



# BUILDING PLAN REVIEW INSPECTION REFERENCE GUIDE

## Why should I read this checklist?

You should read the checklist because the plans cannot contain all of the information that is necessary to comply with the code. The information may not be complete nor correct on the plans.

All items in the checklist are **NOT** specifically called out on the approved set of plans, yet these requirements still apply to your project. The items that the plans examiner would like to draw attention to are marked with a numerical reference to the checklist.

Please be sure to read this checklist to be sure that you are meeting all code requirements prior to inspection.

This checklist, based on the 2006 International Residential Code, is part of the plans and must remain attached to the approved set of plans.

Approved plans shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or, of any other ordinance of this jurisdiction

## Where do these requirements come from?

These codes are a minimum established through adoption by the State of Washington.

- TC = Thurston County Ordinance Title 14
- IRC = International Residential Code, 2006
- IFC = International Fire Code, 2006
- IMC = International Mechanical Code, 2006
- UPC = Uniform Plumbing Code, 2006
- WSEC = Washington State Energy Code, 2006
- VIAQ = Washington State Ventilation & Indoor Air Quality Code, 2006

## Climatic and Geographic Design Criteria

Ground Snow Load =	20 pounds per square foot
Wind Speed =	85 miles per hour
Seismic Design Category =	D1
Weathering =	slight to moderate
Frost Depth =	12 inches
Termites =	Slight to moderate
Decay =	slight to moderate
Winter Design Temperature =	17 ° Fahrenheit
Ice Shield Required =	No
Flood Hazard =	Call the Permit Assistance Center
Air Freezing Temperature and Mean Annual Temperature =	See the WSEC

**The approved set of plans shall be kept at the job site and shall be available to the building official or his or her authorized representative during inspection.**

## I Still Have Questions...

For additional information, speak with a staff member at the Permit Assistance Center. Contact information is listed below. You may also review all Thurston County Codes online on the County website referenced at the bottom of this page.

## Thurston County Permit Assistance Center

2000 Lakeridge Drive SW, Bldg 1, Second Floor; Olympia, WA 98502  
Phone: (360) 786-5490; TDD line: (360) 754-2933; Fax: (360) 754-2939

[www.co.thurston.wa.us/permitting](http://www.co.thurston.wa.us/permitting)

## 1. ADMINISTRATION

**R102.1** Scope. Where different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

**R104.9** Approved materials and equipment. Materials, equipment and devices approved by the building official shall be constructed and installed in accordance with such approval.

**R105.1** Permit required. Any owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application to the building official and obtain the required permit.

**R105.4** Validity of permit. The issuance or granting of a permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other ordinance of the jurisdiction.

**R105.6** Suspension or revocation. The building official is authorized to suspend or revoke a permit issued under the provisions of this code wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or regulation or any of the provisions of this code.

**R105.7** Placement of permit. The building permit or copy thereof shall be kept on the site of the work until the completion of the project.

**R105.8** Responsibility. It shall be the duty of every person who performs work for the installation or repair of building, structure, electrical, gas, mechanical or plumbing systems, for which this code is applicable, to comply with this code.

**R106.1.2** Manufacturer's installation instructions. Manufacturer's installation instructions, as required by this code, shall be available on the job site at the time of inspection.

**R106.3.1** Approval of construction documents. One set of construction documents shall be kept at the site of work and shall be open to inspection by the building official or his or her authorized representative.

**R106.4** Amended construction documents. Work shall be installed in accordance with the approved construction

documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

**R109.1.1** Foundation inspection. Inspection of the foundation shall be made after poles or piers are set or trenches or basement areas are excavated and any required forms and any required reinforcing steel is in place and supported prior to the placing of concrete.

**R109.3** Inspection requests. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall be the duty of the person requesting any inspections required by this code to provide access to and means for inspection of such work.

**R109.4** Approval required. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.

**R110.1** Use and occupancy. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a certificate of occupancy

## 3. BUILDING PLANNING

**R301.5** Live Load. Attics without storage = 10 psf. Attics with limited storage = 20 psf. Attics without storage are those where the maximum clear height between joist and rafter is less than 42 inches, or where there are not two or more adjacent trusses with the same web configuration capable of containing a rectangle 42 inches high by 2 feet wide, or greater, located within the plane of the truss. For attics without storage, this live load need not be assumed to act concurrently with any other live load requirement. For attics with limited storage and constructed with trusses, this live load need be applied only to those portions of the bottom chord where there are two or more adjacent trusses with the same web configuration capable of containing a rectangle 42 inches high or greater by 2 feet wide or greater, located within the plane of the truss. The rectangle shall fit between the top of the bottom chord and the bottom of any other truss member, provided that each of the following criteria is met:

1. The attic area is accessible by a pull-down stairway or framed opening in accordance with Section R807.1; and
2. The truss has a bottom chord pitch less than 2:12.

Attic spaces served by a fixed stair shall be designed to support the minimum live load specified for a sleeping room.

**R302.1** Exterior walls. Exterior walls with a fire separation distance less than 3 feet shall have not less than a one-hour fire-resistive rating with exposure from both sides. Projections shall not extend to a point closer than 2 feet from the line used to determine the fire separation distance. Thurston County Current Planning will set zoning setbacks, see the approved site plan.

**R303.1** Habitable rooms. All habitable rooms shall be provided with aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural ventilation shall as per the energy code and ventilation sections of the checklist. The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

Exceptions:

1. The glazed areas need not be openable where the opening is not required by Section R310 and an approved mechanical ventilation system is provided capable of producing 0.35 air change per hour in the room or a whole-house mechanical ventilation system is installed capable of supplying outdoor ventilation air of 15 cubic feet per minute (cfm) (7.08 L/s) per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom.
2. The glazed areas need not be provided in rooms where Exception 1 above is satisfied and artificial light is provided capable of producing an average illumination of 6 foot-candles (6.46 lux) over the area of the room at a height of 30 inches above the floor level.
3. Use of sunroom additions and patio covers, as defined in Section R202, shall be permitted for natural ventilation if in excess of 40 percent of the exterior sunroom walls are open, or enclosed only by insect screening.

**R303.6** Stairway illumination. All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to a basement from the outside grade level shall be provided with an artificial light source located in the immediate vicinity of the bottom landing of the stairway.

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

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.

**R303.8** 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. The installation of one or more portable space heaters shall not be used to achieve compliance with this section.

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

Other rooms. Other habitable rooms shall have a floor area of not less than 70 square feet.

Exception: Kitchens.

Minimum dimensions. Habitable rooms shall not be less than 7 feet in any horizontal dimension.

Exception: Kitchens.

**R304.4** Height effect on room area. Portions of a room with a sloping ceiling measuring less than 5 feet 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.

**R305.1** 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.

Exceptions:

1. Beams and girders spaced not less than 4 feet on center may project not more than 6 inches below the required ceiling height.
2. Bathrooms shall have a minimum ceiling height of 6 feet 8 inches over the fixture and at the front clearance area for fixtures as shown in Figure R307.2. 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.

3. For rooms with a sloped ceiling, 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.

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

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

### **R308** Glazing

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 which is visible in the final installation.

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

1. Glazing in swinging doors except jalousies.
2. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bi-fold closet door assemblies.
3. Glazing in storm doors.
4. Glazing in all unframed swinging doors.
5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any part of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface.
6. Glazing, in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24-inch arc of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface.
7. Glazing in an individual fixed or operable panel, other than those locations described in Items 5 and 6 above, that meets all of the following conditions:
  - 7.1. Exposed area of an individual pane greater than 9 square feet.
  - 7.2. Bottom edge less than 18 inches above the floor.
  - 7.3. Top edge greater than 36 inches above the floor.
  - 7.4. One or more walking surfaces within 36 inches horizontally of the glazing, requirements of Section R308.2.
8. All glazing in railings regardless of an area or height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.
9. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where

the bottom edge of the glazing is less than 60 inches above a walking surface and within 60 inches horizontally of the water's edge. This shall apply to single glazing and all panes in multiple glazing.

10. Glazing adjacent to stairways, landings and ramps within 36 inches horizontally of a walking surface when the exposed surface of the glass is less than 60 inches above the plane of the adjacent walking surface.
11. Glazing adjacent to stairways within 60 inches horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glass is less than 60 inches above the nose of the tread.

Exception: The following products, materials and uses are exempt from the above hazardous locations:

1. Openings in doors through which a 3-inch sphere is unable to pass.
2. Decorative glass in Items 1, 6 or 7.
3. Glazing in Section R308.4, Item 6, when there is an intervening wall or other permanent barrier between the door and the glazing.
4. Glazing in Section R308.4, Item 6, in walls perpendicular to the plane of the door in a closed position, other than the wall toward which the door swings when opened, or where access through the door is to a closet or storage area 3 feet or less in depth. Glazing in these applications shall comply with Section R308.4, Item 7.
5. Glazing in Section R308.4, Items 7 and 10, when a protective bar is installed on the accessible side(s) of the glazing 36 inches  $\pm$  2 inches above the floor. The bar 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 height.
6. Outboard panes in insulating glass units and other multiple glazed panels in Section R308.4, Item 7, when the bottom edge of the glass is 25 feet or more above grade, a roof, walking surface, or other horizontal [within 45 degrees (0.79 rad) of horizontal] surface adjacent to the glass exterior.
7. Louvered windows and jalousies complying with the requirements of Section R308.2.
8. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.
9. Safety glazing in Section R308.4, Items 10 and 11 is not required where:
  - 9.1. The side of a stairway, landing or ramp has a guardrail or handrail, including balusters or in-fill panels, complying with the provisions of Sections 1003.3.12 and 1607.7 of the *International Building Code*; and
  - 9.2. The plane of the glass is greater than 18 inches from the railing; or
  - 9.3. When a solid wall or panel extends from the plane of the adjacent

walking surface to 34 inches to 36 inches above the floor and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as the protective bar.

