 mm) in vertical height above the highest connected appliance draft hood or flue collar. A Type B-W gas vent shall terminate at least 12 feet in vertical height above the bottom of the wall furnace. **G2427.6.4**

Gas vents shall extend through the roof flashing, roof jack or roof thimble and terminate with a listed cap or listed roof assembly. **G2427.6.5**

Gas vents shall terminate not less than 3 feet above any forced air inlet located within 10 feet. **G2427.6.6**

A gas vent extending through an exterior wall shall not terminate adjacent to the wall or below eaves or parapets, except as provided in Sections G2427.2.1 and G2427.3.3. **G2427.6.7**

Figure G2427.6.3. GAS VENT TERMINATION LOCATIONS FOR LISTED CAPS
12 INCHES OR LESS IN SIZE AT LEAST 8 FEET FROM A VERTICAL WALL

ROOF SLOPE	H (minimum) ft	ROOF SLOPE	H (minimum) ft
Flat to 6/12	1.0	Over 11/12 to 12/12	4.0
Over 6/12 to 7/12	1.25	Over 12/12 to 14/12	5.0
Over 7/12 to 8/12	1.5	Over 14/12 to 16/12	6.0
Over 8/12 to 9/12	2.0	Over 16/12 to 18/12	7.0
Over 9/12 to 10/12	2.5	Over 18/12 to 20/12	7.5
Over 10/12 to 11/12	3.25	Over 20/12 to 21/12	8.0

d. Vent connections: Connectors shall be used to connect fuel burning appliances to a vertical chimney or vent except where the chimney or vent is attached directly to the appliance. Connectors for oil and solid-fuel-burning appliances shall be constructed of factory-built chimney material, Type L vent material or single-wall metal pipe having resistance to corrosion and heat and thickness not less than that of galvanized steel as specified in Table M1803.2. **M1803.1**

Residential-type appliance connectors.

Where vent connectors for residential-type appliances are not installed in attics or other unconditioned spaces, connectors for listed appliances having draft hoods, appliances having draft hoods and equipped with listed conversion burners and Category I appliances shall be one of the following:

1. Type B or L vent material;
2. Galvanized sheet steel not less than 0.018 inch thick;

3. Aluminum (1100 or 3003 alloy or equivalent) sheet not less than 0.027 inch thick;
4. Stainless steel sheet not less than 0.012 inch thick;
5. Smooth interior wall metal pipe having resistance to heat and corrosion equal to or greater than that of Item 2, 3 or 4 above; or
6. A listed vent connector .

Vent connectors shall not be covered with insulation, unless a listed insulated vent connectors installed in accordance with the manufacturer's installation instructions. **G2427.10.2.3**

M11. Fireplaces and Chimneys: Masonry fireplaces, masonry chimneys, masonry heaters, factory built fireplaces and factory built chimneys shall be built and installed in accordance with IRC Chapter 10. All solid fuel burning fireplaces and woodstoves shall be certified and labeled per Washington State Building Code Standard 31-2. Exterior combustion air shall be provided per IRC Section R1006.

a. Manufactured solid fuel burning appliances shall be provided with the following:

1. **Door:** Tight fitting metal or ceramic glass doors.
2. **Combustion air**
 1. A source from outside the structure of primary combustion air, connected to the appliance as per manufacturer's specification. The air inlet shall originate at a point below the fire box. The duct shall be 4 inches or greater in diameter, not exceed 20 feet in length, and be installed as per manufacturer's instructions; or
 2. The appliance and manufacturer's recommended combustion air supply, as an installed unit, shall be certified by an independent testing laboratory to have passed Test No. 11-Negative Pressure Test, Section 12.3, of ULC S627-M1984 "Space Heaters for Use with Solid Fuels," modified as follows:
 - a. Negative pressure of 8 Pascal shall be initially established with the chamber sealed and the air supply, if not directly connected to the appliance, closed off.
 - b. The air supply if not directly connected to the appliance, shall then be opened.
 - c. The maximum allowable air exchange rate from chamber leakage and intentional air supply for the unit (appliance with combustion air supply) in the test chamber is 3.5 air changes per hour, or 28 cfm (cubic feet of air per minute), whichever is less.

Exception: Combustion air may be supplied to the room in which the solid fuel burning appliance is located in lieu of direct ducting, provided that one of the following conditions is met:

1. The solid fuel burning appliance is part of a central heating plant and installed in an unconditioned space in conformance with the International Mechanical Code; or
2. The solid fuel burning appliance is installed in existing construction directly on a concrete floor or surrounded by masonry materials as in a fireplace.

The combustion air terminus shall be located as close to the solid fuel burning appliance as possible and shall be provided with a barometric damper or equivalent. The combustion air source shall be specified by the manufacturer or no less than 4 inches in diameter or the equivalent in area or as approved. **R1006.2**

b. Site Built Fireplaces shall comply with Table R1001.1 and Figure R1001.1 (see sheet 29) and shall be provided with each of the following:

1. **Damper:** Tightly fitting flue dampers, operated by a readily accessible manual or approved automatic control. Exception: Fireplaces with gas logs shall be installed in accordance with the International Mechanical Code Section 901, except that the standards for liquefied petroleum gas installations shall be NFPA 58 (Liquefied Petroleum Gas Code) and NFPA 54 (National Fuel Gas Code).
2. **Combustion air:** An outside source for combustion air ducted into the firebox. The duct shall be at least 6 square inches, and shall be provided with an operable outside air duct damper.

Exception: Washington certified fireplaces shall be installed with the combustion air systems necessary for their safe and efficient combustion and specified by the manufacturer in accordance with the Washington State Building Standard 31-2 (WAC 51-50-31200) and IBC Section 2114 (WAC 51-50-2114).

3. Door: Site built fireplaces shall have tight fitting glass or metal doors, or a flue draft induction fan or as approved for minimizing back-drafting. Factory built fireplaces shall use doors listed for the installed appliance. **R1001.7.1**

c. Manufactured fuel burning appliances shall be installed according to the manufacturer's listing. The manufacturer's installation instructions shall remain with the appliance until inspection, or provided to the inspector before the inspection. **R1004.1**

d. Chimney Termination: Masonry chimneys shall extend at least 2 feet higher than any portion of a building within 10 feet, but shall not be less than 3 feet above the highest point where the chimney passes through the roof. **R1003.9**

Factory-built chimneys shall be listed and labeled and shall be installed and terminated in accordance with the manufacturer's installation instructions. **IMC 805.1**

M12. Microwave oven installations. Installation of a listed and labeled cooking appliance or microwave oven over a listed and labeled cooking appliance shall conform to the terms of the listing of the upper appliance's listing and label and manufacturer's installation instructions. The microwave oven shall conform to UL 923. Exhaust duct shall comply with requirements for range exhaust ducts per section M1503. **M1504.**

M13. Separate permits required. Separate permits may be required to be obtained from King County Health Department for plumbing, gas piping, and/or onsite sewage system for review, inspection, and approval prior to building framing inspection. Separate permits may be required to be obtained from King county Fire Marshal Office for fuel tank, fire sprinkler system, and/or fire access.

