CLACKAMAS COUNTY DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
BUILDING CODES DIVISION

2017 EDITION OF THE OREGON RESIDENTIAL SPECIALTY CODE (BASED ON 2015 IRC)

SUMMARY OF RESIDENTIAL STRUCTURAL AND MECHANICAL CODE REQUIREMENTS

Oregon codes are available for viewing online at: Oregon.gov/bcd.

This checklist and all approved construction documents must be kept on the job site at all times while work is in progress. All work must be installed in accordance with the approved construction documents, and any changes shall be resubmitted for approval as an amended set of construction documents, in accordance with Section R106.

Refer to the building permit card and Section R109 for required inspections.

Certificate of Occupancy (Section R110)

Residential Certificate of Occupancy. Prior to occupancy of a new residential dwelling or townhouse, the building official must issue a certificate of occupancy in the form and format established by the division. OAR 918-480-0140

Definitions (Section R202)

BUILDING HEIGHT. The vertical distance from grade plane to the average height of the highest roof surface.

GRADE PLANE. A reference plane representing the average of the finished ground level adjoining the building at all exterior walls.

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

LOT LINE. A line dividing one lot from another, or from a street or any public place.

SEISMIC DESIGN CATEGORY. Clackamas County is in Seismic Design Category D-1. ORSC Table 301.2(1) and Figure R301.2(2)

Minimum Design Criteria (Section R301)

Seismic Category: D1

Design Wind Speed: 120mph ultimate / 93mph nominal (for sunrooms, refer to R301.2.1.1)

Wind Exposure Category: To be determined in accordance with R301.2.1.3 (Exposure C may be used as a default)

Site Address

1. **Address identification.** The address identification shall be legible and placed in a position that is visible from the street or road fronting the property, with characters which contrast with their background. Section R319.1

Light and Ventilation

2. **Stairway illumination:** All interior and exterior stairways shall be provided with a means to illuminate the stair, including landing and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. Section R303.6

3. **Habitable room glazing.** 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 be through windows, doors, louvers or other approved openings to the outdoor air. The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated. Section R303.1

   Exceptions:
   1. The glazing areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical ventilation system is installed in accordance with M1507.1
   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 (65 lux) over the area of the room at a height of 30 inches above the floor level.
   3. Use of sunroom and patio covers, as defined in Section R202, shall be permitted for natural ventilation if in excess of 40 percent of the exterior sunroom walls are open, or are enclosed only by insect screening.

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

Bathrooms without bathing or spa facilities. Water closet compartments or toilet rooms without bathtub, shower or spa facilities shall be provided with aggregate glazing area of not less than 3 square feet (0.3 m2), one-half of which must be openable. Section R303.3.2.

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

Safety glazing is required in in wet locations (such as bathing rooms, spas, saunas, steam rooms, and swimming pool areas) where exposed glazing is located within 60 inches measured horizontally from the water's edge and is less than 60 inches measured vertically from a standing or walking surface. For specific requirements, refer to Section R308.4

5. **Required heating.** Every dwelling unit shall be provided with heating facilities capable of maintaining a minimum room temperature of 68^0F (20^0C) at a point 3 feet above the floor and 2 feet from exterior walls in all habitable rooms at the design temperature. The installation of one or more portable space heaters shall not be used to achieve compliance with this section. Section R303.9

Minimum Areas, Dimensions and Ceiling Height

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

Exception: Kitchens.

7. **Ceiling height.** Habitable rooms, hallways, bathrooms, toilet rooms, laundry rooms and portions of basements containing these spaces, shall have a ceiling height of not less than 7 feet. The required height shall be measured from the finished floor to the lowest projection from the ceiling. Section R305.1

Exceptions:

1. For rooms with sloped ceilings, the required floor area of the room shall have a ceiling height of not less than 5 feet and not less than 50 percent of the required floor area shall have a ceiling height of not less than 7 feet.
2. Not more than 75 percent of the floor area of a bathroom or toilet is permitted to have a sloped ceiling less than 7 feet in height, provided an area of 21 inches by 24 inches in front of toilet and lavatories has a minimum of 6 feet, 4 inches in height, measured from the finished floor. An area of 24 inches by 30 inches in front of and inside a tub shower shall have a minimum of 6 feet, 4 inches in height, measured from the standing surface of the fixture.
3. Beams, girders, ducts or other obstructions in basements containing habitable space shall be permitted to project to within 6 feet 4 inches of the finished floor.
4. Beams and girders spaced not less than 4 feet on center may project not more than 6 inches below the required ceiling height.
5. Conversion of existing non-habitable spaces, such as a basement or attic, to habitable space, shall provide a minimum 6 feet, 8 inches ceiling height for flat ceilings or the portion required for exception #1 in this section.

8. **Hallway.** The minimum width of a hallway shall be not less than 3 feet. Section R311.6

9. **Bathtub and shower spaces.** Fixtures shall be spaced as shown in Figure R307.1.

10. **Dwelling units containing a loft.** Refer to Section R329 for complete requirements.

Doors and Windows

11. **Egress Door.** Not less than one side-hinged, 32" x 78" egress door shall be provided from each dwelling unit. The required exit door shall provide for a continuous unobstructed path from all portions of the dwelling to the exterior, directly to a public way, yard, or court, without requiring travel through a garage or carport. 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. Sections R311.1 and R311.2

12. **Landings at exterior doors:** There shall be a floor or landing on each side of each exterior door. The width of each landing shall not be less than the door served. Every landing shall have a minimum dimension of 36 inches measured in the direction of travel. The floor or landing at the required egress door shall not be more than 1.5 inches lower than the top of the threshold, and where such landings are not at grade they shall be provided with access to grade by means of a ramp in accordance with Section R311.8 or a stairway in accordance with R311.7. For other doors, the landing shall not be more than 8" below the top of the door threshold and provided the door does not swing over the landing. The landing shall be permitted to have a slope not to exceed 0.25 units vertical in 12 units horizontal (2-percent). Section R311.3

Exception: Exterior balconies less than 60 square feet in area and only accessible by a door are permitted to have a landing less than 36 inches measured in the direction of travel.

Attachment. Exterior landings, decks, balconies, stairs, and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Sections R311.5.1 and R507.1

13. **Window Fall Protection.** In dwelling units, where the top of the sill of an operable window opening is located less than 24 inches above the finished floor and greater than 72 inches above the finished grade or other surface below on the exterior of the building, the operable window shall not allow a 4 inch sphere to pass through in its largest opened

position, or be provided either with window fall protection devices or window opening control devices that comply with ASTM F2090. Such devices may not reduce the minimum net clear opening area for required emergency escape openings as required by Section R310.2.1

14. **Emergency Escape and Rescue Openings**. Basements and every sleeping room shall have at least one openable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, emergency egress and rescue openings shall be required in each sleeping room, but shall not be required in adjoining areas of the basement. **The bottom of emergency escape and rescue openings shall not exceed 44 inches in height, measured from top of finished floor to the bottom edge of the clear opening, per R310.2.2.** Where a door opening having a threshold below the adjacent ground elevation serves as an emergency and rescue opening and is provided with a bulkhead enclosure, the bulkhead enclosure shall comply with Section 310.3. The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. Escape and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2.3. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way. Section R310

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

Minimum opening area. All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet. Section R310.2.1

Exception: Grade floor openings (bottom of clear opening not more than 44 inches above or below finished ground level) shall have a minimum net clear opening of 5 square feet.