**R309.1.1** Duct penetration. Ducts in the garage and ducts penetrating the walls or ceilings separating the dwelling from the garage shall be constructed of a minimum No. 26 gage sheet steel or other approved material and shall have no openings into the garage.

**R309.2** Separation required. The garage shall be separated from the residence and its attic area by not less than 1/2-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 1/2-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 1/2-inch gypsum board applied to the interior side of the exterior walls that are within this area.

Garage to home door shall be solid wood of not less than 1 3/8" thickness, solid or honey comb core steel doors. 20 minute rated doors are allowed.

**R310.** Emergency escape and rescue required. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room, but shall not be required in adjoining areas of the basement.

Minimum opening area. All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet.

Exception: Grade floor openings shall have a minimum net clear opening of 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.

**R311.2.2** Under stair protection. Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2-inch gypsum board.

**R311.3** Hallways. The minimum width of a hallway shall be not less than 3 feet.

**R311.4.1** Exit door required. The required exit door shall provide for direct access from the habitable portions of the dwelling to the exterior without requiring travel through a garage.

Door type and size. The required exit door shall be not less than 3 feet in width and 6 feet 8 inches in height.

**R311.4.3** Landings at doors. There shall be a floor or landing on each side of each exterior door.

Exception: The landing at an exterior doorway shall not be more than 7 3/4 inches below the top of the threshold, provided the door, other than an exterior storm or screen door does not swing over the landing.

**R311.4.4** Type of lock or latch. All egress doors shall be readily openable from the side from which egress is to be made without the use of a key or special knowledge or effort.

**R311.5.** Stairs, Width. See Thurston County Figure 12 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 4.5 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 31.5 inches where a handrail is installed on one side and 27 where handrails are provided on both sides.

Illumination. All stairs shall be provided with illumination in accordance with Section R303.6. See Thurston County Figure 12

Headroom. The minimum headroom in all parts of the stairway shall not be less than 6 feet 8 inches.

Riser height. The maximum riser height shall be 7 3/4 inches. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch.

Tread depth. The minimum tread depth shall be 10 inches. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch.

Landings for stairways. There shall be a floor or landing at the 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 greater than 12 feet between

floor levels or landings. The width of each landing shall not be less than the stairway served. Every landing shall have a minimum dimension of 36 inches measured in the direction of travel.

**R311.5.6 Handrails.** Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers.

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

**Continuity.** Handrails for stairways shall be continuous for the full length of the flight. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inch between the wall and the handrails.

Handrail grip size. See Thurston County Figure 12.

**R312.1 Guards required.** Porches, balconies, ramps or raised floor surfaces located more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 36 inches (914 mm) in height. Open sides of stairs with a total rise of more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 34 inches (864 mm) in height measured vertically from the nosing of the treads.

**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.

**R313 Smoke alarms.** 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 in the event the fire alarm is removed or the system is not connected to a central station.

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

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional story of the dwelling, including basements but not including crawl spaces and uninhabitable attics.

**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. Interconnection and hard-wiring of smoke alarms in existing areas shall not be required where the alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available which could provide access for hard wiring and interconnection without the removal of interior finishes.
2. Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section.

**Power source.** In new construction, the required smoke alarms shall receive their primary power from the building wiring.

**R317.2.1. Continuity.** The fire-resistance-rated wall or assembly separating townhouses shall be continuous from the foundation to the underside of the roof sheathing, deck or slab. The fire-resistance-rating shall extend the full length of the wall or assembly, including wall extensions through and separating attached enclosed accessory structures. Where a story extends beyond the exterior wall of a story below:

1. The fire-resistance-rated wall or assembly shall extend to the outside edge of the upper story; or
2. The underside of the exposed floor-ceiling assembly shall be protected as required for projections in Section R302.

**R319. Posts, poles and columns.** Posts, poles and columns supporting permanent structures that are embedded in concrete in direct contact with the ground shall be approved pressure preservative treated wood suitable for ground contact use.

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

Exceptions:

1. Posts or columns which are either exposed to the weather or located in basements or cellars, supported by piers or metal pedestals projecting 1 inch above the floor or finished grade and 6 inches above exposed earth, and are separated there from by an approved impervious moisture barrier.

3. Posts or columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building, supported by a concrete pier or metal pedestal at a height greater than 8 inches from exposed ground, are separated there from by an impervious moisture barrier.

**R319.3** Fasteners. Fasteners for pressure preservative and fire-retardant-treated wood shall be of hot-dipped galvanized steel, stainless steel, silicon bronze or copper.

Exception: One-half-inch diameter or larger steel bolts.

**R321.1** Premises identification. Approved numbers or addresses shall be provided for all new buildings in such a position as to be plainly visible and legible from the street or road fronting the property.

#### 4. FOUNDATIONS

**R401.** Requirements. Foundation construction shall be capable of accommodating all loads according to Section R301.

Drainage. Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection so as to not create a hazard. Lots shall be graded so as to

drain surface water away from foundation walls. The grade away from foundation walls shall fall a minimum of 6 inches within the first 10 feet.

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

**R401.4.1** Geotechnical evaluation. In lieu of a complete geotechnical evaluation, the load-bearing values in Table R401.4.1 shall be assumed. A load-bearing value of 1500 pounds per square foot will be assumed for projects without other evidence submitted.

**R403.1** 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.

**TABLE R402.2**

**MINIMUM SPECIFIED COMPRESSIVE STRENGTH OF CONCRETE**

TYPE OR LOCATIONS OF CONCRETE CONSTRUCTION	MINIMUM SPECIFIED COMPRESSIVE STRENGTH <sup>a</sup> (f'c)
Basement walls, foundations and other concrete not exposed to the weather	2,500
Basement slabs and interior slabs on grade, except garage floor slabs	2,500
Basement walls, foundation walls, exterior walls and other vertical concrete work exposed to the weather	3,000
Porches, carport slabs and steps exposed to the weather, and garage floor slabs	3,000

For SI: 1 pound per square inch = 6.895 kPa.

a. At 28 days psi.

b. See Table R301.2(1) for weathering potential.

c. Concrete in these locations that may be subject to freezing and thawing during construction shall be air-entrained concrete in accordance with Footnote d.

d. Concrete shall be air entrained. Total air content (percent by volume of concrete) shall not be less than 5 percent or more than 7 percent.

e. See Section R402.2 for minimum cement content.

**TABLE R403.1  
MINIMUM WIDTH OF CONCRETE OR MASONRY FOOTINGS (inches)<sup>a</sup>**

LOAD-BEARING VALUE OF SOIL 1,500 (psf)	
Conventional light-frame construction	
1-story	12
2-story	15
3-story	23
4-inch brick veneer over light frame or 8-inch hollow concrete masonry	
1-story	12
2-story	21
3-story	32
8-inch solid or fully grouted masonry	
1-story	16
2-story	29
3-story	42

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

a. Where minimum footing width is 12 inches, a single wythe of solid or fully grouted 12-inch nominal concrete masonry units is permitted to be used.

**Minimum size.** Minimum sizes for concrete and masonry footings shall be as set forth in Table R402.2 and R403.1. See Thurston County figures 2, 3, and 5 for concrete footings.

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

**Seismic reinforcing.** Concrete footings shall have minimum reinforcement. See Thurston County figures 2, 3 and 5.

**Foundations with stemwalls.** Foundations with stemwalls shall be provided with a minimum of one No. 4 bar within 12 inches of the top of the wall and one No. 4 bar located 3 inches to 4 inches from the bottom of the footing. See Thurston County figures 2, 3, and 5.

**Slabs-on-ground with turned-down footings.** Slabs-on-ground with turned down footings shall have a minimum of one No. 4 bar at the top and bottom of the footing. See Thurston County figures 2, 3, and 5.

**Exception:** For slabs-on-ground cast monolithically with a footing, one No. 5 bar or two No. 4 bars shall be located in the middle third of the footing depth.

**Minimum depth.** All exterior footings shall be placed at least 12 inches below the undisturbed ground.

**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 18 inches below the top of slab.

**R403.1.6 Foundation anchorage at braced wall panels.** When braced wall panels are supported by monolithic slabs, footings or foundations, the wood sole plates, wood sill plates or cold-formed steel bottom tracks shall be anchored to the slab cast monolithically with a footing, footing or foundation in accordance with this section. The wood sole or sill plate shall be anchored to the monolithic slab, footing or foundation with anchor bolts spaced a maximum of 6 feet on center. There shall be a minimum of two bolts per plate section with one bolt located not more than 12 inches or less than seven bolt diameters from each end of the plate section. Bolts shall be at least 1/2 inch in diameter and shall extend a minimum of 7 inches into masonry or concrete. A nut and washer shall be tightened on each bolt to the plate. Cold-formed steel framing systems shall be fastened in accordance with Section R505.3.1 or R603.3.1.

**Exceptions:**

1. Foundation anchorage, spaced as required to provide equivalent anchorage to 1/2-inch-diameter anchor bolts.
2. Walls 24 inches total length or shorter connecting offset braced wall panels shall be anchored to the footing or foundation with a minimum of one anchor bolt located in the center third of the plate section and shall be attached to adjacent braced wall panels as specified in Figure R602.10.5 at the corners.
3. Walls 12 inches total length or shorter connecting offset braced wall panels shall be permitted to be connected to the footing or foundation without anchor bolts. The wall

shall be attached to adjacent braced wall panels as specified in Figure 602.10.5 at the corners.