Ventilation and Air Quality

V1. Return air: Return air shall be taken from inside the dwelling. Dilution of return air with outdoor air shall be permitted in accordance with the ventilation system prescribed in section M1507.3. **M1602.1**

Outdoor intake air for ventilation, or forced-air heating or cooling systems shall comply with ALL the following:

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

Exceptions:

1. Taking return air from a kitchen is not prohibited where such return air openings serve the kitchen only, and are located not less than 10 feet (3048 mm) from the cooking appliances.
2. Dedicated forced-air systems serving only the garage shall not be prohibited from obtaining return air from the garage.
3. Taking return air from an unconditioned crawl space shall not be accomplished through a direct connection to the return side of a forced-air furnace. Transfer openings in the crawl space enclosure shall not be prohibited.
4. Return air from one dwelling unit shall not be discharged into another dwelling unit. **M1602.2**

V2. Recirculation of air: Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or to another dwelling and shall be exhausted directly to the outdoors. Exhaust air from bathrooms or toilet rooms shall not discharge into attic, crawlspace, or other areas of the building. **M1507.2**

V3. Minimum Ventilation Performance: Each dwelling unit or guest room shall be equipped with local exhaust and whole house mechanical ventilation system complying with Washington State Amendments to IRC sections M1507.1, M1507.3.4, M1507.3.5, M1507.3.6 or M1507.3.7. (See Ventilation System Requirements sheets for specific requirements as specified on 2015 WSEC Residential Construction Energy Compliance form and calculated from values in Tables M1507.3.3(1) and Table M1507.3.3(2). At the discretion of the building official, flow testing may be required to verify that the mechanical system(s) satisfies the requirements of IRC Section M1507.3.4, M1507.3.5, M1507.3.6 or M1507.3.7

V4. Controls and Operation: **M1507.3.2**

a. Ventilation System Controls: All controls and 24-hour clock timer shall be installed in a readily accessible location. Local exhaust systems. Local exhaust systems shall be controlled by manual switches, dehumidistats, timers, or other approved means. The timer shall be capable of continuous operation and have an automatic and manual control that operates the forced air system blower and automatic damper. Continuous whole-house ventilation systems shall operate continuously and be equipped with an override control. A "fan on" switch shall be permitted as an override control. The 24-hour timer shall be capable of operating the whole house ventilation system without energizing other energy-consuming appliances. The system shall be designed so that it can operate automatically based on the type of control timer installed. At the time of the final inspection the timer shall be set to operate the whole house ventilation system for a minimum of eight hours a day. The intermittent mechanical ventilation system shall operate at least one hour out of every four.

b. Labeling: A label shall be affixed to the control that reads "Whole House Ventilation (see operating instructions)". Installers shall provide the manufacturer's installation, operation instructions, and a whole house ventilation system operation description.

c. Fan Noise: Whole house ventilation fans located four feet or less from the interior grille shall have a sone rating of 1.0 or less at .01 water gauge. Manufacturer's noise ratings shall be determined as per HVI 915 (March 2009). Remotely mounted fans shall be acoustically isolated from the structural elements of the building and from attached duct work using insulated flexible duct or other approved material.

V5. Local Exhaust Ventilation: Local exhaust ventilation is required in each kitchen, bathroom, water closet, laundry room, indoor swimming pool, spa, and other rooms where excess water vapor or cooking odor is produced. The minimum local exhaust ventilation effective exhaust capacity shall not be less than levels specified in Table M1507.4, and be controlled by readily accessible manual switches, de-humidistats, timers, or other approved controls. **M1507.1**

1. **EXHAUST FAN REQUIREMENTS (Reference Table M1507.4):**
- a) Bathrooms, laundries, toilet rooms, pools, spas or similar rooms: 50 CFM @ 0.25" W.G.
 - b) Kitchens: 100 CFM @ 0.25" W.G. Range hoods and down draft ranges shall be rated not less than 100 CFM @ 0.10" W.G. and exhaust duct shall be made of smooth walled, galvanized steel or stainless steel or copper.
2. **EXHAUST DUCT REQUIREMENTS:** Ducts shall be insulated to a minimum R-4 in unconditioned spaces; Terminate outside the building not less than three feet from property lines or any openings into the building and a minimum 10 feet from mechanical air intakes; Be equipped with a back-draft damper; and Comply with IRC Table M1507.3.6.2, and IRC Section M1507.4.

NOTE: All manufacturer's fan flow ratings shall be determined as per HVI 916 (April 1995) or AMCA 210.

Concrete Foundation Walls^{1,2,3,4,5, 11, 12} – Seismic Zone D

For Single Family and Duplex Residential Occupancies and Private Garage Occupancies only
(Tables IBC 1807.1.6.2, R404.1.2(8), R404.1.2(1) as revised by King County)

Maximum Wall thickness	Maximum Wall Height ⁵	Maximum Unbalanced Fill ^{1, 2}	Minimum Vertical reinforcement ^{3,6}	Minimum Horizontal Reinforcement ⁶	Anchor Bolt Spacing ¹⁰	
					1/2" ø	5/8" ø
6"	4'-6"	3'-0"	#4 @ 48" O.C.	#4 @ 48" O.C. ⁷	72"	72"
6"	4'-6"	4'-0"	#4 @ 48" O.C.	#4 @ 48" O.C. ⁷	42"	53"
8"	8'-0"	4'-0"	#4 @ 48" O.C.	#4 @ 48" O.C. ⁷	72"	72"
8"	9'-0"	4'-0"	#4 @ 48" O.C.	#4 @ 36" O.C. ⁸	72"	72"
8"	9'-0"	5'-0"	#4 @ 36" O.C. ⁹	#4 @ 36" O.C. ⁸	42"	48"
8"	9'-0"	6'-0"	#4 @ 20" O.C. ⁹	#4 @ 36" O.C. ⁸	24"	30"
8"	9'-0"	7'-0"	#4 @ 16" O.C. ⁹	#4 @ 36" O.C. ⁸	16"	20"
8"	9'-0"	8'-0"	#4 @ 12" O.C. ⁹	#4 @ 36" O.C. ⁸	10"	12"

1. A design in accordance with accepted engineering practice shall be provided when any of the following exist:
- a. Walls are subject to hydrostatic pressure from groundwater.
 - b. Walls supporting more than 48" of unbalanced backfill that do not have permanent lateral support at the top and bottom. Unbalanced backfill height is the difference in height of the exterior and interior finish ground levels.
2. Floor diaphragm shall be completed before backfilling or foundation wall sufficiently braced to prevent damage by backfill.
3. This table is designed for use in the following soil classes in accordance with the United Soil Classification system: GW, GP, SW, SP and GM (40 pcf active soil pressure) Refer to tables R405.1 and IBC Table1610.1.
4. This table is not intended to prevent temperature and shrinkage cracks. Reinforcing steel shall be placed on tension side of the wall and provided not less than ¾ cover from the face of the wall. In concrete cast against earth reinforcing shall be placed a minimum of 3 inches from the soil.
5. Wall height is measured as the vertical distance from the top of the wall to the top of the footing.
6. Reinforcing steel used in this table is based on the use of reinforcement with a minimum yield strength of 40,000 psi.
7. All foundations shall include (1) #4 rebar at the top of the wall and (1) #4 in the bottom of the footing, continuous horizontal reinforcing.
8. Foundations with over 4 feet of unbalanced fill or with walls over 8 feet in height, shall include at least (1) #4 rebar in the top 12" of the wall, (1)#4 rebar in the bottom of the footing and (1)#4 rebar at third points of wall of continuous horizontal reinforcing
9. The distance from the face of the soil side of the wall to the center of vertical reinforcement shall be at least 5-1/2 inches in an 8-inch wall.
10. When braced wall panels are supported directly on continuous foundations, the wall sill plate shall be anchored to the foundation as follows:
The wood sole plate and wood sill plate shall be anchored to the foundation with anchor bolts spaced a maximum of 6 feet on center and 4 feet on center for building over two stories in height. There shall be a minimum of two bolts per plate section.
Bolts shall be at least ½ inch in diameter and shall extend a minimum of 7 inches into concrete.
A nut and 0.229" x 3"x 3" washer shall be tightened on each bolt to the plate (Section 2308.3 IBC; R403.1.6 IRC)
11. Wall top support: Floor joists and blocking shall be connected to the sill plate at the top of the wall by an engineered design or by one of the following appropriate methods:
Type Joist / blocking Attachment Required:
A. (3) 8d per joist Table 602.3(1)
B. (1) 20 gage angle clip each joist with (5) 8d per leg
C. 1-1/4 inch thick steel angle. Horizontal leg attached to joist/blocking, vertical leg attached to joist/blocking ½ inch minimum diameter bolt or a framing anchor that will resist a reaction of 380 pounds
12. The provisions of this table may be applied to Group R-3 and Group U occupancies, and townhouses as defined in Section R202 IRC