Minimum opening height. The minimum net clear opening height shall be 24 inches. Section R310.2.1

Minimum opening width. The minimum net clear opening width shall be 20 inches. Section R310.2.1

Operational constraints. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Section R310.1.1

15. **Safety glazing** is required in all hazardous locations, such as windows where the nearest vertical edge is within 24 inches of a door, at sliding glass doors, French doors, tub/shower enclosures, glazing adjacent to walking surfaces (such as stairways, landings and ramps), and glazing in wet locations (such as bathing rooms, spas, saunas, steam rooms, and swimming pool areas) where exposed glazing is located within 60 inches measured horizontally from the water's edge and is less than 60 inches measured vertically from a standing or walking surface. For specific requirements, refer to Section R308.4

Stairs and Ramps

16. **Stair Requirements:**

Width. Stairways shall be not 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 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 inches where handrails are provided on both sides. Section R311.7.1

Exceptions:

1. The width of spiral stairways shall be in accordance with Section R311.7.10.1
2. Where a floor is served by more than one stairway, stairways other than the first stairways may have a clear width of not less than 30 inches. Any handrail may encroach a maximum of 4.5 inches into the clear width. Section R311.7.1

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

Exceptions:

1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall be allowed to project horizontally into the required headroom not more than 4.75 inches.
2. The headroom for winder stairs shall be in accordance with Section R311.7.10.1.

Vertical rise. A flight of stairs shall not have a vertical rise larger than 147 inches between floor levels or landings. Section R311.7.3

Risers. The maximum riser height shall be 8 inches and shall be measured vertically between the leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch. Risers shall be vertical or sloped from the underside of the leading edge of the tread above at an angle not more than 30 degrees from the vertical. Open risers are permitted, provided that the opening between treads does not permit the passage of a 4-inch-diameter sphere. Section R311.7.5.1

Treads. The minimum tread depth shall be 9 inches. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The walking surface of treads and landings of a stairway shall be sloped no steeper than one unit

vertical in 48 units horizontal (2-percent slope). The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch. Section R311.7.5.2

Winder Treads: Refer to Sections R311.7.4 and R311.7.5.2.1.

Nosings. The radius of curvature at the leading edge of the tread shall be no greater than 9/16 inch. A nosing not less than 3/4 inch, and not more than 1-1/4 inches, shall be provided on stairways with solid risers. The greatest nosing projection shall not exceed the smallest nosing projection by more than 3/8 inch between two stories, including the nosing at the level of the floors and landings. Beveling of nosing shall not exceed ½ inch. Section R311.7.5.3

Exception: A nosing is not required where the tread depth is a minimum of 10 inches.

Steps. The rise of a step or steps shall not be less than 4 inches or greater than 8 inches. Section R311.7.4.5

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

Landings. There shall be a floor or landing at the top and bottom of each stairway. The minimum stair landing width, perpendicular to the direction of travel, shall be no less than the width of the flight served. Landing of shapes other than square or rectangular shall be permitted provided the depth at the walk line and the total area is not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run the minimum depth in the direction of travel shall not be less than 36". Section R311.7.5

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

17. **Ramps** serving the required egress door shall have a maximum slope of 1:12 (8.3 percent slope). All other ramps shall have a maximum slope of 1:8.

Exception: Where it is technically infeasible to comply because of site constraints, a ramp serving a required egress door may have a maximum slope of 1:8. Section R311.8.

Landings. There shall be a floor or landing at the top and bottom of each ramp, where doors open onto ramps, and where ramps change direction. The width of the landing perpendicular to the ramp slope shell be not less than 36 inches. Section R311.8.2

Accessibility Note: Dwelling units required to be accessible by ORS 447.231 shall comply with Chapter 11 of the *Oregon Structural Specialty Code* as applicable. Section R320

Handrails and Guards

18. **Handrails** shall be provided on at least one side of each stair with a continuous run of treads or flight with four or more risers (the continuous handrail required for winders shall be located on the side where the tread is narrower), and at each ramp exceeding a slope of 1:12. Sections R311.7.8 and R311.8.3

Height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 30 inches and not more than 38 inches. Sections R311.7.8.1 and R311.8.3.1

Exceptions (for stairs):

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to guard, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches.
3. When a handrail is incorporated as the top of a guard, the minimum height shall be not less than 34 inches and not more than 38 inches as measured vertically from a line connecting the leading edges of the treads.

Continuity. Handrails for stairways shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above lowest riser of the flight. Handrails for ramps shall be continuous for the full length of the ramp. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inch between the wall and the handrail. Sections R311.7.8.2 and R311.8.3.3

Exceptions:

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

Grip size. All required handrails shall be of one of the following types or provide equivalent graspability. Sections R311.7.8.3 and R311.8.3.2.

- Type I. Handrails with a circular cross section shall have an outside diameter of at least 1¼ inches and not greater than 2 inches. If the handrail is not circular it shall have a perimeter dimension of at least 4 inches and not greater than 6¼ inches with a maximum cross section of dimension of 2¼ inches.
- Type II. Handrails with a perimeter greater than 6¼ inches shall provide a graspable finger recess

area on both sides of the profile. The finger recess shall begin within a distance of ¾ inch measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16 inch with 7/8 inch below the widest portion of the profile. The minimum width of the handrail above the recess shall be 1¼ inches to a maximum of 2¾ inches. Edges shall have a minimum radius of 0.01 inches.

19. **Guards** shall be located along open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches measured vertically to the floor or grade below at any point within 36 inches horizontally to the edge of the open side. Guards shall be designed and constructed to resist live loads per Table R301.5. Insect screening shall not be considered as a guard**.** Sections R301.5 and R312.1.1

Height. Required guards shall be not less than 36 inches in height as measured vertically above the adjacent walking surface or a line connecting the leading edges of the treads. Section R312.1.2.

Exceptions:

1. Guards on the open side of stairs shall have a height of not less than 34 inches measured vertically from a line connecting the leading edges of the treads.
2. Where the top of a guard serves as a handrail on the open sides of stairs, the top of the guard shall be not less than 34 inches and not more than 38 inches as measured vertically from a line connecting the leading edges of the treads.

Guard opening limitations. Required guards shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches in diameter. Section R312.1.3

Exceptions:

1. The triangular openings formed by the riser, tread and bottom rail of a guard at the open side of a stairway are permitted to be of such size that a sphere 6 inches cannot pass through.
2. Openings for required guardrails on the sides of stairs shall not allow passage of a sphere 5 inches or more in diameter to pass through. Opening limitations for required guardrails on open sides of stairways are applicable above the second riser of the stair.

Alarms

20. **Smoke alarms** shall comply with NFPA 72, shall be listed in accordance with UL 217, and shall be provided within new dwelling units. Where alterations, repairs, or additions requiring a permit occur, or where 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. Sections R314.1 and R314.2

Exceptions:

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

Locations. Smoke alarms shall be installed in the following locations per Section R314.3:

- In each sleeping rooms.
- Outside of each separate sleeping area in the immediate vicinity of the bedrooms.
- On each additional story of the dwelling, including basements but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.
- Smoke alarms shall be installed not less than 3 feet horizontally from a door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by this section.
- Refer to NFPA 72, Section 29.5 for additional requirements.