Foundation anchorage in Seismic Design Category D1. In addition to the requirements of Section R403.1.6, the following requirements shall apply to wood light-frame structures in Seismic Design Category D1.

1. Interior braced wall sill plates shall be anchored to footings or foundations with anchor bolts spaced at not more than 6 feet on center and located within 12 inches from the ends of each plate section when supported on a continuous foundation.
2. The maximum anchor bolt spacing shall be 4 feet for buildings over two stories in height.
3. Plate washers complying with Section R602.11.1 shall be provided for all anchor bolts over the full length of required braced wall lines. Properly sized cut washers shall be permitted for anchor bolts in wall lines not containing braced wall panels or in braced wall lines.
4. Stepped cripple walls shall conform to Section R602.11.3.
5. Where wood foundations in accordance with Section R404.2 are used, the force transfer shall have a capacity equal to or greater than the connections required by Section R602.11.1 or the braced wall panel shall be connected to the wood foundations in accordance with the braced wall panel-to-floor fastening requirements of Table 602.3(1).

**R403.1.7.1** 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.

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.

**R404.1.2** Concrete foundation walls. Concrete foundation walls shall be constructed as set forth in IRC chapter 4 See Thurston County figures 2,3 &5.

Design required. A design in accordance with accepted engineering practice shall be provided for concrete or masonry foundation walls when any of the following conditions exist:

1. Walls are subject to hydrostatic pressure from groundwater.
2. Walls supporting more than 48 inches (1219 mm) of unbalanced backfill that do not have permanent lateral support at the top and bottom.

Seismic Design Categories D1 and D2, See Thurston County figures 2, 3, and 5.

Foundation wall thickness based on walls supported. The thickness of concrete and masonry foundation walls shall

not be less than the thickness of the wall supported, except that foundation walls of at least 8-inch nominal thickness shall be permitted under brick-veneered frame walls and under 10-inch-wide cavity walls where the total height of the wall supported, including gables, is not more than 20 feet, provided the requirements of Sections R404.1.1 and R404.1.2 are met.

Backfill placement. Backfill shall not be placed against the wall until the wall has sufficient strength and has been anchored to the floor above, or has been sufficiently braced to prevent damage by the backfill.

Exception: Such bracing is not required for walls supporting less than 4 feet of unbalanced backfill.

**R404.3** Wood sill plates. Wood sill plates shall be a minimum of 2-inch by 4-inch nominal lumber.

**R404.5** Retaining walls. Retaining walls that are not laterally supported at the top and that retain in excess of 24 inches of unbalanced fill shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Retaining walls shall be designed for a safety factor of 1.5 against lateral sliding and overturning.

**R405.1** Concrete or masonry foundations. Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade.

**R405.2.1** Base. A porous layer of gravel, crushed stone or coarse sand shall be placed to a minimum thickness of 4 inches under the basement floor. Provision shall be made for automatic draining of this layer and the gravel or crushed stone wall footings.

**R405.2.2** Basement wall moisture barrier. A 6-mil-thick polyethylene moisture barrier shall be applied over the porous layer with the basement floor constructed over the polyethylene.

Drainage system. In other than Group I soils, a sump shall be provided to drain the porous layer and footings. The sump shall be at least 24 inches in diameter or 20 inches square, shall extend at least 24 inches below the bottom of the basement floor and shall be capable of positive gravity or mechanical drainage to remove any accumulated water. The drainage system shall discharge into an approved sewer system or to daylight.

**R406.1** Concrete and masonry foundation dampproofing. 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 dampproofed from the top of the footing to the finished grade

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 with a membrane extending from the top of the footing to the finished grade.

**R407.3** Structural requirements. Columns shall be restrained to prevent lateral displacement at the bottom end.

**R408.2** Openings for under-floor ventilation. The minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 m<sup>2</sup>) for each 300 square feet (100 m<sup>2</sup>) of under-floor space area. One ventilating opening shall be within 3 feet (914 mm) of each corner of the building, 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 following materials provided that the least dimension of the covering shall not exceed 1/4 inch:

1. Perforated sheet metal plates not less than 0.070 inch thick.
2. Expanded sheet metal plates not less than 0.047 inch thick.
3. Cast iron grills or grating.
4. Extruded load-bearing brick vents.
5. Hardware cloth of 0.035 inch wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension being 1/8 inch.

**R408.4** 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 16 inches by 24 inches.

**R408.5** Removal of debris. The under-floor grade shall be cleaned of all vegetation and organic material.

**R408.6** Finished grade. The finished grade of under-floor surface may be located at the bottom of the footings; however, where there is evidence that the groundwater table can rise to within 6 inches of the finished floor at the building perimeter or where there is evidence that the surface water does not readily drain from the building site, the grade in the underfloor space shall be as high as the outside finished grade, unless an approved drainage system is provided.

## 5. FLOORS

**R502.2.1** Framing at braced wall lines. A load path for lateral forces shall be provided between floor framing and braced wall panels located above or below a floor, as specified in Section R602.10.8.

**R502.2.2** Decks. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical 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.

**R502.8** Drilling and notching. Structural floor members shall not be cut, bored or notched in excess of the limitations shown in Thurston County figures 10 and 11.

**R502.8.2** Engineered wood products. Cuts, notches and holes bored in trusses and engineered structural wood members are prohibited except where permitted by manufacturer's recommendation or where designed by a registered design professional.

**R506.2.2** Slab base. A 4-inch-thick base course consisting of clean graded sand, gravel, crushed stone or crushed blast-furnace slag passing a 2-inch sieve shall be placed on the prepared sub-grade when the slab is below grade.

Exception: A base course is not required when the concrete slab is installed on well-drained or sand-gravel mixture soils classified as Group I according to the United Soil Classification System in accordance with Table R405.1.

**R506.2.3** Vapor retarder. A 6-mil polyethylene or approved vapor retarder shall be installed as per the WSEC.

Exception: The vapor retarder may be omitted:  
1. From garages, utility buildings and other unheated accessory structures.

## 6. WALL CONSTRUCTION

**R602** Identification. Load-bearing dimension lumber for studs, plates and headers shall be identified by a grade mark.

Grade. Studs shall be a minimum No. 3, standard or stud grade lumber.

Exception: Bearing studs not supporting floors and non-bearing studs may be utility grade lumber, provided the studs are spaced in accordance with Table R602.3(5).

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 non-load-bearing walls.
2. Studs more than 10 feet in height which are in accordance with Table R602.1.3.

**R602.3.2** 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. Plates shall be not less than 2 inches nominal thickness and have a width at least equal to the width of the studs.

Exception: A single top plate may be installed in stud walls, provided the plate is adequately tied at joints, corners and intersecting walls by a minimum 3-inch-by-6-inch by a 0.036-inch-thick galvanized steel plate on each side. Joists are to be centered over the studs with a tolerance of no more than 1 inch.

**R602.3.3** Bearing studs. 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.

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

**R602.4** Interior load-bearing walls. Interior load-bearing walls shall be constructed, framed and fireblocked as specified for exterior walls.

**R602.8** Fireblocking 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.

1. In concealed spaces of stud walls and partitions, including furred spaces and parallel rows of studs or staggered studs; as follows:
  - 1.1. Vertically at the ceiling and floor levels.
  - 1.2. Horizontally at intervals not exceeding 10 feet (3048 mm).
2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings.
3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall comply with Section R311.2.2.
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 R1001.16.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.

**R602.9** Cripple walls. Foundation cripple walls shall be framed of studs not less in size 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 sheathed on at least one side with a wood structural panel that is 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.

**R602.10.** Braced wall lines. Braced wall lines shall consist of braced wall panel construction in accordance with Section R602.10.3. The amount and location of bracing shall be in accordance with Table R602.10.1. Braced wall panels shall begin no more than 8 feet from each end of a braced wall line. Braced wall panels that are counted as part of a braced wall line shall be in line, except that offsets out-of-plane of up to 4 feet shall be permitted provided that the total out-to-out offset dimension in any braced wall line is not more than 8 feet.

Cripple walls. Cripple walls shall be braced with an amount and type of bracing as required for the wall above with the following modifications:

1. The percent bracing amount shall be increased by 15 percent, and
2. The wall panel spacing shall be decreased to 18 feet instead of 25 feet.

Braced wall panel construction methods.

1. Wood boards of 5/8 inch net minimum thickness applied diagonally on studs spaced a maximum of 24 inches.
2. Wood structural panel sheathing with a thickness not less than 5/16 inch for 16-inch stud spacing and not less than 3/8 inch for 24-inch stud spacing.
3. One-half-inch or 25/32-inch thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches on center.
4. Gypsum board with minimum 1/2-inch thickness placed on studs spaced a maximum of 24 inches on center and fastened at 7 inches on center with the size nails specified in Table R602.3(1) for sheathing and Table R702.3.5 for interior gypsum board.
5. Particleboard wall sheathing panels installed in accordance with Table R602.3(4)
6. Portland cement plaster on studs spaced a maximum of 16 inches on center and installed in accordance with Section R703.6.
7. Hardboard panel siding when installed in accordance with Table R703.4.

Exception: Alternate braced wall panels constructed in accordance with Section R602.10.6.1 shall be permitted to replace any of the above methods of braced wall panels.