TABLE R403.1 (KC)
FOUNDATIONS FOR STUD BEARING WALLS ON 2000 psf SOIL BEARING ^{a, b, c}

NUMBER OF STORIES SUPPORTED BY THE FOUNDATION	THICKNESS OF FOUNDATION WALL (INCHES) ^d	WIDTH OF FOOTING	
		CONVENTIONAL LIGHT- FRAME CONSTRUCTION (INCHES)	4” VENEER OVER LIGHT FRAME OR 8” HOLLOW CONCRETE MASONRY
1-Story	8”	12”	12”
2-Story	8”	12”	16”
3-Story	8”	17”	24”

- a. All exterior footings shall be placed at least 12” below the undisturbed ground or below the frost depth, whichever is deeper per Section R403.1.4.
- b. Seismic conditions: Interior footings supporting bearing or bracing walls and cast monolithically with a slab on grade shall extend to a depth of not less than 12” below the top of the slab per Section R403.1.4.2.
- c. When braced wall panels are support directly on continuous foundations, the wall sill plate shall be anchored to the foundation as follows:
 The wood sole plate and wood sill plate shall be anchored to the foundation with anchor bolts spaced a maximum of 6’ on center.
 There shall be a minimum of two bolts per plate section.
 Bolts shall be at least ½” in diameter and shall extend a minimum of 7” into masonry or concrete. A nut and washer shall be tightened on each bolt to the plate. Sections R403.1.6, R602.11.1.
- d. Wall thickness may be 6” where wall height does not exceed 4’6”.

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS ^a

STUD SIZE (inches)	BEARING WALLS					NON-BEARING WALLS	
	Laterally unsupported stud height ^a (feet)	Maximum spacing when supporting roof and ceiling only (inches)	Maximum spacing when supporting one floor, roof and ceiling (inches)	Maximum spacing when supporting two floors, roof and ceiling only (inches)	Maximum spacing when supporting one floor only (inches)	Laterally unsupported stud height ^a (feet)	Maximum spacing (inches)
2 x 3 ^b	—	—	—	—	—	10	16
2 x 4	10	24 ^c	16 ^c	—	24	14	24
3 x 4	10	24	24	16	24	14	24
2 x 5	10	24	24	—	24	16	24
2 x 6	10	24	24	16	24	20	24

- a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.
- b. Shall not be used in exterior walls.
- c. A habitable attic assembly supported by 2 x 4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall be increased to 2 x 6 or the studs shall be designed in accordance with accepted engineering practice.

TABLE R602.3.1
**MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS
OF 100 MPH OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C AND D₁^{b,c}**

HEIGHT (feet)	ON-CENTER SPACING (inches)			
	24	16	12	8
Supporting a roof only				
>10	2x4	2x4	2x4	2x4
12	2x6	2x4	2x4	2x4
14	2x6	2x6	2x6	2x4
16	2x6	2x6	2x6	2x4
18	NA ^a	2x6	2x6	2x6
20	NA ^a	NA ^a	2x6	2x6
24	NA ^a	NA ^a	NA ^a	2X6

Supporting one floor and a roof				
>10	2x6	2x4	2x4	2x4
12	2x6	2x6	2x6	2x4
14	2x6	2x6	2x6	2x6
16	NA ^a	2x6	2x6	2x6
18	NA ^a	2x6	2x6	2x6
20	NA ^a	NA ^a	2x6	2x6
24	NA ^a	NA ^a	NA ^a	2x6
Supporting two floors and a roof				
>10	2x6	2x6	2x4	2x4
12	2x6	2x6	2x6	2x6
14	2x6	2x6	2x6	2x6
16	NA ^a	NA ^a	2x6	2x6
18	NA ^a	NA ^a	2x6	2x6
20	NA ^a	NA ^a	NA ^a	2x6
22	NA ^a	NA ^a	NA ^a	NA ^a
24	NA ^a	NA ^a	NA ^a	NA ^a

- a. Design required.
- b. Applicability of this table assumes the following: Snow load not exceeding 25 psf, f_b not less than 1310 psi determined by multiplying the AF&PA NDS tabular base design value by the repetitive use factor, and by the size factor for all species except southern pine, E not less than 1.6×10^6 psi, tributary dimensions for floors and roof not exceeding 6 feet, maximum span for floors and roof not exceeding 12 feet, eaves not greater than 2 feet in dimension and exterior sheathing. Where the conditions are not within these parameters, design is required.
- c. Utility, standard, stud and No 3 grade lumber of any species are not permitted.