Installation near cooking appliances. Per Section R314.3.1, smoke alarms shall not be installed in the following locations unless this would prevent placement of a smoke alarm in a location required by Section R314.3:

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

Interconnection. Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation if one alarm will activate all of the alarms in the individual dwelling unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.

Exception: Interconnection in existing areas shall not be required where alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure.

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

Exceptions:

1. Alarms shall be permitted to be battery operated where installed in buildings without power.
2. Smoke alarms for alterations, repairs, and additions shall be permitted to be battery powered.

Fire Alarm Systems may be used in lieu of smoke alarm systems in accordance with Section R314.7

Carbon monoxide alarms shall be be listed in accordance with UL 2034, and shall be provided within new dwelling units. Where a new carbon monoxide source is introduced or work requiring a structural permit occurs in existing dwellings, carbon monoxide alarms shall be provided as required for new dwellings. Sections R315.1 and R315.2

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

Location. Carbon monoxide alarms shall be located in each bedroom or within 15 feet of each bedroom door. Bedrooms on separate floor levels in a structure consisting of two or more stories shall have separate carbon monoxide alarms serving each story. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom. Section R315.3

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

Exceptions:

1. Alarms shall be permitted to be battery operated where installed in buildings without power.
2. Alarms for alterations, repairs, and additions shall be permitted to be battery powered.

Combination smoke and carbon monoxide alarms may be used in lieu of separate smoke and carbon monoxide alarms, and shall be listed in accordance with UL 2034 and UL 217. Interconnection and hard-wiring of combination smoke/carbon monoxide 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.

Fire Resistant Construction

21. **Fireblocking** shall be provided to cut off all concealed draft openings (both vertical and horizontal) and to form an effective fire barrier between stories, and between a top story and the roof space. Wood fireblocking shall be 2 inches nominal thickness, or two thicknesses of 1 inch nominal lumber with broken lap joints, or 23/32" wood structural panels with joints backed by 23/32 wood structural panels or 3/4 inch particleboard with joints backed with same material, 1/2" gypsum board, ¼" cement-based millboard or other noncombustible material securely fastened in place. Where unfaced fiberglass is used as fireblocking, it must fill the entire cross section of the wall cavity to a minimum height of 16". Sections R302.11 and R602.8

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

1. In concealed spaces of stud walls and partitions, including furred spaces, at the ceiling and floor level and at 10 foot intervals both vertical and horizontal. Batts or blankets of mineral wool or glass fiber or other approved non-rigid materials shall be allowed as fireblocking in walls constructed using parallel rows of studs or staggered studs.
2. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, 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, refer to R1003.19. For fireplaces, refer to Sections R302.11, R602.8, and R1001.12.
6. Fireblocking of cornices of a two-family dwelling is required at the line of dwelling unit separation,

22. **Draftstopping required.** When there is usable space both above and below the concealed space of a floor/ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet. Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below draftstopping shall be provided in floor/ceiling assemblies under the following circumstances:

1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members. Section R302.12

23. **Draftstopping materials** shall be 1/2-inch gypsum board, 3/8-inch wood structural panels, and 3/8" Type 2-M-W particleboard or other approved material adequately supported. Draftstops shall be installed parallel to the floor framing members. Section R302.12.1

24. **Fire protection of floors.** Floor assemblies that are not required elsewhere in this code to be fire-resistance rated, shall be protected with a ½ inch gypsum wall-board membrane, 5/8 inch wood structural panel membrane, or equivalent on the underside of the floor framing member. Penetrations or openings for ducts, vents, outlets, lighting, devices, wires, piping, or other similar openings or penetrations shall be permitted. Section R302.13

Exceptions:

1. Floor assemblies located above a space protected by an approved fire sprinkler system.
2. Floor assemblies located directly over a crawl space not intended for storage or fuel-fired appliances.
3. Portions of floor assemblies shall be permitted to be unprotected where complying with the following:
    a. The aggregate area of the unprotected portions does not exceed 80 square feet per story.
    b. Fireblocking in accordance with Section R302.11.1 is installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
    c. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.

Garages and Carports

25. **Garage separation.** The garage shall be separated from the residence and attic areas in accordance with Table R302.6:

Table R302.6
Dwelling-Garage Separation

SEPARATION	MATERIAL
From the residence and attics	Not less than 1/2-inch gypsum board or equivalent applied to the garage side
From habitable rooms above the garage	Not less than 5/8-inch Type X gypsum board or equivalent, attached per Table R702.3.5
Structure(s) supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than ½-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

Exception: Separation is not required when both the dwelling and garage are protected by an approved automatic sprinkler system.

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

27. **Opening Protection.** Openings between the garage and residence shall be equipped with solid wood doors not less than 1-3/8 inches in thickness, solid or honeycomb core steel doors not less than 1-3/8 inches thick, or 20-minute fire-rated doors. Section R302.5.1.1

Exception: Opening protection is not required when both the dwelling and garage are protected by an approved automatic sprinkler system.

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

29. **Floors.** Garage and carport floors shall be of approved noncombustible materials. The area of floor used for parking of automobiles or other vehicles shall be sloped to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway. Sections R309.1 and R309.2

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

30. **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 a part of the garage. Section M1307.3

Exception: Elevation is not required for appliances that are listed as flammable-vapor-ignition resistant.

31. **Protection from impact.** Appliances shall not be located in a location subject to vehicle impact except where protected by approved barriers. Figure M1307.3.1 contains examples of normal vehicle paths and acceptable types of protection. Section M1307.3.1

Footings and Foundations

32. **Minimum concrete compressive strength** shall be in accordance with Table R402.2.

33. **Footings.** All exterior walls shall be supported on continuous solid or fully grouted or concrete footings, or other materials as specified in Section R403.1 and shall be supported on undisturbed natural soil or engineered fill. Section R403.1

34. **Footings supporting deck posts** shall provide lateral restraint in accordance with R507.8.1.

35. **Minimum depth.** Bottoms of all footings supporting exterior walls, bearing walls, walls supporting braced wall panels, and pier and column footings shall extend beyond the frost depth (not less than 12 inches below finished grade for locations below 2,500' elevation, 18 inches at/above 2,500' and below 4,000' elevation, and 24" at/above 4,000' elevation). Sections R403.1.3.4 and R403.1.4

36. **Minimum size** for continuous concrete or masonry footings shall be in accordance with Table R403.1 and Figure R403.1(1) or R403.1.3, as applicable. Plain isolated square or round footings shall be permitted subject to the limitations in R403.1.7.1 and R403.1.7.2. Sections R403.1.1 and R403.1.7.

37. **Slope.** The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding 1 in 10. Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the slope of the bottom surface of the footing will exceed 1 in 10. Section R403.1.5

38. **Ground clearance.** Wood siding, sheathing and wall framing on the exterior of a building shall have a clearance of not less than 6 inches from the ground. Section R317.1

39. **Footings on or adjacent to slopes.** The placement of buildings and structures on or adjacent to slopes steeper than one unit vertical in three units horizontal shall conform to Sections R403.1.9.1 through R403.1.9.4. Refer to Fig. R403.1.9.1.