Length of braced panels. For Methods 2, 3, 4, 6, 7 and 8 above, each braced wall panel shall be at least 48 inches in length, covering a minimum of three stud spaces where studs are spaced 16 inches on center and covering a minimum of two stud spaces where studs are spaced 24

inches on center. For Method 5 above, each braced wall panel shall be at least 96 inches in length where applied to one face of a braced wall panel and at least 48 inches where applied to both faces.

**R602.10.1.** Alternate braced wall panels. Alternate braced wall panels constructed in accordance with one of the following provisions shall be permitted to replace each 4 feet of braced wall panel as required by Section R602.10.4. The maximum height and minimum width of each panel shall be in accordance with Table R602.10.6.

1. In one-story buildings, each panel shall have a length of not less than 2 feet, 8 inches and a height of not more than 10 feet. Each panel shall be sheathed on one face with 3/8-inch-minimum-thickness wood structural panel sheathing nailed with 8d common or galvanized box nails in accordance with Table R602.3(1) and blocked at all wood structural panel sheathing edges. Two anchor bolts installed in accordance with Figure R403.1(1) shall be provided in each panel. Anchor bolts shall be placed at panel quarter points. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an uplift capacity of at least 1,800 pounds (816.5 kg). The tie-down device shall be installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation which is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom. When the continuous foundation is required to have a depth greater than 12 inches, a minimum 12-inch-by-12-inch continuous footing or turned down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped 15 inches with the reinforcement required in the continuous foundation located directly under the braced wall line. (Minimum hold down capacity = 1800 lbs.)

2. In the first story of two-story buildings, each braced wall panel shall be in accordance with Item 1 above, except that the following:

- 2.1 The wood structural panel sheathing shall be provided on both faces;
- 2.2 Sheathing edge nailing spacing shall not exceed four inches on center; and
- 2.3 Anchor bolts shall be placed at the center of the panel width and in from each end of the panel a horizontal distance of one-fifth the panel width (three total).

(Minimum hold down capacity = 3000 lbs.)

Panel joints. All vertical joints of panel sheathing shall occur over, and be fastened to, common studs. Horizontal joints in braced wall panels shall occur over,

and be fastened to, common blocking of a minimum 2 inches in nominal thickness.

Connections. Braced wall panel bottom (sole) plates shall be fastened to the floor framing and top plates shall be connected to the framing above in accordance with Table R602.3(1). Sill plates shall be fastened to the footing, foundation or slab in accordance with Sections R403.1.6 and R602.11. Where joists are perpendicular to the braced wall lines above, blocking shall be provided under and in line with the braced wall panels. Where joists are perpendicular to the braced wall lines below, blocking shall be provided over and in line with the braced wall panels. Where joists are parallel to braced wall lines above or below, a rim joist or other parallel framing member shall be provided at the wall to permit fastening per Table R602.3(1). For buildings in Seismic Design Category D1, braced wall panels shall also be fastened in accordance with Section R602.11.2.

Design of structural elements. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in Sections R602.10 through R602.10.9, those portions shall be designed and constructed in accordance with accepted engineering practice.

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

Spacing between braced wall lines in each story shall not exceed 25 feet on center in both the longitudinal and transverse directions.

Exception: In one- and two-story buildings, spacing between braced wall lines shall not exceed 35 feet on center in order to accommodate an area not exceeding 900 square feet in each dwelling unit.

Cripple-wall bracing. In addition to the requirements of Section R602.10.2, where interior braced wall lines occur without a foundation below, the length of parallel exterior cripple-wall bracing shall be one and one-half times the length required by Table R602.10.1. Where cripple-walls braced using Method 3 of Section R602.10.3 cannot provide this additional length, the capacity of the sheathing shall be increased by reducing the spacing of fasteners along the perimeter of each piece of sheathing to 4 inches (102 mm) on center.

Wall anchorage. Braced wall line sill plates shall be anchored to concrete or masonry foundations. For all buildings plate washers, a minimum of 1/4 inch by 3 inches by 3 inches in size, shall be provided between the foundation sill plate and the nut. Diagonally slotted washers are permitted, provided a standard cut washer placed between the plate washer and the nut.

Interior braced wall panel connections. Interior braced wall panels shall be fastened to floor and roof framing in accordance with Table R602.3(1).

**R613.1** Exterior windows and glass doors. Windows shall be installed and flashed in accordance with the manufacturer's written installation instructions. Written installation instructions shall be provided by the manufacturer for each window.

**R613.2** Window sills. Where the opening of an operable window is more than 72 inches above the finished grade or surface below, the lowest part of the clear opening of the window shall be a minimum of 24 inches above the finished floor of the room in which the window is located. Glazing between the floor and 24 inches shall be fixed or have openings through which a 4-inch diameter sphere cannot pass.

## 7. WALL COVERING

**R701.2** Installation. Products sensitive to adverse weather shall not be installed until adequate weather protection for the installation is provided. Exterior sheathing shall be dry before applying exterior cover.

**R702.3.8** Water-resistant gypsum backing board. Use of water-resistant gypsum backing board shall be permitted on ceilings where framing spacing does not exceed 12 inches on center for ½-inch-thick or 16 inches for 5/8-inch-thick gypsum board. Water-resistant gypsum board shall not be installed over a vapor retarder in a shower or tub compartment.

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

**R703.1** General. Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing as described in Section R703.8. The exterior wall envelope shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer as required by Section R703.2. and a means of draining water that enters the assembly to the exterior.

**R703.2** Water-resistive barrier. One layer of No. 15 asphalt felt or other approved water-resistive barrier, free from holes and breaks, shall be applied over studs or sheathing of all exterior walls.

Exception: Omission of the water-resistive barrier is permitted in the following situations:

1. In detached accessory buildings.

Panel siding. Joints in wood, hardboard or wood structural panel siding shall be made as follows unless otherwise approved. Vertical joints in panel siding shall occur over framing members, unless wood or wood structural panel sheathing is used, and shall be ship-lapped or covered with a batten. Horizontal joints in

panel siding shall be lapped a minimum of 1 inch or shall be ship-lapped or shall be flashed with Z-flashing and occur over solid blocking, wood or wood structural panel sheathing.

Horizontal siding. Horizontal lap siding shall be lapped a minimum of 1 inch, or 0.5 inch if rabbeted, and shall have the ends caulked, covered with a batten, or sealed and installed over a strip of flashing.

**R703.8** Flashing. Approved corrosion-resistive flashing shall be provided in the exterior wall envelope in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at all of the following locations:

1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior wall finish or to the water-resistive barrier for subsequent drainage.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

Fiber Cement Panel siding. Panels shall be installed with the long dimension parallel to framing. Vertical joints shall occur over framing members and shall be sealed with caulking or covered with battens. Horizontal joints shall be flashed with Z-flashing and blocked with solid wood framing.

Fiber Cement Horizontal lap siding. Lap siding shall be lapped a minimum of 1 1/4 inches and shall have the ends sealed with caulking, covered with an H-section joint cover, or located over a strip of flashing. Lap siding courses may be installed with the fastener heads exposed or concealed, according to approved manufacturers installation instructions.

## 8. ROOF-CEILING CONSTRUCTION

**R802.3.1** 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).

**R802.10.5** Truss to wall connection. Trusses shall be connected to wall plates by the use of approved connectors having a resistance to uplift of not less than 280 pounds (79.45 kg.) and shall be installed in accordance with the manufacturer's specifications.

**R806.1** Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilating openings shall be provided with corrosion-resistant wire mesh, with 1/8 inch minimum to 1/4 inch maximum openings.

**Minimum area.** The total net free ventilating area shall not be less than 1 to 150 of the area of the space ventilated except that the total area is permitted to be reduced to 1 to 300, provided at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

**Vent 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 at the location of the vent.

**R807.1** Attic access. In buildings with combustible ceiling or roof construction, an attic access opening shall be provided to attic areas that exceed 30 square feet and have a vertical height of 30 inches or greater. 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.

## 9. ROOF ASSEMBLIES

**R903.2** Flashing. Flashings shall be installed in such a manner so as to prevent moisture entering the wall and roof.

**Locations.** Flashings shall be installed at wall and roof intersections; wherever there is a change in roof slope or direction; and around roof openings.

**R903.4** Roof drainage. Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point of the roof.

**R904.4** Product identification. Roof covering materials shall be delivered in packages bearing the manufacturer's identifying marks.

**R905.1** Roof covering application. Roof coverings shall be applied in accordance with the manufacturer's installation instructions.

**Slope.** Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (2:12) or greater. For roof slopes from two units vertical in 12 units horizontal (2:12) up to four units vertical in 12

units horizontal (4:12), double underlayment application is required in accordance with Section R905.2.7.

**Asphalt shingles.** Asphalt shingles shall have self-seal strips or be interlocking, and comply with ASTM D 225 or D 3462.

**Fasteners.** Fasteners for asphalt shingles shall be As per manufacturer's specifications

**Attachment.** Asphalt shingles shall have the minimum number of fasteners required by the manufacturer.

**Underlayment application.** For roof slopes from two units vertical in 12 units horizontal (17-percent slope), up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be two layers applied in the following manner. Apply a 19-inch (483mm) strip of underlayment felt parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inch-wide (914 mm) sheets of underlayment, overlapping successive sheets 19 inches (483 mm), and fastened sufficiently to hold in place. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater, underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches, fastened sufficiently to hold in place. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be offset by 6 feet.

**Base and cap flashing.** Base and cap flashing shall be installed in accordance with manufacturer's installation instructions.