FIGURE R602.10.6.1: ALTERNATE BRACED WALL PANEL

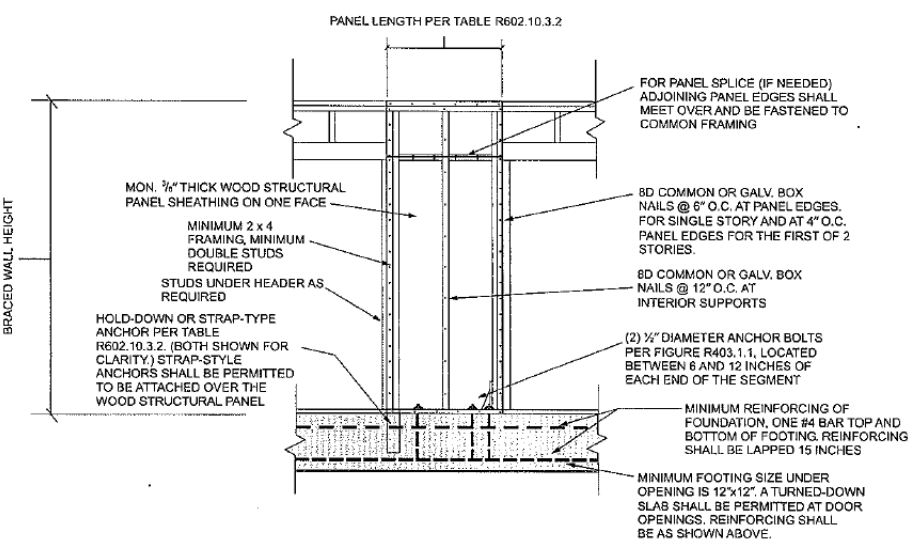


FIGURE R602.10.6.2: METHOD PFH: PORTAL FRAME WITH HOLD-DOWNS

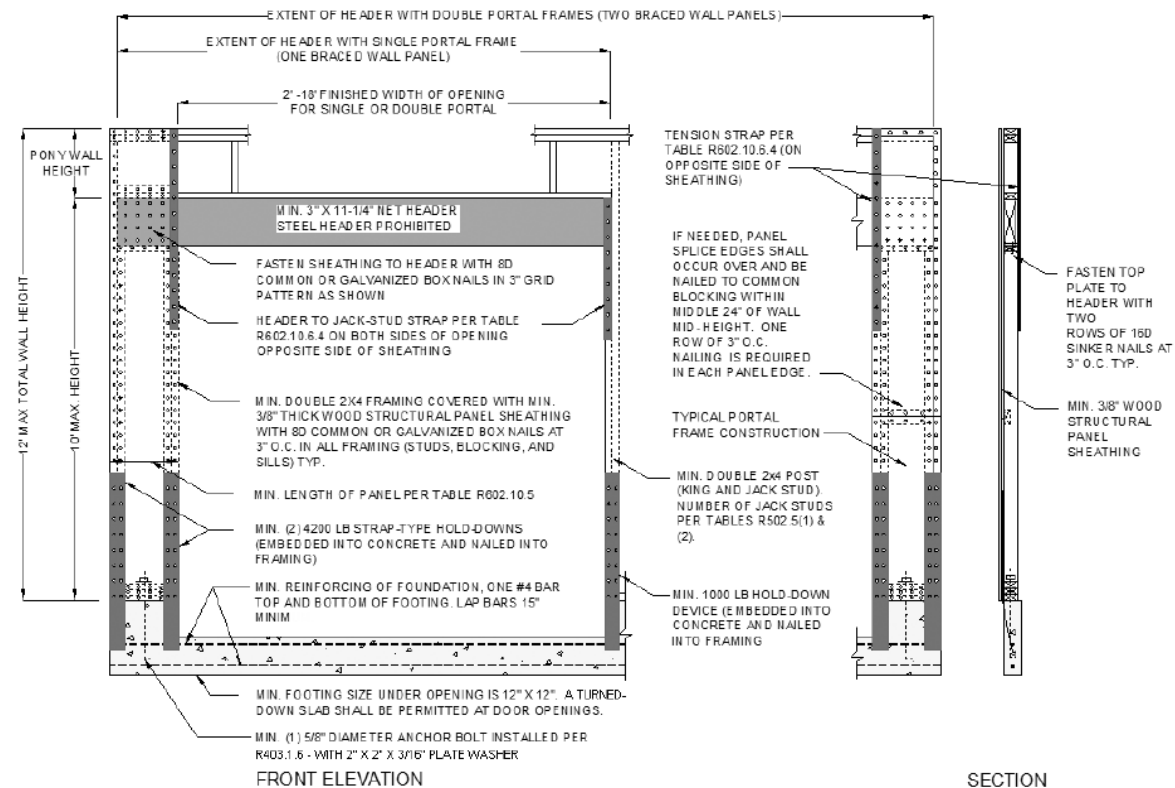


TABLE R703.4 WEATHER-RESISTANT SIDING ATTACHMENT AND MINIMUM THICKNESS

703.4 Attachments. - Unless specified otherwise, all wall coverings shall be securely fastened in accordance with Table R703.4 or with other approved aluminum, stainless steel, zinc-coated or other approved corrosion-resistive fasteners.

SIDING MATERIAL		NOMINAL THICKNESS (Inches)	JOINT TREATMENT	WEASTEHR RESISTIVE BARRIER REQUIRED	TYPE OF SUPPORTS FOR THE SIDING MATERIAL AND FASTENERS ^{b,c,d}					
					Wood or wood structural panel sheathing	Fiberboard sheathing into stud	Gypsum sheathing into stud	Foam plastic sheathing into stud	Direct to studs	Number or spacing of fasteners
Horizontal aluminum ^e	Without insulation	0.019 ^f	Lap	Yes	0.120 nail 1 ½: long	0.120 nail 2" long	0.120 nail 2" long	0.120 nail ^z	No allowed	Same as stud spacing
		0.024	Lap	Yes	0.120 nail 1 ½: long	0.120 nail 2" long	0.120 nail 2" long	0.120 nail ^z	Not allowed	
	With insulation	0.019	Lap	Yes	0.120 nail 1 ½: long	0.120 nail 2 ½" long	0.120 nail 2 ½" long	0.120 nail ^z	0.120 nail 1 ½: long	
Veneer: brick, concrete, stone or masonry ^w		2	Section R703	Yes (note w)	See Section R703 and Figure R703.7 ^h or Section R703.6.1					
Hardboard ^k Panel siding-vertical		7/16		Yes	Note m	Note m	Note m	Note m	Note m	6" panel edges 12" inter. Sup. ^p
Hardboard ^k Panel siding-horizontal		7/16	Note p	Yes	Note o	Note o	Note o	Note o	Note o	Same as stud spacing 2 per bearing
Steel ^h		29 ga.	Lap	Yes	0.113 nail 1 ¾" Staple-1 ¾"	0.113 nail 2 ¾" Staple-2 ½"	0.113 nail 2 ½" Staple-2 ¾"	0.113 nail ^v Staple ^v	Not allowed	Same as stud spacing
Particleboard panels		3/8 – 1/2		Yes	6d box nail	6d box nail	6d box nail	box nail ^v	6d box nail, 3/8 not allowed	6" panel edge 12" inter. sup.

	5/8		Yes	6d box nail	8d box nail	8d box nail	box nail ^v	6d box nail	
Wood Structural (Plywood) panel ⁱ (exterior grade)	3/8 – 1/2	Note x	Yes	0.099 nail-2"	0.113 nail-2 ½"	0.099 nail-2"	0.113 nail ^v	0.099 nail-2"	6" panel edge 12" inter. sup.
Wood Structural (Plywood) panel lapsiding	3/8 – 1/2	Note p Note x	Yes	0.099 nail-2"	0.113 nail-2 ½"	0.099 nail-2"	0.113 nail ^x	0.099 nail-2"	8" along bottom edge
Vinyl siding ^l	0.035	Lap	Yes	0.120 nail 1 ½"	0.120 nail 2"	0.120 nail ^z 2"	0.120 nail ^z Staple	Not allowed	Same as stud spacing
Wood ^l Rustic, drop	3/8 min	Lap	Yes	Fastener penetration into stud-1"				0.113 nail-2 ½" Staple-2"	Face nailing up to 6" widths, 1 nail per bearing; 8" widths and over, 2 nails per bearing
Shiplap	19/32 Average	Lap	Yes						
Bevel	7/16	Lap	Yes						
Butt tip	3/16	Lap	Yes						
Fiber cement panel siding ^q	5/16	Note q	Yes (note u)	6d corrosion resistant nail ^f	6d corrosion resistant nail ^f	6d corrosion resistant nail ^f	6d common corrosion- resistant (12" x 0.113") nail ^{f,v}	4d corrosion resistant nail ^v	6: oc on edges, 12" oc on intermed. Studs
Fiber cement lap siding ^s	5/16	Note s	Yes (note u)	6d corrosion resistant nail ^f	6d corrosion resistant nail ^f	6d corrosion resistant nail ^f	6d common corrosion- resistant (12" x 0.113") nail ^{f,v} ,	6d corrosion resistant nail or 11 gage roofing nail ^f	Note t