40. **Expansive soils.** Foundations and floor slabs for buildings located on expansive soils shall be designed in accordance with Chapter 18 of the Building Code (OSSC). Section R403.1.10

41. **Seismic reinforcing.** Concrete stem walls and footings shall be provided with a minimum of one No. 4 bar within 12 inches of the top of the wall and within 3-4 inches of the bottom of the footing, with support and cover in accordance with Section R403.1.3.5.

Exception: Foundations constructed monolithically shall be permitted to have a minimum of two No. 4 bars placed in the footing. Section R403.1.3.3

Where a construction joint is created between a concrete footing and stem wall, a minimum of one No. 4 bar with standard hook complying with R608.5.4.5 shall be provided at no more than 4 feet on center. The vertical bar shall extend a minimum of 14 inches into the stemwall and to the bottom of the footing, with support and cover in accordance with Section R403.1.3.5.3.

Where a grouted masonry stem wall is supported on a concrete footing and stem wall, a minimum of one No. 4 bar shall be installed at not more than 4 feet on center which shall extend to 3 inches clear of the bottom of the footing with a standard hook. Masonry stem walls without solid grout and vertical reinforcement are not permitted. Section R403.1.3.2

Slabs on grade with turned-down footings cast monolithically shall have a minimum of one No. 4 bar at the top and bottom of the footing, or one No. 5 bar or two No. 4 bars in the middle third of the footing depth. Where a slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks (complying with R608.5.4.5) on each end shall be installed at no more than 4 feet on center in accordance with Fig. R403.1.3, Detail 2. Section R403.1.3.3.

42. **Grounding electrodes.** When concrete reinforcing bars are installed in concrete footings, the following requirements shall be met to provide for a grounding electrode system:

1. Uncoated No. 4 reinforcing bar installed not less than 3 inches from the bottom of the footing and not less than 20 feet in length encased with a minimum of 2 inches of concrete.
2. An uncoated No. 4 reinforcing bar stubbed up at least 12 inches above the floor plate line and tightly attached to the reinforcing bar located in the footing. The spliced lap of the stubbed up bar to the footing bar shall be a minimum of 12 inches. Section R403.1.8

43. **Wood sill plate anchor bolts** shall be min. 1/2-inch diameter, 7 inches embedment, max. 6 feet on center and not more than 12 inches from a corner or less than 7 bolt diameters from mudsill splice. Min. 2 anchor bolts per plate. These requirements apply to all exterior walls, interior braced panel walls and interior load bearing walls. Walls connecting offset braced wall panels and 24 inches or shorter in length are permitted to be connected to the foundation with one anchor bolt located in the middle third of the plate and, such walls 12 inches or shorter in length are permitted without anchorage to the foundation as long as they are connected to the adjacent braced panels at the corners per Figure R602.10.4.4(1). Sections R403.1.6 and R403.1.6.1.

Plate washers conforming to 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. Plate washers, a minimum of 0.229 inches by 3 inches by 3 inches in size, shall be installed between the foundation sill plate and the nut. The hole in the plate washer is permitted to be diagonally slotted with a width of up to 3/16 inch larger than the bolt diameter and a slot length not to exceed 1-3/4 inches, provided a standard cut washer is placed between the plate washer and the nut. See Section R602.11.1.

44. **Concrete slab** on ground floors shall be not less than 3 1/2 inches thick. Section R506.1

45. **Foundation walls.** Concrete and Masonry foundation walls shall be constructed in accordance with Section R404.1.

46. **Retaining Walls:** Retaining walls that are not laterally supported at the top and that retain in excess of 48 inches of unbalanced fill or retaining walls exceeding 24 inches in height that resist lateral loads in addition to soil shall be designed in accordance with accepted engineering practice to ensure stability against overturning, sliding, excessive foundation pressure and water uplift in accordance with the design principles of the Building Code (OSSC). A minimum factor of safety of 1.5 shall be used against sliding and overturning. This section shall not apply to foundation walls supporting buildings. Section R404.4.

Exception: Retaining walls which do not support (or in the event of failure: could not impact) buildings, accessory parking, a required accessible route, or the means of egress, are not within the scope of the State Building Code (example: Walls which retain material *solely* for landscaping purposes). Refer to Statewide Statutory Interpretation No. 14-03, available for viewing online at Oregon.gov/bcd.

47. **Foundation drainage and waterproofing.** Lots shall be graded to to drain surface water away from foundation walls, and grade shall fall a minimum of 6 inches within 10 feet of foundations per Section R401.3.

Exception: Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains, swales, or other means shall be provided, and shall be constructed to ensure drainage away from the structure. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building.

Drains shall be provided around all concrete or masonry foundations that retain earth AND enclose habitable or usable space (except when the foundation is installed on a well-drained ground or sand-gravel mixture soils) in accordance with Section R405. Such walls requiring drainage system shall also be required to be waterproofed in accordance with Section R406.

Crawl Spaces

48. **Access opening.** Crawl space openings through a floor shall be a minimum of 18 inches by 24 inches. Openings through a perimeter wall shall be not less than 16 inches by 24 inches. When any portion of the through-wall access is below grade, an areaway not less than 16 inches by 24 inches shall be provided and the bottom of the areaway shall be below the threshold of the access opening. Through wall access opening shall not be located under a door to the residence. Pipes, ducts and other construction must not obstruct accessibility to and within the crawl space. See Section M1305.1.4 for mechanical equipment access. Section R408.4

49. **Flood Resistance:** Buildings located in located in flood hazard areas as determined by the Flood Plain Administrator shall be provided with flood openings in accordance with Section R322.2.2, and the finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side (except for under-floor spaces which meet the requirements of FEMA Technical Bulletin 11-1). Section R408.7

50. **Under-floor space ventilation.** The under-floor space between the bottom of the floor joists and the earth under any building (except space occupied by a basement) shall have ventilation openings through foundation walls or exterior walls. The minimum net area of ventilation openings shall not be less than 1 square foot for each 150 square feet of under-floor space area, and may not be reduced due to radon mitigation requirements. Ventilating openings shall be placed so as to provide cross ventilation of the space with one such opening located within 3 feet of each corner of the building.

Exceptions:

1. Ventilation openings may be omitted on one side of a building.
2. Ventilation openings may be omitted when continuously operated mechanical ventilation is installed, with a capacity to exhaust 1.0 cfm for each 50 square feet of crawl space floor area, and with the ground surface covered with an approved ground cover material.
3. Ventilation openings in townhouses shall be permitted to be omitted on two sides when adjoining adjacent dwellings.