**Valleys.** Valley linings shall be installed in accordance with manufacturer's installation instructions.

**Crickets and saddles.** A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches wide as measured perpendicular to the slope. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

**Sidewall flashing.** Flashing against a vertical sidewall shall be by the step-flashing method.

**Flashing against a vertical front wall,** as well as soil stack, vent pipe and chimney flashing, shall be applied according to asphalt shingle manufacturer's printed instructions.

**R907.1** General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 9.

**Exception:** Re-roofing shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-

percent slope) in Section 905 for roofs that provide positive roof drainage.

Structural and construction loads. The structural roof components shall be capable of supporting the roof covering system and the material and equipment loads that will be encountered during installation of the roof covering system.

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.

Exceptions:

1. Complete and separate roofing systems, such as standing-seam metal roof systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support shall not require the removal of existing roof coverings.
2. Metal panel, metal shingle, and concrete and clay tile roof coverings shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section R907.4.
3. The application of new protective coating over existing spray polyurethane foam roofing systems shall be permitted without tear-off of existing roof coverings.

Roof recovering. Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other approved materials securely fastened in place.

Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counter flashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

Flashings shall be reconstructed in accordance with approved manufacturer's installation instructions.

Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

## 10. CHIMNEYS AND FIREPLACES

R1003.2. Footings and foundations. Footings for masonry fireplaces and their chimneys shall be constructed of concrete or solid masonry at least 12 inches thick and shall extend at least 6 inches beyond the face of the fireplace or foundation wall on all sides.

R1003.3. Seismic reinforcing. Masonry or concrete chimneys in Seismic Design Categories D1 shall be reinforced.

### FACTORY-BUILT FIREPLACES

R1004.2 Hearth extensions. Hearth extensions of approved factory-built fireplaces shall be installed in accordance with the listing of the fireplace. The hearth extension shall be readily distinguishable from the surrounding floor area.

### FACTORY-BUILT CHIMNEYS

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

**R1005.2** Decorative shrouds. Decorative shrouds shall not be installed at the termination of chimneys for factory-built fireplaces except where such shrouds are listed and labeled for use with the specific factory-built fireplace system and installed in accordance with the manufacturer's installation instructions.

### EXTERIOR AIR SUPPLY

**R1006.2.** Exterior air intake. The exterior air intake shall be capable of providing all combustion air from the exterior of the dwelling or from spaces within the dwelling ventilated with outside air such as non-mechanically ventilated crawl or attic spaces. The exterior air intake shall not be located within the garage or basement of the dwelling nor shall the air intake be located at an elevation higher than the firebox. The exterior air intake shall be covered with a corrosion-resistant screen of 1/4-inch mesh.

Clearance. Unlisted combustion air ducts shall be installed with a minimum 1-inch clearance to combustibles for all parts of the duct within 5 feet of the duct outlet.

Passageway. The combustion air passageway shall be a minimum of 6 square inches and not more than 55 square inches, except that combustion air systems for listed fireplaces shall be constructed according to the fireplace manufacturer's instructions.

## 13. GENERAL MECHANICAL SYSTEM REQUIREMENTS

**M1305.1.1** Central furnaces. Central furnaces 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.

Appliances in rooms. Appliances installed in a compartment, alcove, basement or similar space shall be accessed by an opening or door and an unobstructed passageway measuring not less than 24 inches wide and large enough to allow removal of the largest appliance in the space.

Appliances in attics. Attics containing appliances requiring access 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 in length when measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring.

A luminaire shall be provided that is controlled by a switch located at the required passageway opening. A receptacle outlet shall be provided near the appliance.

Appliances under floors. Underfloor spaces containing appliances requiring access shall be provided with an unobstructed passageway large enough to remove the largest appliance, but not less than 30 inches high and 22 inches wide, nor more than 20 feet in length when measured along the centerline of the passageway from the opening to the appliance.

Ground clearance. Appliances supported from the ground shall be level and firmly supported on a concrete slab or other approved material extending above the adjoining ground. Appliances suspended from the floor shall have a clearance of not less than 6 inches from the ground.

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

**M1307.** Anchorage of appliances. Water heaters shall be anchored or strapped to resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third and lower one-third of the appliance's vertical dimensions. At the lower point, the strapping shall maintain a minimum distance of 4 inches above the controls.

Elevation of ignition source. Appliances having an ignition source shall be elevated such that the source of ignition is not less than 18 inches above the floor in 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 with a private garage through openings shall be considered to be part of the garage.

Protection from impact. Appliances located in a garage or carport shall be protected from impact by automobiles.

## 14. HEATING AND COOLING EQUIPMENT

**M1403.2** Foundations and supports. Supports and foundations for the outdoor unit of a heat pump shall be raised at least 3 inches above the ground to permit free drainage of defrost water, and shall conform to the manufacturer's installation instructions.

**M1408.1** Vented floor furnaces Vented floor furnaces shall conform to UL 729 and be installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.

**M1409.1** Vented wall furnaces Vented wall furnaces shall conform to UL 730 and be installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.

**M1411.3** Condensate disposal. Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

### SECTION M1502 CLOTHES DRYERS EXHAUST

**M1502.** General. Dryer exhaust systems shall be independent of all other systems, and shall convey the moisture to the outdoors.

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 duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.

Duct size. The diameter of the exhaust duct shall be as required by the clothes dryer's listing and the manufacturer's installation instructions.

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 exceed 8 feet and shall be listed and labeled in accordance with UL 2158A.

Duct construction. Exhaust ducts shall be constructed of minimum 0.016-inch-thick rigid metal ducts, having smooth interior surfaces with joints running in the direction of air flow. Exhaust ducts shall not be connected with sheet metal screws or fastening means which extend into the duct.

Duct length. The maximum length of a clothes dryer exhaust duct shall not exceed 25 feet from the dryer location to the wall or roof termination. The maximum length of the duct shall be reduced 2.5 feet for each 45-degree bend and 5 feet for each 90-degree bend. The maximum length of the exhaust duct does not include the transition duct.

## SECTION M1503 RANGE HOODS

**M1503.1** General. Range hoods shall discharge to the outdoors through a single-wall duct. The duct serving the hood 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, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

Exception: Ducts for domestic kitchen cooking appliances equipped with downdraft exhaust systems shall be permitted to be constructed of schedule 40 PVC pipe provided that the installation complies with all of the following:

1. The duct shall be installed under a concrete slab poured on grade,
2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel,
3. The PVC duct shall extend not greater than 1 inch above the indoor concrete floor surface,
4. The PVC duct shall extend not greater than 1 inch above grade outside of the building, and
5. The PVC ducts shall be solvent cemented.

## SECTION M1505 OVERHEAD EXHAUST HOODS

**M1505.1** General. Domestic open-top broiler units shall be provided with a metal exhaust hood, not less than 28 gauge, with a clearance of not less than 0.25 inch 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 and shall extend over the entire unit. Such exhaust hood shall discharge to the outdoors and shall be equipped with a backdraft damper or other means to control infiltration/exfiltration when not in operation. Broiler units incorporating an integral exhaust system, and listed and labeled for use without an exhaust hood, need not be provided with an exhaust hood.

Joints and seams. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gasketing or other approved closure systems.

### 16. DUCT SYSTEMS

**M1601** Support. Metal ducts shall be supported by 0.5-inch wide 18-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet or other approved means. Nonmetallic ducts shall be supported in accordance with the manufacturer's installation instructions.

Duct insulation. Duct coverings shall not penetrate a fire blocked wall or floor.

Duct separation. Ducts shall be installed with at least 4 inches separation from earth except where they meet the requirements of Section M1601.1.2.

**M1601.4** Under-floor plenums. An under-floor space used as a supply plenum shall conform to the requirements of this section. Fuel gas lines and plumbing waste cleanouts shall not be located within the space.

General. The space shall be cleaned of loose combustible materials and scrap, and shall be tightly enclosed.

Materials. The under-floor space, including the sidewall insulation, shall be formed by materials having flame-spread ratings not greater than 200 when tested in accordance with ASTM E 84.

Furnace connections. A duct shall extend from the furnace supply outlet to not less than 6 inches below the combustible framing. This duct shall comply with the provisions of Section M1601.1. A noncombustible receptacle shall be installed below any floor opening into the plenum in accordance with the following requirements:

1. The receptacle shall be securely suspended from the floor members and shall not be more than 18 inches below the floor opening.
2. The area of the receptacle shall extend 3 inches beyond the opening on all sides.
3. The perimeter of the receptacle shall have a vertical lip at least 1 inch high at the open sides.

Access. Access to an under-floor plenum shall be provided through an opening in the floor with minimum dimensions of 18 inches by 24 inches.

Furnace controls. The furnace shall be equipped with an automatic control that will start the air-circulating fan when the air in the furnace bonnet reaches a temperature not greater than 150°F (66°C). The furnace shall additionally be equipped with an approved automatic control that limits the outlet air temperature to 200°F (93°C).

## SECTION M1602 RETURN AIR

**M1602.** Prohibited sources. Outside or return air for a forced-air heating or cooling system shall not be taken from the following locations:

1. Closer than 10 feet from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet above the outside air inlet.
2. Where there is the presence of flammable vapors; or where located less than 10 feet above the surface of any abutting public way or driveway; or

where located at grade level by a sidewalk, street, alley or driveway.

3. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with ACCA Manual D, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of such rooms or spaces.

Exception: The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to such room or space.

4. A closet, bathroom, toilet room, kitchen, garage, mechanical room, furnace room or other dwelling unit.
5. A room or space containing a fuel-burning appliance where such room or space serves as the sole source of return air.