- a. Based on stud spacing of 16 inches on center where studs are spaced 24 inches, siding shall be applied to sheathing approved for that spacing.
- b. Nail is a general description and shall be T-head, modified round head, or round head with smooth or deformed shanks.
- c. Staples shall have a minimum crown width of 7/16-inch outside diameter and be manufactured of minimum 16 gage wire.
- d. Fasteners shall be aluminum, galvanized, or rust-preventative coated and shall be driven into the studs for fiberboard or gypsum backing.
- e. Aluminum nails shall be used to attach aluminum siding.
- f. Aluminum (0.019 inch) shall be unbacked only when the maximum panel width is 10 inches and the maximum flat area is 8 inches. The tolerance for aluminum siding shall be +0.002 inch of the nominal dimension.
- g. All attachments shall be coated with a corrosion-resistant coating.
- h. Shall be of approved type.
- i. Three-eighths-inch plywood shall not be applied directly to studs spaced more than 16 inches on center when long dimension is parallel to studs. Plywood 1/2-inch or thinner shall not be applied directly to studs spaced more than 24 inches on center. The stud spacing shall not exceed the panel span rating provided by the manufacturer unless the panels are installed with the face grain perpendicular to the studs or over sheathing approved for that stud spacing.
- j. Wood board sidings applied vertically shall be nailed to horizontal nailing strips or blocking set 24 inches on center. Nails shall penetrate 1½ inches into studs, studs and wood sheathing combined or blocking.
- k. Hard board siding shall comply with CPA/ANSI A135.6.
- l. Vinyl siding shall comply with ASTM D 3679.
- m. Minimum shank dia. of 0.092", minimum head dia. of 0.225", and nail length must accommodate sheathing and penetrate framing 1½ inches.
- n. When used to resist shear forces, the spacing must be 4 inches at panel edges and 8 inches on interior supports.
- o. Minimum shank diameter of 0.099 inch, minimum head diameter of 0.240 inch, and nail length must accommodate sheathing and penetrate framing 1½ inches.
- p. Vertical end joints shall occur at studs and shall be covered with a joint cover or shall be caulked.
- q. See Section R703.10.1.
- r. Fasteners shall comply with the nominal dimensions in ASTM F 1667.
- s. See Section R703.10.2.
- t. Face nailing: one 6d common nail through the over lap ping planks at each stud. Concealed nailing: one 11 gage 1½ inch long galv. roofing nail through the top edge of each plank at each stud.
- u. See Section R703.2 exceptions.
- v. Minimum nail length must accommodate sheathing and penetrate framing 1½ inches.
- w. Adhered masonry veneer shall comply with the requirements of Section R703.6.3 and shall comply with the requirements in Sections 6.1 and 6.3 of ACI 530/ASCE 5/TMS-4

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

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER a, b, c	SPACING OF FASTENERS
Joist to sill or girder, toe nail	3-8d (2-½" x 0.113")	—
1" x 6" subfloor or less to each joist, face nail	2-8d (2½" x 0.113") 2 staples, 1¾"	—
2" subfloor to joist or girder, blind and face nail	2-16d (3½" x 0.135")	—
Sole plate to joist or blocking, face nail	16d (3½" x 0.135")	16" o.c.
Top or sole plate to stud, end nail	2-16d (3½" x 0.135")	—
Stud to sole plate, toe nail	3-8d (2½" x 0.113") or 2-16d (3½" x 0.135")	—
Double studs, face nail	10d (3" x 0.128")	24" o.c.
Double top plates, face nail	10d (3" x 0.128")	24" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d (3½" x 0.135")	16" o.c.
Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	8-16d (3½" x 0.135")	—
Blocking between joists or rafters to top plate, toe nail	3-8d (2½" x 0.113")	—
Rim joist to top plate, toe nail	8d (2½" x 0.113")	6" o.c.
Top plates, laps at corners and intersections, face nail	2-10d (3" x 0.128")	—
Built-up header, two pieces with ½" spacer	16d (3½" x 0.135")	16" o.c. along each edge
Continued header, two pieces 16d	16d (3½" x 0.135")	16" o.c. along each edge
Ceiling joists to plate, toe nail	3-8d (2½" x 0.113")	—
Continuous header to stud, toe nail	4-8d (2½" x 0.113")	—
Ceiling joist, laps over partitions, face nail	3-10d (3" x 0.128")	—
Ceiling joist to parallel rafters, face nail	3-10d (3" x 0.128")	—
Rafter to plate, toe nail	2-16d (3½" x 0.135")	—
1" brace to each stud and plate, face nail	2-8d (2½" x 0.113") 2 staples, 1¾"	—
1" x 6" sheathing to each bearing, face nail	2-8d (2½" x 0.113") 2 staples, 1¾"	—
1" x 8" sheathing to each bearing, face nail	2-8d (2½" x 0.113") 3 staples, 1¾"	—
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d (2½" x 0.113") 4 staples, 1¾"	—
Built-up corner studs	10d (3" x 0.128")	24"o.c.
Built-up girders and beams, 2-inch lumber layers	10d (3" x 0.128")	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
2" planks	(3½" x 0.135")	At each bearing
Roof rafters to ridge, valley or hip rafters: toe nail	4-16d (3½" x 0.135")	—
face nail	3-16d (3½" x 0.135")	—
Rafter ties to rafters, face nail	3-8d (2½" x 0.113")	—
Collar tie to rafter, face nail, or 1¼" 20 gage ridge strap	3-10d (3" x 0.128")	—

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

- a.** All nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.
- b.** Staples are 16 gage wire and have a minimum 7/16-inch on diameter crown width
- c.** Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- d.** Four-foot-by-8-foot or 4-foot-by-9-foot panels shall be applied vertically.

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

DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER b, c, e	SPACING OF FASTENERS	
		Edges (inches) i	Intermediate supports (inches) c, e
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing			
5/16"-½"	6d common (2" x 0.113") nail (subfloor,wall) 8d common (2½" 0.131") nail (roof)f	6	12 ^g
19/32" -1"	8d common nail (2½" x 0.131")	6	12 ^g
1 1/8"-1¼"	10d common (3" x 0.148") nail or 8d (2½" x 0.131") deformed nail	6	12
Other wall sheathing ^h			
½" structural cellulosic fiberboard sheathing	1/2" galvanized roofing nail, 7/16" crown or 1" crown staple 16 ga., 11/4" long l	3	6
25/32" structural cellulosic fiberboard sheathing	1/2" galvanized roofing nail, 7/16" crown or 1" crown staple 16 ga., 11/4" long	3	6
½" gypsum sheathingd	1½" galvanized roofing nail; 6d common (2" x 0.131") nail; staple galvanized 1½" long; 1¼" screws, Type W or S	7	7
5/8" gypsum sheathing ^d	1¾" galvanized roofing nail; 8d common (2½" x 0.131") nail; staple galvanized 15/8" long; 15/8" screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing			
¾" and less	6d deformed (2" x 0.120") nail or 8d common (2½" x 0.131") nail	6	12
7/8"-1"	8d common (2½" x 0.131") nail or 8d deformed (2½" x 0.120") nail	6	12
11/8"-1¼"	10d common (3" x 0.148") nail or 8d deformed (2½" x 0.120") nail	6	12

- e.** Spacing of fasteners not included in this table shall be based on Table R602.3(2).
- f.**For regions having basic wind speed of 110 mph or greater, 8d deformed (2 ½" x 0.120) nails shall be used for attaching plywood and wood structural panel roof sheathing to framing within minimum 48-inch distance from gable end walls, if mean roof height is more than 25 feet, up to 35 feet maximum.
- g.** For regions having basic wind speed of 100 mph or less, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 100 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.
- h.** Gypsum sheathing shall conform to ASTM C 136 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C 208.
- i.** Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.