Ventilation openings shall be covered with corrosion resistant wire mesh or equivalent with the least dimension being 1/8-inch thick. Unvented crawlspaces are not allowed in new construction within Clackamas County where radon mitigating construction is required. Sections R408.1, R408.2, and R408.3

51. **Drainage.** Provide water drainage from the crawl space by means of crawl space and foundation drains sloped for gravity drainage and extending to a storm sewer, street gutter, road ditch or other drainage way or raise the finish grade in the crawl space to the level of finish grade outside. Section R408.6

52. **Removal of debris.** The under-floor grade shall be cleaned of all vegetation and organic material. All wood forms used for placing concrete shall be removed before a building is occupied or used for any purpose. All construction materials shall be removed before a building is occupied or used for any purpose. Section R408.5

Protection Against Decay

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

1. Wood joists or bottom of wood structural floor when closer than 18 inches or wood girders when closer than 12 inches to exposed ground in crawl spaces or unexcavated area located within the periphery of the building foundation.
2. All wood framing members and sill plates in contact with concrete or masonry foundation walls.
3. Sills and sleepers on a concrete or masonry slab that is in direct contact with the ground unless separated from such slab by an impervious moisture barrier.
4. The ends of wood girders entering exterior masonry or concrete walls having clearances of less than 0.5 inches on tops, sides and ends.
5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches from the ground or less than 2 inches measured vertically from concrete steps, porch slabs, patio slabs, and similar horizontal surfaces exposed to the weather.
6. Wood structural members supporting moisture permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, unless separated from such floors or roofs by an impervious moisture barrier.
7. Wood furring strips or other wood framing members attached directly to the interior of exterior masonry walls or concrete walls below grade except where an approved vapor retarder is applied between the wall and the furring strips or framing members.
8. Exposed wood members and glued-laminated timbers that form the structural supports for buildings, balconies, porches, or similar building appurtenances when those members are exposed to the weather without adequate protection from a roof, eave, overhang, or other covering which would moisture or water accumulation on the surface or at joints between members (both horizontal and vertical members).
9. All wood in contact with the ground, embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather that supports permanent structures intended for human occupancy shall be approved pressure-preservative-treated wood suitable for ground contact use, except untreated wood may be used where entirely below groundwater level or continuously submerged in fresh water.

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

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

Exceptions:

1. Columns exposed to the weather or in basements when supported by concrete piers or metal pedestals projecting 1 inch above a concrete floor or 6 inches above exposed earth and the earth is covered by an approved impervious moisture barrier.
2. Columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building when supported by a concrete pier or metal pedestal at a height more than 8 inches from exposed earth and the earth is covered by an impervious moisture barrier.
3. Deck posts supported by concrete piers or metal pedestals projecting not less than 1 inch above a concrete floor or 6 inches above exposed earth.

56. **Fasteners.** Fasteners and washers for pressure-preservative and fire-retardant-treated wood shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or cooper. In the absence of manufacturer's recommendations, a minimum of ASTMA653 type G185 zinc-coated galvanized steel, or equivalent shall be used. Section R317.3.1

Exceptions:

1. One-half-inch diameter or larger steel bolts.
2. Fasteners other than nails and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55, minimum.
3. Plain carbon steel fasteners in SBX/DOT and zinc borate preservative-treated wood in an interior, dry environment shall be permitted.

Framing

57. **Grading and fasteners.** Load bearing dimension lumber (including logs used in log home construction) for joists, beams, girders, and rafters shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accredited body that complies with DOC PS 20. In lieu of a grade mark, a certificate of inspection issued by a compliant lumber grading or inspection agency shall be acceptable. Refer to Tables R602.3 (1) & R602.3 (2) for fastener (nails, staples, etc.) requirements. Sections R502, R602, and R802.1.1.

58. **Design and construction.** Floor framing shall be designed and constructed in accordance with Chapter 5, Figure R502.2 and Section R317, or in accordance with ANSI AWC NDS. Section R502.2

59. **Bearing.** Joists and beams or girders must have not less than 1 1/2 inches of bearing on wood or metal or 3 inches on concrete or masonry except where supported on a 1-inch-by-4-inch ribbon strip and nailed to the adjacent stud or by the use of approved joist hangers. Section R502.6

60. **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 wood structural panel that is fastened to both the top and bottom plates in accordance with Table 602.3(1), or these cripple walls shall be constructed of solid blocking. Cripple walls shall be supported on continuous foundations and braced as required for lateral loads in accordance with Sections R602.10.2 and R602.10.9. Section R602.9

61. **Floor systems**. Joist framing from opposite sides over a bearing support shall lap a minimum of 3 inches and shall be nailed together with a minimum of three 10d face nails. A wood or metal splice with strength equal to or greater than that provided by the nailed lap is permitted. Section R502.6.1

62. **Joists under bearing partitions** shall be of adequate size to support the load. Double joists, sized to adequately support the load, that are separated to permit the installation of piping or vents shall be full depth solid blocked with lumber not less than 2 inches in nominal thickness spaced not more than 4 feet on center. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load. Section 502.4

63. **Joist framing.** Joists framing into the side of a wood girder shall be supported by approved framing anchors or on ledger strips not less than nominal 2 inches by 2 inches. Section R502.6.2

64. **Lateral restraint at supports.** Joists shall be supported laterally at the ends by full-depth solid blocking not less than 2 inches nominal thickness; or by attachment to a full-depth header, band or rim joist, or to an adjoining stud or otherwise provided with lateral support to prevent rotation. Joists exceeding a nominal 2 inches by 12 inches shall be supported laterally by solid blocking, diagonal bridging (wood or metal), or a continuous 1 inch by 3 inch strip nailed across the bottom of joists perpendicular to joists at intervals not exceeding 8 feet**.** Section R502.7, Section R502.7.1

Exception: Trusses, structural composite lumber, structural glued-laminated members and I-joists shall be supported laterally as required by the manufacturer's recommendations.

65. **Columns:** Wood columns shall not be less than 4 inch by 4 inch and protected from decay in accordance with R317. Steel columns shall not be less than 3 inch diameter, schedule 40 pipe, and shall be given a shop coat of rust-inhibitive paint (except for corrosion-resistant steel). Section R407

66. **Plywood gussets.** Where post and beam or girder construction is used to support floor framing, positive connections shall be provided to ensure against lateral displacement. See Figure R502.9 for typical plywood gusset connections at all post-to-beam connections. Gusset dimensions shall be a minimum of twice the beam height and the width of the post/column. Lateral bracing is required at the bottom end of posts exceeding 4'-0" in length (for posts up to 8 feet in height, this may be accomplished using gussets at each side of the post plus an angled 1x4 brace in accordance with Fig. R502.9). Section R502.9

Exception: Girders and posts supporting exterior decks not exceeding 18 inches in height are not required to be laterally braced or have a gusset at post and girder connections.

67. **Wood floor and roof trusses** shall be designed in accordance with approved engineering practice, and shop drawings shall be prepared by a registered design professional. Trusses shall not be cut, notched, spliced, drilled or otherwise altered without the approval of a registered design professional. All changes to approved truss layouts and designs must be submitted for review and approval prior to installation. Sections R502.11 and R802.10

68. **Prefabricated I-joists.** I joist layouts and schedules, and all changes thereof, shall be submitted for review and approval prior to installation. Sections R106.1 and R502.1.2.

69. **Floor sheathing.** Maximum allowable spans and minimum thicknesses required for lumber used as floor sheathing shall conform to Tables R503.1, R503.2.1.1(1), and R503.2.1.1(2). Section R503.