Exceptions:

1. The fuel-burning appliance is a direct-vent appliance or an appliance not requiring a vent in accordance with Section M1801.1 or Chapter 24.
2. The room or space complies with the following requirements:
  - 2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6 L/W) of combined input rating of all fuel burning appliances therein.
  - 2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.
  - 2.3. Return-air inlets shall not be located within 10 feet of any appliance firebox or draft hood in the same room or space.
3. Rooms or spaces containing solid-fuel burning appliances, provided that return-air inlets are located not less than 10 feet from the firebox of such appliances.

**M1602.3** Inlet opening protection. Outdoor air inlets shall be covered with screens having not less than 1/4-inch openings and not greater than 1/2-inch openings.

## 17. COMBUSTION AIR

**M1701.1** Air supply. Liquid and solid fuel-burning appliances shall be provided with a supply of air for fuel combustion, draft hood dilution and ventilation of the space in which the appliance is installed.

Buildings of unusually tight construction. In buildings of unusually tight construction, combustion air shall be obtained from outside the sealed thermal envelope.

Volume dampers prohibited. Volume dampers shall not be installed in combustion air openings.

Prohibited sources. Combustion air ducts and openings shall not connect appliance enclosures with space in which the operation of a fan may adversely affect the flow of combustion air. Combustion air shall not be obtained from an area in which flammable vapors present a hazard. Fuel-fired appliances shall not obtain combustion air from any of the following rooms or spaces:

1. Sleeping rooms.
2. Bathrooms.
3. Toilet rooms.

Exception: The following appliances shall be permitted to obtain combustion air from sleeping rooms, bathrooms and toilet rooms:

1. Solid fuel-fired appliances provided that the room is not a confined space and the building is not of unusually tight construction.
2. Appliances installed in an enclosure in which all combustion air is taken from the outdoors and the enclosure is equipped with a solid weatherstripped door and self-closing device.

Confined space. Two permanent openings to adjacent spaces shall be provided so that the combined volume of all spaces meets the criterion. One opening shall be within 12 inches of the top and one within 12 inches of the bottom of the space. Each opening shall have a free area equal to a minimum of 1 square inch per 1,000 Btu/h input rating of all appliances installed within the space, but not less than 100 square inches.

Unusually tight construction. Where the space is of adequate volume, but is within a building sealed so tightly that infiltration air is not adequate for combustion, combustion air shall be obtained from outdoors or from spaces freely communicating with the outdoors.

## SECTION M2004 WATER HEATERS USED FOR SPACE HEATING

**M2004.1** General. Water heaters used to supply both potable hot water and hot water for space heating shall be installed in accordance with this chapter, Chapter 24, Chapter 28 and the manufacturer's installation instructions.

## SECTION M2005 WATER HEATERS

**M2005.** General. Water heaters shall be installed in accordance with the manufacturer's installation instructions and the requirements of this code.

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. Direct-vent water heaters are not required to be installed within an enclosure.

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 ventilation of those spaces is in accordance with this code.

## **SECTION M2101 HYDRONIC PIPING SYSTEMS INSTALLATION**

**M2101.** General. Hydronic piping shall conform to Table M2101.1. Approved piping, valves, fittings and connections shall be installed in accordance with the manufacturer's installation instructions.

System drain down. Hydronic piping systems shall be installed to permit the system to be drained.

Protection of potable water. The potable water system shall be protected from backflow in accordance with the provisions listed in Section P2902.

Pipe penetrations. Openings through concrete or masonry building elements shall be sleeved.

Contact with building material. A hydronic piping system shall not be in direct contact with any building material that causes the piping material to degrade or corrode.

Prohibited tee applications. Fluid in the supply side of a hydronic system shall not enter a tee fitting through the branch opening.

Expansion, contraction and settlement. Piping shall be installed so that piping, connections and equipment shall not be subjected to excessive strains or stresses. Provisions shall be made to compensate for expansion, contraction, shrinkage and structural settlement.

Piping support. Hangers and supports shall be of material of sufficient strength to support the piping, and shall be fabricated from materials compatible with the piping material. Piping shall be supported at intervals not exceeding the spacing specified in Table M2101.9.

Hydronic piping shall be tested hydrostatically at a pressure of not less than 100 pounds per square inch (psi) (689 kPa) for not less than 15 minutes.

## **SECTION M2103 FLOOR HEATING SYSTEMS**

**M2103.** Piping materials. Piping for embedment in concrete or gypsum materials shall be standard-weight steel pipe, copper tubing, cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pressure pipe, chlorinated polyvinyl chloride (CPVC), polybutylene, cross-linked polyethylene (PEX)

tubing or polypropylene (PP) with a minimum rating of 100 psi at 180°F.

Piping joints. Piping joints that are embedded shall be installed in accordance with the following requirements:

1. Steel pipe joints shall be welded.
2. Copper tubing shall be joined with brazing material having a melting point exceeding 1,000°F.
3. Polybutylene pipe and tubing joints shall be installed with socket-type, heat-fused polybutylene fittings.
4. CPVC tubing shall be joined using solvent cement joints.
5. Polypropylene pipe and tubing joints shall be installed with socket-type heat-fused polypropylene fittings.
6. Cross-linked polyethylene (PEX) tubing shall be joined using cold expansion, insert or compression fittings.

Testing. Piping or tubing to be embedded shall be tested by applying a hydrostatic pressure of not less than 100 psi. The pressure shall be maintained for 30 minutes, during which all joints shall be visually inspected for leaks.

## **PLUMBING:**

### **PIPE INSTALLATION**

**P103.5.** No plumbing or drainage system, building sewer disposal system or part thereof shall be covered or concealed or put to use until it has been tested, inspected and accepted by Thurston County or a duly authorized representative of the County.

**P304** All plumbing fixtures shall be connected to the sewage drainage system.

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

**P313.5** All plumbing piping shall be protected from freezing.

**P313.8** Penetrations in the exterior wall or roof shall be made watertight by flashing.

**P313.9** Plastic and copper piping run through framing members to within one inch of the exposed framing shall be protected by 18 GA minimum steel nail plates.

**P314.1** Piping shall be supported per UPC table 3-2.

## **WATER SUPPLY**

**P601** Potable running water is required to all plumbing fixtures.

Cross-Connection Control. Devices or assemblies for protection of the public water system must be models approved by the department of health. A water purveyor certificate shall be submitted at the time of final inspection.

Non-community systems (private wells) that comply with the backflow preventer section shall be considered in compliance with the requirements of this section.

The premise owner or responsible person shall have the backflow prevention assembly tested by a Washington state department of health certified backflow assembly tester:

1. At the time of installation, repair or relocation; and
2. At least on an annual schedule thereafter.

Records of the inspection shall be maintained by the premise owner or responsible person and made available to the building inspector at final and on request of the building official.

Potable water supplies to systems having no pumps or connections for pumping equipment, and no chemical injection or provisions for chemical injection, shall be protected from backflow by one of the following devices:

1. Atmospheric vacuum breaker
2. Pressure vacuum breaker
3. Reduced pressure backflow preventer
4. A double check valve may be allowed when approved by the water purveyor and the building official
5. A spill proof pressure vacuum breaker may be allowed when approved by the water purveyor and the building official

Water distribution pipe, building supply water pipe and fittings shall be of brass, copper, cast iron, CPVC, galvanized malleable iron, galvanized wrought iron, galvanized steel, PEX or other approved materials. Polyethylene (PE) and Polyvinyl chloride (PVC) shall not be used for water distribution pipe and fittings.

Copper tube for water pipe shall be type L. Type M may be used above ground in, or on, a building or underground outside a structure.

Flexible copper connectors shall be installed in readily accessible locations unless otherwise listed.

PEX-AL-PEX or PE-AL-PE tubing shall not be installed within the first eighteen inches of piping connected to a water heater:

1. on the discharge side of supply tanks or near the tank
2. on the discharge side of water meters and on each unmetered water supply.
3. on the cold water supply to each water heater at or near the water heater

In multi-dwelling units one or more shut off valves shall be provided in each dwelling unit so that the water supply to any plumbing fixture or group of fixtures in the dwelling unit can be shut off without affecting other dwelling units.

Control valve shall be installed immediately ahead of each water supplied appliance and fixture. Parallel water distribution systems shall have a control valve at each fixture or installed at the manifold and identified with the fixture being supplied.

All required shutoff or control valves shall be accessible.

Residual water pressure shall not be less than 15 PSI. A tank or other means to increase pressure to 15 PSI shall be provided.

Water pressure in excess of 80 PSI shall be preceded by a strainer and the static pressure reduced to 80 PSI. Regulators and strainers shall be accessible.

Any water system provided with a check valve or a pressure regulating device, which does not have a bypass feature as it, source shall be provided with an approved pressure relief valve. Any water system containing storage water heating equipment shall be provided with a combination pressure and temperature relief valve, except for instantaneous water heaters having an inside diameter of not more than 3 inches. When the building supply pressure is greater than the required relief valve or if the pressure relief device prevents relief through the building supply, an approved expansion tank or other device designed for intermittent operation for thermal expansion control shall be installed.

Pressure relief shall be automatic with a drain and set at a pressure of not more than 150 psi.

Relief valves located inside a building shall be provided with a drain, not smaller than the relief valve outlet, of galvanized steel, hard drawn copper piping and fittings, CPVC, or listed relief valve drain tube with fittings which will not reduce the internal bore of the pipe or tubing (straight lengths as opposed to coils) and shall extend from the valve to the outside of the building with the end of the pipe not more than two (2) feet nor less than six (6) inches above the ground or the flood level of the area receiving the discharge and pointing downward. Such drains may terminate at other approved locations. No part of such drain pipe shall be trapped or subject to freezing. The terminal end of the drain pipe shall not be threaded.