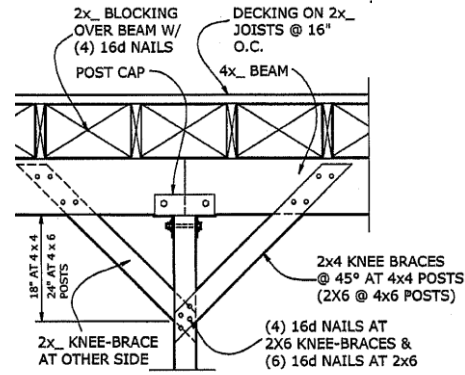
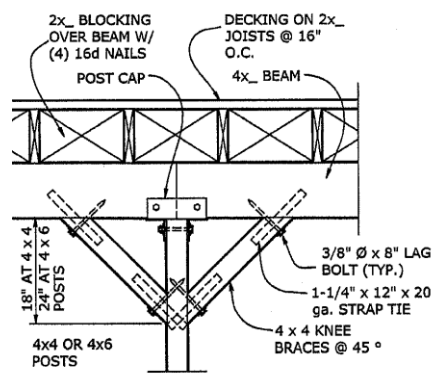
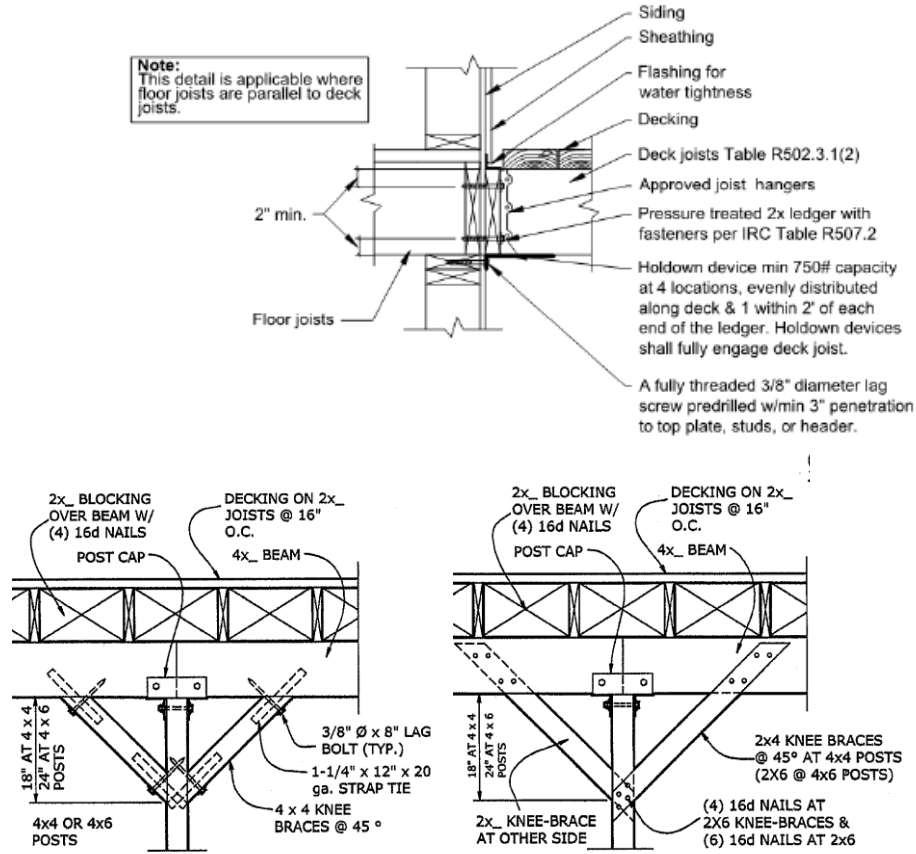
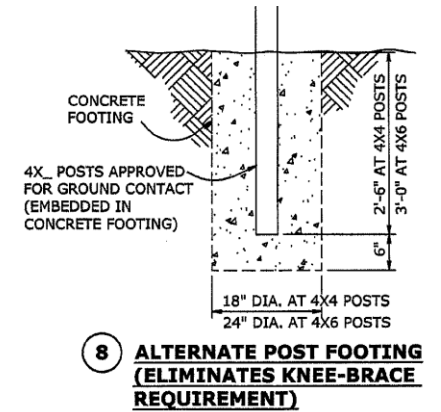
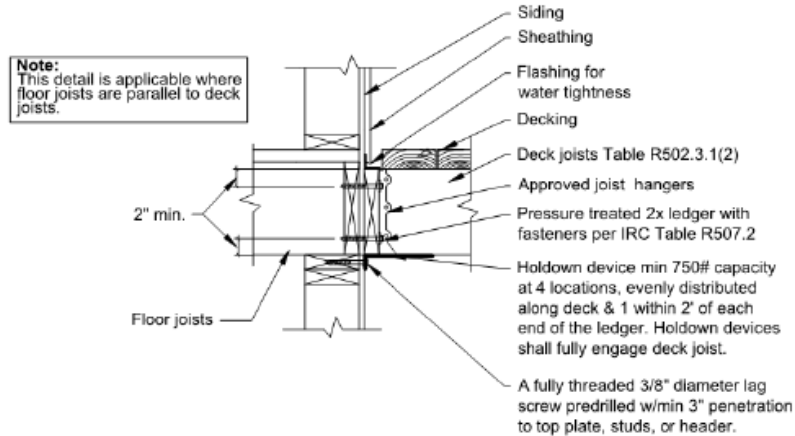
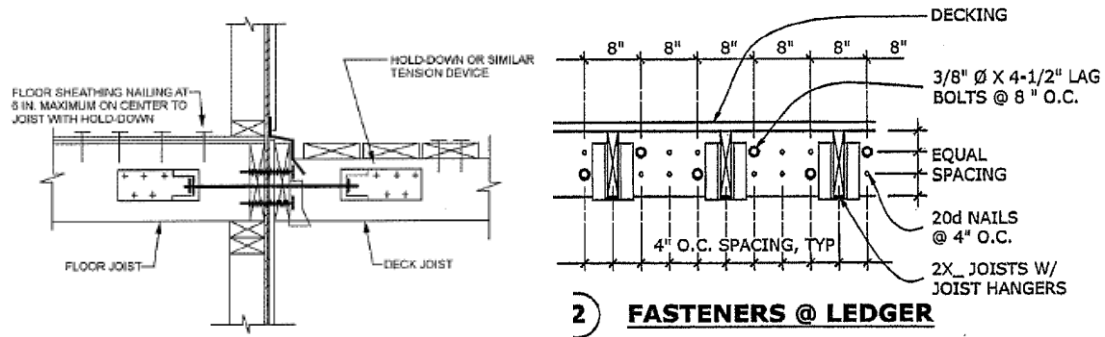


TABLE R1001.1:
SUMMARY OF REQUIREMENTS FOR MASONRY FIREPLACES AND CHIMNEYS

ITEM	LETTER ^a	REQUIREMENTS
Hearth slab thickness	A	4"
Hearth extension (each side of opening)	B	8" fireplace opening < 6 square foot. 12" fireplace opening ≥ 6 square foot.
Hearth extension (front of opening)	C	16" fireplace opening < 6 square foot. 20" fireplace opening ≥ 6 square foot.
Hearth slab reinforcing	D	Reinforced to carry its own weight and all imposed loads.
Thickness of wall of firebox	E	10" solid brick or 8" where a firebrick lining is used. Joints in firebrick ¼" maximum.
Distance from top of opening to throat	F	8"
Smoke chamber wall thickness	G	6"
Unlined walls		8"
Chimney		
Vertical reinforcing ^b	H	Four No. 4 full-length bars for chimney up to 40" wide. Add two No. 4 bars for each additional 40 ² or fraction of width or each additional flue.
Horizontal reinforcing steel	J	¼" ties at 18" and two ties at each bend in vertical
Bond beams	K	No specified requirements.
Fireplace lintel	L	Noncombustible material.
Chimney walls with flue lining	M	Solid masonry units or hollow masonry units grouted solid with at least 4-inch nominal thickness.
Distances between adjacent flues	—	See Section R1003.13.
Effective flue area (based on area of fireplace opening)	P	See Section R1003.15.
Clearances		
Combustible material		See Sections R1001.11 and R1003.18
Mantel and trim	R	See Section R1001.11, Exception 4.
Above roof		3 FT at roofline and 2 FT at 10 FT
Anchorage^b		
Strap	S	Two - 3/16" × 1" straps
Embedment into chimney		12" hooked around outer bar with 6" extension.
Fasten to		4 joists
Bolts		Two - ½" diameter bolts.
Footings		
Thickness	T	12" min.
Width		6" each side of fireplace wall.

Note: This table provides a summary of major requirements for the construction of masonry chimneys and fireplaces. Letter references are to Figure R1001.1, which shows examples of typical construction. This table does not cover all requirements, nor does it cover all aspects of the indicated requirements. For the actual mandatory requirements of the code, see the indicated section of text.