70. **Decks**: Decks when supported by attachment to an exterior wall shall be positively connected to the primary system for both vertical and lateral loads by means of a minimum ½ inch, galvanized or stainless lag screws or bolts in accordance with Table R507.2. Such lag screws and bolts shall be placed in accordance with Figure R507.2.1(1). In addition, hold-down tension devices shall be required to be installed per Figure R507.2.3(1) or Figure R507.2.3(2). Decks with cantilevered framing members shall be designed and constructed to resist uplift resulting from the full live load acting on the cantilevered portion of the framing. Joists supporting decking shall be spaced in accordance with Table R507.4, and decking shall be fastened with not less than (2) 8d threaded nails or (2) No. 8 wood screws. Decks that do not meet the above requirements shall be designed and constructed as a self-supporting structure. Section R507

71. **Wall bracing.** Changes to prescriptive wall bracing plans, and/or changes to a lateral design by a registered design professional, shall be submitted as plan revisions for review and approval prior to installation. Sections R106.1.3, R106.3.4, R106.4, and R602.10

72. **Braced wall panel connections.** Braced panels shall be connected to floor framing or foundations in accordance with R602.10.8, and roof framing in accordance with R602.10.8.2

73. **Wall studs** shall be continuous from support at the sole plate to a support at the top plate to resist loads perpendicular to the wall. The support shall be a foundation or floor, ceiling or roof diaphragm or shall be designed in accordance with acceptable engineering practice. Exception: Jack studs, trimmer studs and cripple studs at openings in walls that comply with Table R602.7(1) and R602.7(2). Section R602.3

Stud size, height and spacing shall be in accordance with Table R602.3(5). Section R602.3.1

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 and load bearing walls or 10 feet for interior nonload-bearing walls.
2. Where snow loads are less than or equal to 25psf, and the ultimate wind speed is less than or equal to 130mph, 2x6 studs supporting a roof load with not more than 6 feet of tributary length shall have a maximum height of 18 feet where spaced at 16 inches on center, or 20 feet where spaced at 12 inches on center. Studs shall be a minimum No. 2 grade lumber.

Stud grade. Studs shall be a minimum No. 3, standard or stud grade lumber. Section R602.2

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

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

75. **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 plate in accordance with Table R602.3(1). Ceiling joists shall be continuous or securely joined in accordance with Table R802.5.1(9) where they meet over interior partitions and are nailed to adjacent rafters to provide a continuous tie across the building when such joists are parallel to the rafters. Where ceiling joists are not connected to the rafters at the top plate, joists connected higher in the attic shall be installed as rafter ties, or rafter ties shall be installed to provide a continuous tie. Where ceiling joists are not parallel to rafters, rafter ties shall be installed. Rafter ties shall be a minimum of 2-inch by 4-inch nominal, installed in accordance with the connection requirements in Table R802.5.1(9), or connections of equivalent capacities shall be provided. Where ceiling joists or rafter ties are not provided, the ridge formed by these rafters shall be supported by a wall or girder designed in accordance with accepted engineering practice. Collar ties shall be spaced not more than 4 feet on center. Section R802.3.1. Refer to Figure R802.5.1

76. **Ceiling joists lapped.** Ends of ceiling joists shall be lapped a minimum of 3 inches or butted over bearing partitions or beams and toenailed to the bearing members. Where ceiling joists are used to resist rafter thrust, lapped joists shall be nailed together in accordance with Table R802.5.1(9) and butted joists shall be tied together in a manner to resist such thrust. Section R802.3.2

77. **Bearing.** The ends of each rafter or ceiling joist shall have not less than 1 1/2 inches of bearing on wood or metal and not less than 3 inches on masonry. Section R802.6

78. **Lateral support.** Rafters and ceiling joists having a depth-to-thickness ratio exceeding 5 to 1 based on nominal dimensions shall be provided with lateral support at points of bearing to prevent rotation. Section R802.8

79. **Truss/rafter uplift resistance.** Trusses shall be connected to supporting wall assemblies by connections capable of resisting uplift forces as specified on the approved truss design drawings. Individual rafters shall be connected to supporting wall assemblies by connections capable of resisting uplift forces as determined by Table R802.11 or as determined by accepted engineering practice. Sections R802.11.1.1 and R802.11.1.2

80. **Lumber sheathing.** Allowable spans for lumber used as roof sheathing shall conform to Table R803.1. Spaced lumber sheathing for wood shingles and shake roofing shall conform to the requirements of Section R905.7.1 and R905.8.1. Section R803.1

Masonry and Concrete Walls

81. **Grouted Masonry and Glass Unit Masonry:** Grouted masonry shall be constructed per Section R606. Glass Unit Masonry walls shall be constructed in accordance with Section R607.

82. **Exterior Concrete Walls:** Prescriptive requirements provided within the ORSC are not applicable for construction within Clackamas County due to seismic category limitations. For the construction of such walls, a design in accordance with ACI 318 or PCA 100 is required. Section R608.2

Wall and Ceiling Covering

83. **Gypsum wallboard** shall be installed in accordance with Section R702.3, with fastening in accordance with Table R702.3.5.

84. **Flame spread.** Wall and ceiling finishes other than trim shall have a flame spread classification of not greater than 200 and a smoke-developed index of not greater than 450. Section R302.9

85. **Installation.** Exterior sheathing shall be dry before applying exterior cover. Section R701.2

86. **Exterior Wall Envelope:** The exterior wall envelope shall be installed in a manner that water that enters the assembly can drain to the exterior. The envelope shall consist of an exterior veneer, a water-resistive barrier, a minimum 1/8 inch space between the water-resistive barrier and the exterior veneer, and integrated flashings. See Section R703.1.1 for exceptions to this requirement. Sections R703.1 and R703.1.1

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

Exception: Water-resistive barrier is not required for detached accessory buildings.

88. **Siding.** Weather resistant siding shall be installed per R703.5 and R703.6.

89. **Weather Exposure:** The maximum weather exposure for shakes and shingles shall not exceed the values provided in table R703.5.2

90. **Stone and Masonry Veneer.** Such veneers installed over a backing of wood or cold formed steel shall be limited to the first story above grade and shall not exceed 5 inches in thickness. Section R703.8

Exceptions:

1. Veneers up to 20 feet in height are permissible in structures without cripple walls above noncombustible foundations, with a maximum 4 inch thickness and a maximum weight limited to 40 psf. Table R703.8(2)
2. The limitations listed above do not apply where full height veneer does not exceed 25% of the total braced wall perimeter and not more than 40% of an exterior braced wall line.

91. **Flashing.** Approved corrosion-resistive flashing shall be applied shingle-fashion in such a manner 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: Section R703.4

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-framed construction.
6. At wall and roof intersections.
7. At built-in gutters.

Roof and Attic Spaces

92. **Roof Drainage control.** All dwellings and non-exempt accessory structures located below 1,500' shall have a controlled method of water disposal from roofs that will collect and discharge all roof drainage in accordance with the Plumbing Code. Section R801.4.

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

94. **Ventilation required.** Enclosed attics and enclosed rafter spaces formed where ceiling is applied to the underside of roof rafters shall have cross ventilation for each separate space by ventilated openings protected against the entrance of rain or snow. Ventilation openings shall be provided with corrosion-resistant wire mesh, with 1/16 inch minimum to ¼ inch maximum openings. At eave and cornice vents, not less than a 1 inch space shall be provided between the insulation and roof sheathing at the location of the vent. Section R806.