Exception: Replacement water heating equipment shall only be required to provide a drain pointing downward from the relief valve to extend between two feet and six inches from the floor. No additional floor drain need be provided.

Unions shall be installed in the water supply piping within twelve inches of the regulating equipment, water

heating, conditioning tanks, and similar equipment for servicing.

**P610** Water distribution and water pipe sizing shall be per the plumbing code.

## TESTING

**P609.4** Hot and cold water supply lines shall be tested and proved tight. Charge the system with the same water pressure that is to be used or test with air at 50 PSI. Air testing is not allowed for plastic piping. Piping shall withstand either test without leaking for 15 minutes.

## DRAINAGE

**P701.1** Drainage material shall be cast iron, galvanized steel or wrought iron, lead, copper, brass, Stainless Steel 304 or 316L, schedule 40 ABS DWV, or Schedule 40 PVC DWV. Galvanized pipe shall be kept at least 6" above ground.

Drainage piping shall be sized per the plumbing code.

Changes in direction of drainage piping shall be made by approved fittings and shall be of the angles presented by 1/16 bend; 1/8 bend; 1/6 bend; or other approved fittings of equivalent sweep.

Horizontal drainage piping shall run a slope of 1/4" per 1'0". Where such slope is impractical, use piping that is 4" or more in diameter and run at a slope of 1/8" per 1'0".

Horizontal drainage lines, connecting with a vertical stack, shall enter through forty-five degree wye branches, sixty degree wye branches, combination wye and 1/8 bend branches. No fitting having more than one inlet at the same level shall be used unless designed not to allow discharge from one inlet to enter the other inlet. Double sanitary tees may be used when the fitting is at least two pipe sizes larger than the largest inlet.

Horizontal drainage lines connecting with other horizontal drainage lines shall enter through 45 degree Y branches, combination "Y" and 1/8 bend branches, or other approved fittings of equivalent sweep.

Cleanouts. Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal and each 100'-0" run of piping or fraction thereof.

Cleanout clearance

12" in front of cleanout for 2 or less inch piping.

18" in front of cleanout for piping greater than 2 inches

Cleanouts must be located within 20 feet of access door when located underfloor in residence.

Cleanouts may be omitted:

When horizontal drain pipe installed on slope of 72° or less from vertical angle.

When horizontal drain line is less than 5 feet unless serving sinks or urinals.

Additional cleanout is required in horizontal line for each aggregate change of direction exceeding 135°.

Plastic drainage and venting piping shall not be tested with air.

A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 10-foot head of water. This pressure shall be held for at least 15 minutes. The system shall then be tight at all points.

## VENTING

**P901** Each plumbing fixture trap shall be provided with a vent.

Vent piping size shall be determined from its length and total number of fixture units per UPC Table 7-6.

Vent pipes shall be free from drops or sags. Vents shall be level, or graded so as to drop back by gravity to drainage pipe it serves.

Each vent shall rise to a point not less than 6" above flood level rim of fixture served before offsetting horizontally.

Vent pipe opening from soil or waste pipe, except for water closets, shall not be below weir of trap.

Each plumbing fixture, excepting those having integral traps shall be trapped separately.

Floor drains shall have trap primers or extended to drain to daylight.

## WATER HEATERS

**P505.** Prohibited Locations. Water heaters which depend on the combustion of fuel for heat shall not be installed in a room used or designed to be used for sleeping purposes, bathroom, clothes closets or in a closet or other confined space opening into a bath or bedroom.

Except:

1. Direct vent water heaters.
2. Water heaters installed in a closet that has a eather-stripped solid door with an approved door closing device, and designed exclusively for the water heater and where all air for combustion and ventilation is supplied from the outdoors.

Where not prohibited by other regulations, water heaters may be located under a stairway or landing.

WAC 51-56-003 Venting and combustion air of fuel fired appliances are installed per the mechanical appliance requirements.

Listed water heaters shall be installed per the manufacturers installation instructions.

Oil-burning water heaters shall be installed per NFPA 31.

Every water heater installation shall be accessible for inspection, repair, or replacement.

Attic and underfloor water heater locations shall be provided with an electric outlet and lighting fixture at or near the water heater. The lighting fixture shall be controlled by a switch located adjacent to the opening or trap door.

**OTHER FIXTURES**

**P414** Whirlpool bathtubs shall have a removable panel to access the pump.

**P804.1** Clothes washer standpipe shall not extend more than 30" nor less than 18" above its trap. The trap shall

not be installed below the floor but shall be roughed in not more than 18" nor less than 6" above the floor. Minimum 2 inch drain pipe and fittings. NOTE: Measurements are taken from trap weir.

**P909** Island venting for sinks and similar equipment shall be installed per section 909. A handout for island venting is available at the permit assistance center.

**STORM DRAINAGE**

**P1101** Storm drainage shall be infiltrated on site as required by D.25 of the Thurston County Drainage and Erosion Control Plan.

Subsoil drains shall be provided around the perimeter of the building. They may be positioned inside or outside of the footing. The drains shall be of perforated or open-jointed approved drainage tile or pipe not less than three inches in diameter. And shall be laid in gravel, slag, crushed rock, approved 3/4 inch recycled glass aggregate with a minimum of 4 inches surrounding the pipe on all sides. Filter media shall be provided for exterior subsoil piping.

Sub soil drains shall be piped to infiltrate on site.

Sub soil drains shall be open-jointed or perforated pipe, vitrified clay, plastic, cast iron or porous concrete.

**TABLE 5-11.3**

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating <sup>2</sup> , Gallons	42	54	54	54	67	67	80	67	80	80	80

Notes:

1. The first hour rating is found on the "Energy Guide" label.
2. Non-storage and solar water heaters shall be sized to meet the appropriate first hour rating as shown in the table.
3. For replacement water heaters, see Section 101.4.1.1.1.

**ENERGY CODE**

N502. Protect insulation applied to exterior of foundation walls from damage.

Insulation for slab on grade:

Shall extend down from top of slab for 24" or extend down to bottom of slab and horizontally beneath slab for total of 24".

If installed on exterior of foundation wall, shall extend down min. 24" below grade or frost line. The entire area of a radiant slab shall be thermally isolated with a minimum of R-10.

Insulation for below-grade walls. Exposed above grade insulation shall be protected.

1. Installed on cold side of wall, shall extend from top of below-grade wall to top of footing.
2. Installed on warm side, shall extend from top of below-grade wall to below-grade floor level.
3. Check for continuous insulation between basement wall and ceiling.

**N502.4.3** Seal, caulk, gasket or weather strip to limit air leakage:

1. Exterior joints around windows and door frames.
2. Openings between wall and foundation
3. Between walls and roof and between wall panels
4. Openings at penetrations of utility services through walls, floors, and roofs.
5. All other such openings in the building envelope.

**N502.4.3(b)** Check seal on garage to house door.

**N502.1.4.5** Loose-fill insulation:

Not allowed in vaulted ceilings exceeding 3:12 pitch. Allowed when 30" of clearance is between top of bottom chord or ceiling joist to underside of roof sheathing at roof ridge.

Insure 1" of air space between insulation and underside of roof sheathing in single rafter, joist vaulted ceiling cavities.

Eave vents: baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of insulation.

Insulate attic or crawl space (inside house) access doors with equivalent of surrounding envelope insulation, and weather strip opening.

**N502.1.6.1** Vapor Retarders: Vapor retarders shall be installed on the warm side (in winter) of insulation as specified in the following cases. Patch holes or tears in vapor barrier.

1. Floors: The vapor retarder shall have a one perm dry cup rating or less (i.e. four mil [0.004 inch thick] polyethylene or kraft faced material).
2. Roof/Ceilings: Roof/ceiling assemblies where the ventilation space above the insulation is less than an average of 12 inches shall be provided with a vapor retarder. Faced batt insulation where used as a vapor retarder shall be face stapled. Single rafter joist vaulted ceiling cavities shall be of sufficient depth to allow a minimum one inch vented air space above the insulation.

Vapor retarders shall not be required in roof/ceiling assemblies where the ventilation space above the insulation averages 12 inches or greater.

Walls: Walls separating conditioned space from unconditioned space shall have a vapor retarder installed. Faced batt insulation shall be face stapled.

Exception: Wood framed walls with a minimum nominal R-5 continuous insulated sheathing installed outside the framing and structural sheathing.

**N502.1.6.7** Ground Cover: A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped 12 inches minimum at the joints and shall extend to the foundation wall.

Exception: The ground cover may be omitted in crawl spaces if the crawl space

has a concrete slab floor with a minimum thickness of 3-1/2 inches.

**N503.11** All piping shall be thermally insulated per Table N5-12.

**N503.8.1.1, N503.8.3.1** One thermostat minimum per each separate system with heating temperature range of 55-75°F for heating only, 55-85°F for heating and cooling and 70-85 °F for cooling only. Thermostat setback in place and accessible.

**N503.9** HVAC supply and return air ducts and plenums will have:

- R-8 insulation (exposed to unconditioned air).
- R-5 insulation (in slab or on-ground).

**VENTILATION**

**V302.** Whole house fans located four feet or less from the interior grill shall have a sone rating of 1.5 or less measured at 0.1 inches water gauge. Remotely located fans shall be acoustically isolated from the structural elements of the building and from the attached duct work using insulated flexible duct of other approved means. Ductwork connected to exhaust fans installed with min. bends and of required size. Table 3-3.