- The letters refer to Figure R1001.1.
- Not required in Seismic Design Category A, B or C.

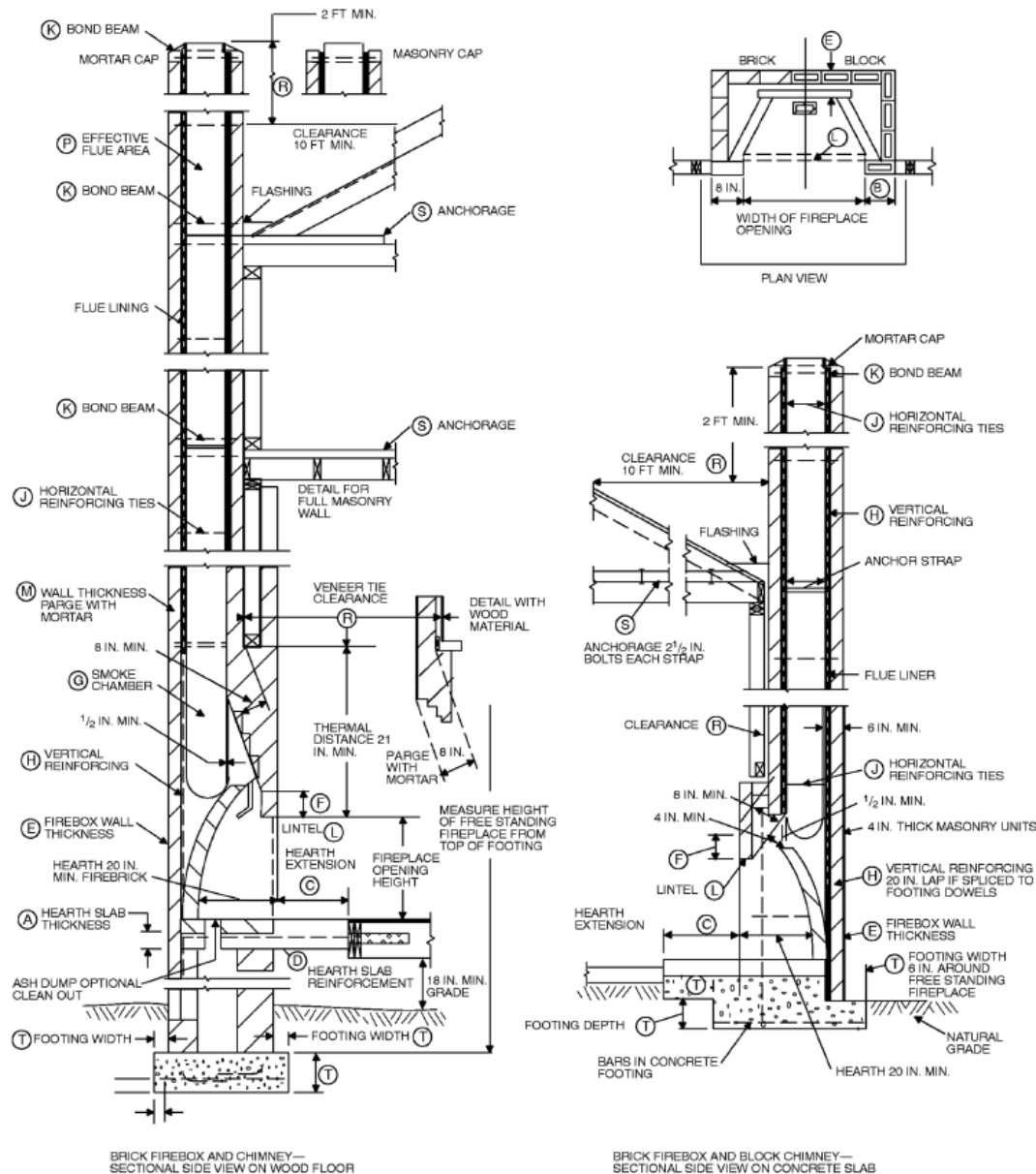


FIGURE R1001.1
FIREPLACE AND CHIMNEY DETAILS

**TABLE R402.4.1.1
COMPONENT**

**AIR BARRIER AND INSULATION INSTALLATION
CRITERIA^a**

Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Cavity insulation installation	All cavities in the thermal envelope shall be filled with insulation. The density of the insulation shall be at the manufacturers' product recommendation and said density shall be maintained for all volume of each cavity. Batt type insulation will show no voids or gaps and maintain an even density for the entire cavity. Batt insulation shall be installed in the recommended cavity depth. Where an obstruction in the cavity due to services, blocking, bracing or other obstruction exists, the batt product will be cut to fit the remaining depth of the cavity. Where the batt is cut around obstructions, loose fill insulation shall be placed to fill any surface or concealed voids, and at the manufacturers' specified density. Where faced batt is used, the installation tabs must be stapled to the face of the stud. There shall be no compression to the batt at the edges of the cavity due to inset stapling installation tabs. Insulation that upon installation readily conforms to available space shall be installed filling the entire cavity and within the manufacturers' density recommendation.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed. Batt insulation installed in attic roof assemblies may be compressed at exterior wall lines to allow for required attic ventilation.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Cavities within corners and headers of framed walls shall be insulated by completely filling the cavity with material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking or floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the underside of floor framing and extend from the bottom of the top of all perimeter floor framing members. The air barrier shall be installed at any exposed edge of insulation.

Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Narrow cavities	Batts in narrow cavities shall be cut to fit and installed to the correct density without any voids or gaps or compression. Narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls. There shall be no voids or gaps or compression where cut to fit. Insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls. Fireplaces shall have gasketed door.
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceiling.
<i>a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.</i>	
Definition of Air Barrier = Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.	

Minimum Ventilation Rates* (continuously operating systems)
IRC Table M1507.3.3(1)

Floor Area (sq. ft.)	Number of Bedrooms				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
< 1500	30	45	60	75	90
1501 – 3000	45	60	75	90	105
3001 – 4500	60	75	90	105	120
4501 – 6000	75	90	105	120	135
6001 – 7500	90	105	120	135	150
> 7500	105	120	135	150	165

*Minimum outdoor airflow rates measured in cfm.

Outdoor Air Flow Rate = Ventilation Rate Requirement multiplied by Ventilation Rate Factor

Intermittent Ventilation Rate Factors
IRCTable M1507.3.3(2)

Run-time % in each 4 hour Period	Ventilation Rate Factor
25% (1 hr every 4 hrs; 6 hrs per day)	4
33% (1 hr 20 min every 4 hrs; 8 hrs per day)	3
50% (2 hrs every 4 hrs; 12 hrs per day)	2
66% (2 hrs 40 min every 4 hrs; 16 hrs per day)	1.5
75% (3 hr every 4 hrs; 18 hrs per day)	1.3
100% (Continuously operating)	1.0

For systems designed to operate between given Run-time, Ventilation rate factors may be interpolated.