Baffles. Baffles of a durable rigid material shall be provided to prevent obstruction of vent openings and to deflect incoming air above the surface of porous insulation so as to prevent wind washing and blowing of loose material. Thermal insulation shall not be installed in a manner that would obstruct openings required for attic ventilation. Section N1104.2.5

Unvented attic assemblies: Refer to Section R806.5

95. **Minimum area.** The total net free ventilating area shall be not less than 1/150 of the space ventilated. The area may be reduced to 1/300 of the vented space provided one or more of the following conditions are met: 1.When a class I or II vapor barrier is installed on the warm-in-winter side of the ceiling. Or, 2. Not less than 40 percent but not more than 50 percent of the required ventilation area is provided by ventilators located in the upper portion or the attic or rafter space. Upper ventilators shall be located not more than 3 feet below the ridge or highest point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. Section R806.2

Roof Coverings

96. **Fire retardant roofing.** For dwellings located on land which is zoned forest, a fire-retardant roof is required per ORS 215.730. Section R901.1

97. **Fasteners for roof covering** shall be in accordance with Chapter 9 of the Oregon Residential Specialty Code, based on type of material used. In all cases, fasteners shall be long enough to penetrate into roof sheathing 3/4 inches or through the thickness of sheathing, whichever is less. Sections R905.2.5, 905.4.5, R905.7.5 and 905.8.6.

98. **Flashing** shall be installed in a manner that prevents moisture from entering the wall and roof through joints in coping, through moisture permeable materials and at intersections with parapet walls and other penetrations through the roof plane such as at junctions of chimneys and roofs, in roof valleys and around all roof openings. A drip edge shall be provided at eaves and rake edges of shingle roofs. Section R905.2.8.

99. **Roof covering application.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the product installation instructions by the manufacturer. Section R905.1

Chimneys and Fireplaces

100. **Spark arrester.** Chimneys for dwellings located on land which is zoned forest shall have a spark arrester. ORS 215.730

101. **Seismic reinforcing and anchorage.** Masonry or concrete chimneys shall be reinforced in accordance with Table R1001.1 and Section R606, and anchored to floor/ceiling framing in accordance with Section 1001.4.1 and R1003.4. Sections R1001.3 and R1003.3

102. **Foundation.** Masonry fireplaces and their chimneys shall be supported on foundations of solid masonry or concrete at least 12 inches thick and shall extend at least 6 inches beyond the face of the fireplace or foundation wall on all sides. Footings shall be placed on natural, undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be at least 12 inches below finished grade. Sections R1001.2 and R1003.2

103. **Termination.** Chimneys shall extend at least 2 feet higher than any portion of the building within 10 feet, but shall not be less than 3 feet above the highest point where the chimney passes through the roof. Section R1003.9

104. **Fireplace clearances.** All wood beams, joists, studs and other combustible materials shall have a clearance of not less than 2 inches from the front faces and sides of the masonry fireplace and not less than 4 inches from the back faces of masonry fireplaces. The air space shall not be filled, except to provide fire blocking in accordance with Section R1001.12. Section R1001.11

105. **Chimney clearances.** Any portion of masonry chimney located in the interior of the building or within the exterior wall of the building shall have a minimum air space clearance to combustibles of 2 inches. Chimneys located entirely outside the exterior walls of the building, including chimneys that pass through the soffit or cornice, shall have a minimum air space clearance of 1 inch. The air space shall not be filled, except to provide fire blocking in accordance with Section R1003.19. Section R1003.18

106. **Chimney crickets.** Chimney shall be provided with crickets when the dimension parallel to the ridgeline is greater than 30 inches and does not intersect the ridgeline. The intersection of the cricket and the chimney shall be flashed and counter flashed in the same manner as normal roof-chimney intersections. Crickets shall be constructed in compliance with Figure R1003.20 and Table R1003.20. Section R1003.20

107. **Lintel and throat.** Masonry over a fireplace opening shall be supported by a lintel of noncombustible material. The minimum required bearing length on each end of the fireplace opening shall be 4 inches. The fireplace throat or damper shall be located a minimum of 8 inches above the lintel. Section R1001.7

108. **Mantel and trim.** Woodwork or other combustible materials shall not be placed within 6 inches of fireplace opening. Combustible material within 12 inches of the fireplace opening shall not project more than 1/8 inch for each 1-inch distance from such opening. Section R1001.11 (Exception 4)

109. **Hearth and hearth extensions.** Masonry fireplaces hearths and hearth extensions shall be constructed of concrete or masonry, supported by noncombustible materials and reinforced to carry their own weight and all imposed loads. No combustible material shall remain against the underside of hearths and hearth extensions after construction. Sections R1001.9 and R1001.10

Hearth thickness. The minimum thickness of fireplace hearths shall be 4 inches. Section R1001.9.1

Hearth extension dimensions. Hearth extensions shall extend at least 16 inches in front inches in front of and at least 8 inches beyond each side of the fireplace opening. Where the fireplace opening is 6 square feet or larger, the hearth extension shall extend at least 20 inches in front of, and at least 12 inches beyond, each side of the fireplace opening. Section R1001.10

110. **Exterior air**. Factory-built or masonry fireplaces covered in Chapter 10 shall be equipped with an exterior air supply to ensure proper fuel combustion unless the room is mechanically ventilated and controlled so that indoor pressure is neutral or positive. Section R1006.1.

Exterior air intake. The exterior air intake shall be capable of supplying 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. Section R1006.2

General Mechanical System Requirements

111. **Flood-resistant installation**: In flood hazard areas as determined by the Flood Plain Administrator, mechanical appliances, equipment and systems shall be located or installed in accordance with Section R322.1.6. Section M1301.1.1

112. **Listed and labeled.** Appliances regulated by this code shall be listed and labeled for the application in which they are installed and used, unless otherwise approved in accordance with Section R104.11. Section M1302.1

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

114. **Central furnaces.** Central furnaces within compartments, alcoves or similar spaces shall conform to Sections M1305.1.1 and M1305.1.2.

115. **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" high and 22" 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 not less than 24" wide. A level service space at least 30" deep and 30" wide shall be present along all sides of the appliance where access is required. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches where such dimensions are large enough to allow removal of the largest appliance. Attic insulation shall be maintained continuous under the appliances. Sections N1104.1 and M1305.1.3.

Exceptions:

1. The passageway and level service space are not required where the appliance is capable of being serviced and removed through the required opening.
2. Where the passageway is unobstructed and not less than 6 feet high and 22 inches wide for its entire length, the passageway shall not be more than 50 feet long.
3. In existing structures the access opening shall be large enough for removal and replacement of the largest piece of the equipment.

116. **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. Section M1306.1

117. **General piping support.** Where mechanical system piping support requirements are not specified in other sections of this code, mechanical systems piping shall be supported in accordance with this section. Section M1309.1 and Table 1309.4

118. **Installation.** Heating and cooling equipment and appliances shall be installed in accordance with the manufacturer's installation instructions and the requirements of this code. The equipment shall be sized based on building loads calculated in accordance with ACCA Manual S or other approved heating and cooling calculation methodologies based on building loads calculated in accordance with ACCA Manual J. Section M1401.1 and M1401.3.

119. **Outdoor discharge.** The air removed by every mechanical exhaust system shall be discharged to the outdoors. Air shall not be exhausted into an attic, soffit, ridge vent or crawlspace. Section M1501.1

Exception: Whole-house ventilation-type attic fans that discharge into the attic space of dwelling units having private attics shall be permitted.