Whole house fan controls: All ventilation system controls shall be readily accessible. Controls for whole house ventilation systems shall be capable of operating the ventilation system without energizing other energy-consuming appliances.

Fan Noise: Whole house fans located 4 feet or less from the interior grille shall have a sone rating of 1.5 or less measured at 0.10 inches water gauge. Manufacturer's noise ratings shall be determined as per HVI 915 (October 1995). 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.

Exception: Whole house ventilation systems which are integrated with forced-air heating systems or heat-recovery ventilation systems are exempt from the sone rating requirements of this section.

**V302.3.4** Whole House Ventilation Ducts: All ducts shall terminate outside the building. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4. All supply ducts in the conditioned space shall be insulated to a minimum of R-4.

Whole House Outdoor Air Supply: A mechanical system shall supply outdoor air as required in Section V302.3.1. The mechanical system may consist of exhaust fans, supply fans, or both.

Whole House Outdoor Air Inlets: Inlets shall be screened or otherwise protected from entry by leaves or other material. Outdoor air inlets shall be located so as not to take air from the following areas:

1. Closer than 10 feet from an appliance vent outlet, unless such vent outlet is 3 feet above the outdoor air inlet.
2. Where it will pick up objectionable odors, fumes, or flammable vapors.
3. A hazardous or unsanitary location.
4. A room or space having any fuel-burning appliances therein.
5. Closer than 10 feet from a vent opening of a plumbing drainage system unless the vent opening is at least 3 feet above the air inlet.
6. Attic, crawl spaces, or garages.

Whole house system outdoor air distribution: outdoor air shall be distributed to each habitable room by individual inlets, separate duct systems, or a forced-air system. Where outdoor air supplies are separated from exhaust points by doors, provisions shall be made to ensure air flow by installation of distribution ducts, undercutting doors, installation of grilles, transoms, or similar means. Doors shall be undercut to a minimum of 1/2-inch above the surface of the finish floor covering. Doors and operable lites in windows are deemed not to meet the outdoor air supply intake requirements.

Whole house Individual Room Outdoor Air Inlets: Where provided, individual room outdoor air inlets shall:

1. Have controllable and secure openings;
2. Be sleeved or otherwise designed so as not to compromise the thermal properties of the wall or window in which they are placed.

Whole House Ventilation Integrated with Forced-Air Systems: Where outdoor air is provided by a forced-air system, the outdoor air connection to the return air stream shall be located upstream of the forced-air system blower and shall not be connected directly into a furnace cabinet to prevent thermal shock to the heat exchanger.

Prescriptive Whole House Ventilation Systems: Whole house ventilation shall be provided by a system that meets the requirements of either Section 303.4.1, 303.4.2, 303.4.3, or V303.4.4. A system which meets all of the requirements of one of these

Sections shall be deemed to satisfy the requirements for a whole house ventilation system.

**V303.4.1** Intermittent Whole House Ventilation Using Exhaust Fans: This Section establishes minimum prescriptive requirements for intermittent whole house ventilation systems using exhaust fans. A system which meets all the requirements of this Section shall be deemed to satisfy the requirements for a whole house ventilation system.

Whole House Ventilation Fans: Exhaust fans providing whole house ventilation shall have a flow rating at 0.25 inches water gauge as specified in Table V303.4.1. Whole house fan prescriptive exhaust fan flow rates per Table V3-2. 3-2. Manufacturers' fan flow ratings shall be determined according to HVI 916 (April 1995) or AMCA 210.

Fan Noise: Whole house fans located 4 feet or less from the interior grille shall have a sone rating of 1.5 or less measured at 0.1 inches water gauge. Manufacturer's noise ratings shall be determined as per HVI 915 (October 1995). 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.

**V303.4.1.3** Fan Controls: The whole house ventilation fan shall be controlled by a 24-hour clock timer with the capability of continuous operation, manual and automatic control. The 24-hour timer shall be capable of operating the whole house ventilation fan without energizing other energy-consuming appliances and readily accessible. At the time of final inspection, the automatic control timer shall be set to operate the whole house fan for at least 8 hours a day. A label shall be affixed to the control that reads "Whole House Ventilation (see operating instructions)."

**V303.3.1** Source Specific Ventilation: Source specific 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 source specific ventilation effective exhaust capacity shall not be less than levels specified in Table 3-1.

Source Specific Exhaust Fans: Exhaust fans providing source specific ventilation shall have a minimum fan flow rating not less than 50 cfm at 0.25 inches water gauge for bathrooms, laundries, or similar rooms and 100 cfm at 0.25 inches water gauge for kitchens. Manufacturers' fan flow ratings shall be determined as per

Source Specific Ventilation Controls: Source specific ventilation systems shall be controlled by manual switches, dehumidistats, timers, or other approved means. Source specific ventilation system controls shall be readily accessible.

Source Specific Ventilation Ducts: Source specific ventilation ducts shall terminate outside the building. Exhaust ducts shall be equipped with back-draft dampers. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4. Terminal elements shall have at least the equivalent net free area of the duct work. Terminal elements for exhaust fan duct systems shall be screened or otherwise protected from entry by leaves or other material.

**TABLE 3-1**

**MINIMUM SOURCE SPECIFIC VENTILATION CAPACITY REQUIREMENTS**

	Bathrooms	Kitchens
Intermittently Operating	50 cfm	100 cfm
Continuous Operation	20 cfm	25 cfm

**TABLE V 3-2**

**VENTILATION RATES FOR ALL GROUP R OCCUPANCIES FOUR STORIES AND LESS**

Minimum and Maximum Ventilation Rates: Cubic Feet Per Minute (CFM)

Floor Area, ft <sup>2</sup>	Bedrooms													
	2 or less		3		4		5		6		7		8	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
<500	50	75	65	98	80	120	95	143	110	165	125	188	140	210
501-1000	55	83	70	105	85	128	100	150	115	173	130	195	145	218
1001-1500	60	90	75	113	90	135	105	158	120	180	135	203	150	225
1501-2000	65	98	80	120	95	143	110	165	125	188	140	210	155	233
2001-2500	70	105	85	128	100	150	115	173	130	195	145	218	160	240
2501-3000	75	113	90	135	105	158	120	180	135	203	150	225	165	248
3001-3500	80	120	95	143	110	165	125	188	140	210	155	233	170	255
3501-4000	85	128	100	150	115	173	130	195	145	218	160	240	175	263
4001-5000	95	143	110	165	125	188	140	210	155	233	170	255	185	278
5001-6000	105	158	120	180	135	203	150	225	165	248	180	270	195	293
6001-7000	115	173	130	195	145	218	160	240	175	263	190	285	205	308
7001-8000	125	188	140	210	155	233	170	255	185	278	200	300	215	323
8001-9000	135	203	150	225	165	248	180	270	195	293	210	315	225	338
>9000	145	218	160	240	175	263	190	285	205	308	220	330	235	353

\*For residences that exceed 8 bedrooms, increase the minimum requirement listed for 8 bedrooms by an additional 15 CFM per bedroom. The maximum CFM is equal to 1.5 times the minimum.

**TABLE V3-3**

**PRESCRIPTIVE EXHAUST DUCT SIZING**

Fan Tested CFM @ 0.25" W.G.	Minimum Flex Diameter	Maximum Length Feet	Minimum Smooth Diameter	Maximum Length Feet	Maximum Elbows <sup>1</sup>
50	4 inch	25	4 inch	70	3
50	5 inch	90	5 inch	100	3
50	6 inch	No Limit	6 inch	No Limit	3
80	4 inch <sup>2</sup>	NA	4 inch	20	3
80	5 inch	15	5 inch	100	3
80	6 inch	90	6 inch	No Limit	3
100	5 inch <sup>2</sup>	NA	5 inch	50	3
100	6 inch	45	6 inch	No Limit	3
125	6 inch	15	6 inch	No Limit	3
125	7 inch	70	7 inch	No Limit	3

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

**V401.1** All structural panel components within heated space labeled one of the following: EXPOSURE 1 or EXTERIOR, or HUD APPROVED.

**V402.3** Fireplaces shall have:

1. Tightly fitting flue dampers, operated by a readily accessible manual or approved automatic control. Gas logs shall be installed in accordance with the Iniform Mechanical Code Ch. 901.
2. An outside source of combustion air ducted into the fire box. The duct shall be at least six square inches and shall be provided with an operable outside air damper.
3. Site built fireplaces shall have tight fitting glass or metal doors, or a metal door or flue draft induction fan or as approved for minimizing back drafting. Factory built fireplaces shall use doors listed for the installed appliance.

**V402.4** Masonry heaters shall be approved by the Department of Ecology, shall have primary combustion air ducted from the outside of the structure to the appliance, and shall have tight fitting ceramic glass or metal doors. Flue damper, when provided, shall have an external control and when in the closed position shall have a net area of not less than five percent of the flue cross sectional area.

**V404.2** Solid fuel burning appliances shall have:

1. Tight fitting metal or ceramic glass doors.
2. Source from outside the structure of the primary combustion air connected to the appliance as per manufacturer’s specs.

The air inlet shall originate at a point below the fire box. The duct shall be 4" or greater in diameter, not exceeding 20 feet in length, or 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 in V Section 402.2 Item 2.

Exception: Combustion air can be supplied to the room in lieu of direct ducting provided that it is part of the central heating plant and provided with combustion air per the IMC, or it is installed in existing construction directly on a concrete floor or surrounded by masonry material such as a fireplace. The combustion air terminus shall be located as close as possible to the appliance and shall be provided with a barometric damper or equivalent and shall be sized per manufacturer's specs, or no less than 4" in diameter or the equal in area.