Minimum Required Exhaust Rates
Table M1507.4

Area to be Vented	Ventilation Rates
Kitchens	100 cfm intermittent or 25 cfm continuously
Bathrooms / Laundry / Pools and Spas / Similar areas	50 cfm intermittent or 20 cfm continuously

Prescriptive Supply Fan Duct Sizing
IRC Table M1507.3.6.2

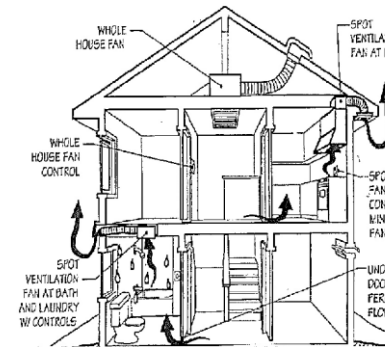
Supply Fan Tested CFM @ 0.40 w.g.		
Specified Volume	Minimum Smooth Duct Diameter	Minimum Flexible Duct Diameter
50 – 90 cfm	4 inch	5 inch
90 – 150 cfm	5 inch	6 inch
150 – 120 cfm	6 inch	7 inch
250 – 400 cfm	7 inch	8 inch

IMC Table 403.8.4.2: Prescriptive Exhaust Duct Sizing

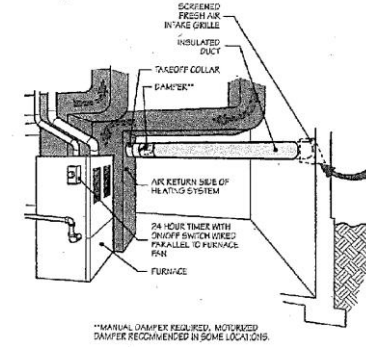
Fan Tested cfm @ 0.25" w.g.	Minimum Flex Diameter	Maximum Length	Minimum Smooth Diameter	Maximum Length	Maximum Elbows ¹
50	4 inches	25 ft.	4 inches	25 ft.	3
50	5 inches	25 ft.	5 inches	25 ft.	3
50	6 inches	No Limit	6 inches	No Limit	3
80	4 inches ²	N/A	4 inches	25 ft.	3
80	5 inches	25 ft.	5 inches	25 ft.	3
80	6 inches	25 ft.	6 inches	No Limit	3
100	5 inches ²	N/A	5 inches	25 ft.	3
100	6 inches	25 ft.	6 inches	No Limit	3
125	6 inches	25 ft.	6 inches	No Limit	3
125	7 inches	25 ft.	7 inches	No Limit	3

Footnotes:

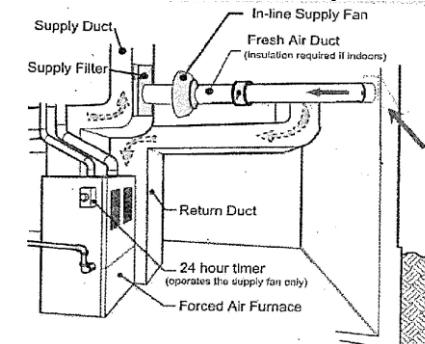
- For each additional elbow, subtract 10 feet from length.
- Flex ducts of this diameter are not permitted with fans of this size.



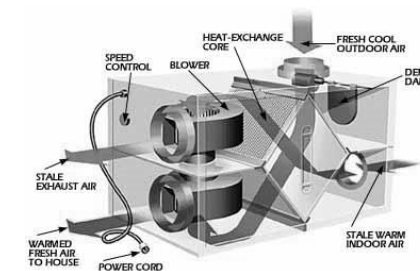
Exhaust Fan Ventilation System



Integrated Ventilation System



Supply Fan Ventilation System



Heat Recovery Ventilation System

WASHINGTON STATE ENERGY CODE

ENERGY EFFICIENCY REQUIREMENTS:

Efficient Building Envelope 1a: Table R402.1.1 Prescriptive compliance with openings $U = 0.28$, floors R-38, slabs R-10 perimeter and entire slab, OR Total UA Equivalent compliance Target UA reduced by 5%.

Efficient Building Envelope 1b: Table R402.1.1 Prescriptive compliance with openings $U = 0.25$, wall R-21 plus R-4, floor R-38, slabs R-10 perimeter and under entire slab with below grade walls R-21 plus R-5 c.i., OR Total UA Equivalent compliance with Target UA reduced by 15%.

Efficient Building Envelope 1c: Table R402.1.1 Prescriptive compliance with openings $U = 0.22$, walls R-21 plus R-12 c.i., floor R-38, slabs R-10 perimeter and under entire slab, and R-49 advanced frame ceilings and vaulted areas, OR Total UA Equivalent compliance with Target UA reduced by 30%.

Efficient Building Envelope 1d: Table R402.1.1 Prescriptive compliance with all openings $U = 0.24$

Air Leakage Control and Efficient Ventilation 2a: Compliance per R402.4.1.2: Envelope leakage reduced to maximum 3.0 ACH. Whole house ventilation requirements met by ventilation system per IRC M1507.3 with high efficiency fan (maximum 0.35 watts/cfm) that is not interlocked with furnace ventilation system.

Air Leakage Control and Efficient Ventilation 2b: Compliance per R402.4.1.2: Envelope leakage reduced to maximum 2.0 ACH. Whole house ventilation requirements met by heat recovery system per IRC M1507.3 with minimum sensible heat recovery efficiency of 0.70.

Air Leakage Control and Efficient Ventilation 2c: Compliance per R402.4.1.2: Envelope leakage reduced to maximum 1.5 ACH. Whole house ventilation requirements met by heat recovery system per IRC M1507.3 with minimum sensible heat recovery efficiency of 0.85.

High Efficiency HVAC Equipment 3a: minimum AFUE of 95% gas, propane, or oil-fired furnace OR minimum AFUE of 92% gas, propane, or oil-fired boiler.

High Efficiency HVAC Equipment 3b: Air-source heat pump with minimum HSPF of 9.0.

High Efficiency HVAC Equipment 3c: Closed-loop ground source heat pump with minimum COP of 3.3 OR open-loop water source heat pump maximum pumping hydraulic head of 150 ft and with COP > 3.6.

High Efficiency HVAC Equipment 3d: where primary space heating system is zonal electric heating, a ductless heat pump system shall be installed to provide heating to the largest zone.

High Efficiency HVAC Distribution 4: All heating and cooling components installed inside conditioned space. All combustion equipment shall be direct vent or sealed combustion. No system components installed in crawlspace. Duct type and length limitations and insulated to R-8 if located outside conditioned space. No electric resistance heat or ductless heat pumps permitted. Direct combustion heating equipment with AFUE not less than 80%.

Efficient Water Heating 5a: All showerheads and kitchen sink faucets shall be rated at 1.75 gpm or less, all others at 1.0 gpm or less when tested in accordance with ASME A112.18.1/CSA B125.1

Efficient Water Heating 5b: Water heating system shall include one of the following: gas, propane or oil water heater with minimum EF of 0.74; OR water heater heated by ground source heat pump with minimum COP of 3.3 OR open-loop water source heat pump maximum pumping hydraulic head of 150 ft and with COP > 3.6

Efficient Water Heating 5c: Water heating system shall include one of the following: gas, propane or oil water heater with minimum EF of 0.91; OR Electric heat pump water heater with EF > 2.0 per NEEA's Northern Climate specifications for Heat Pump Water Heaters; OR solar water heating supplementing minimum standard water heater. Solar water heating will provide rated minimum savings of 85 therms or 2000 kWh based on Solar Rating and Certification Corp (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems. Provide savings calculations.

Efficient Water Heating 5d: Drain water heat recovery unit(s) installed on all shower waste water drains with minimum efficiency > 40% if installed for equal flow, OR minimum efficiency > 52% if installed for unequal flow. Rated per CSA B55.1 standard and so labeled. Must submit Plumbing diagram that specify water heat recovery units, and plumbing layout needed to install with documentation for compliance to standard.

Renewable Electric Energy: for each 1200 kWh of electrical generation provided annually by on-site wind or solar equipment a 0.5 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows:

- **Solar electric systems:** design shall be demonstrated to meet requirement using the National Renewable Energy laboratory calculator PVWATTS. Solar access documentation to be included.
- **Wind generation projects:** design shall document annual power generation based on the following factors: wind turbine power curve, average annual wind speed at the site, frequency distribution of the wind speed at the site and the height of the tower.