120. **Range hoods general.** Range hoods and down draft exhaust systems shall comply with the requirements of Section M1503. Exhaust ducts shall discharge to the outdoors per M1501.1, with a minimum rate of 150cfm continuous per M1507.4. Where installations exhaust more than 400cfm, makeup air shall be provided in accordance with M1503.5.

121. **Mechanical ventilation general.** Where section R303.3 requires toilet rooms, bathrooms and rooms with bathing or spa facilities to be mechanically ventilated, the ventilation equipment shall be installed in accordance with Section M1507.1.

122. **Recirculation of air.** Exhaust air from range hoods, bathrooms, toilet rooms and rooms with bathing or spa facilities shall not be recirculated within a residence or to another dwelling unit and shall be exhausted directly to the outdoors. Exhaust air from range hoods, bathrooms, toilet rooms and rooms with bathing or spa facilities shall not discharge into an attic, crawl space or other areas inside the building. Section M1507.2

123. **Rooms with bathing and spa facilities.** All rooms containing bathing or spa facilities shall be provided with a mechanical ventilation system controlled by a dehumidistat, timer or similar means of automatic control, with a minimum rate of 80cfm intermittent or 20cfm continuous per M1507.4. Section M1507.5

124. **Clothes dryer exhaust.** Dryer exhaust systems shall be independent of all other systems, shall convey the moisture to the outdoors and shall terminate on the outside of the building. Exhaust duct terminations shall be made with a full opening exhaust outlet or in accordance with the dryer manufacturer's installation instructions. Screens shall not be installed at the duct termination. Exhaust ducts shall not be connected with sheet-metal screws or fastening means which extend into the duct. Exhaust ducts shall be equipped with a backdraft damper. The entire exhaust system, excluding transition ducts, shall be supported and secured in place. Exhaust ducts shall be constructed of minimum 0.0157-inch-thick rigid metal ducts, having smooth interior surfaces with joints running in the direction of airflow. Flexible transition ducts used to connect the dryer to the exhaust duct system shall be limited to single length, not to exceed 8 feet in length. Transition ducts shall not be concealed within construction. Section M1502

Exhaust duct size. The diameter of the exhaust duct shall be a minimum of 4 inches or as required by the clothes dryer's listing and the manufacturer's installation instructions. Section M1502.4.1

Length limitation. The maximum length of a clothes dryer exhaust duct shall not exceed 35 feet from the dryer location to the wall or roof termination. The length reduction of the duct for fittings shall comply with tables 1502.4.4.1. The maximum length of the exhaust duct does not include the transition duct. Section M1502.4.5.1

Length Identification. Where the exhaust duct equivalent length exceeds 35 feet, the equivalent length shall be identified on a permanent label or tag located within 6 feet of the exhaust duct connection. Section M1502.4.6

Makeup Air. Installations exhausting more than 200cfm shall be provided with makeup air. Where a closet is designed for the installation of a clothes dryer, an opening having an area of not less than 100 square inches shall be provided in the closet enclosure. Section M1502.7

125. **Duct systems** shall be installed in accordance with Section M1601 and ACCA Manual D, or the installation instructions by the manufacturer. Building cavities used for return air duct or plenums in new construction shall conform to Section M1601.1.1.1 and for existing buildings Section M1601.1.1.2. Section M1601

126. **Combustion air.** Solid fuel-burning appliances shall be provided with combustion air in accordance with installation instructions by the appliance manufacturer. Oil-fired appliances shall be provided with combustion air in accordance with NFPA 31. The requirements for combustion and dilution air for gas-fired appliances shall be in accordance with Chapter 24. Section M1701.1

127. **Radon mitigation.** Radon gas mitigating system is required to be installed when constructing a new home within Clackamas County. Refer to ORSC Appendix F for radon mitigation requirements. Section AF101.1

Energy Efficiency

128. **New construction.** All conditioned spaces within new habitable buildings shall comply with the prescriptive requirements of Table N1101.1(1) plus two additional measures from Table N1101.1(2).

Exception: Conditioned, non-habitable, detached accessory structures shall meet the following requirements without additional measures: R-21 walls, R-38 attic or R-20 above deck roof, U-0.35 windows, U-0.70 opaque doors, and U-0.50 roll-up doors.

Table N1101.1(1) - Prescriptive Envelope Requirements
(* Simplified version - Refer to the entire table for footnotes and complete requirements)

Building Component	Standard Base Case	
	Required Performance	Equiv. Value *
Wall insulation - above grade	U-0.059 *	R21 Intermediate *
Wall insulation - below grade *	C-0.063	R-15/R-21
Flat ceilings *	U-0.021	R-49
Vaulted Ceilings *	U-0.033	R-30 Rafter or R-30A * Scissor Truss
Underfloors	U-0.033	R-30
Slab edge perimeter	F-0.520	R-15
Heated slab interior *	n/a	R-10
Windows *	U-0.030	U-0.030
Window area limitation *	n/a	n/a
Skylights *	U-0.050	U-0.050
Exterior doors *	U-0.020	U-0.020

Exterior doors with > 2.5 sq. ft. glazing *	U-0.040	U-0.040
Forced air duct insulation	n/a	R-8

129. **Alterations and repairs.** Alterations and repairs affecting energy conservation measures, and alterations or repairs which affect components of existing conditioned spaces, shall comply with Table N1101.1.

Exception: The minimum component requirements as specified in Table N110.1.2 may be used to the maximum extent practical.

Table N1101.2 - Existing Building Components Requirements
(* Simplified version - Refer to the entire table for footnotes and complete requirements)

Building Component	Standard Base Case	
	Required Performance	Equiv. Value *
Wall insulation	U-0.083	R-15
Flat ceiling	U-0.025	R-49
Vaulted Ceilings > 10 inches nominal rafter depth	U-0.040	R-25
Vaulted Ceilings > 8 inches nominal rafter depth	U-0.047	R-21
Underfloor > 10 inches nominal joist depth	U-0.028	R-30
Underfloor > 8 inches nominal joist depth	U-0.039	R-25
Slab edge perimeter	F-0.52	R-15
Windows	U-0.030	U-0.030
Skylights	U-0.060	U-0.060
Exterior doors	U-0.020	R-5
Exterior doors with > 2.5 sq. ft. glazing	U-0.040	R-2.5
Forced air ducts	n/a	R-8

130. **Additions.** Additions to existing buildings or structures may be made without making the entire building or structure comply with current energy requirements, if the new additions comply with such requirements.

Large additions. Additions that are either 40 percent of existing building heated space floor area or 600 square feet in area, whichever is less, shall be required to comply with Table N1101.1(2).

Small additions. Additions that are less than 40 percent of the existing building heated floor area or less than 600 square feet in area, whichever is less, shall be required to select one measure from table N1101.1(2) or comply with Table N1101.3.

Exception: Additions that are less than 15 percent of the existing building heated floor area or less than 200 square feet in area, whichever is less, shall not be required to comply with Table N1101.1(2) or Table N1101.3.

131. **Insulation materials.** Insulation materials shall be installed per manufacturer's listing and specifications and this section. Insulation R-values shall be specified as required in 16 CFR Ch. I (1-1-91 Edition) Part 460-Labeling and Advertising of Home Insulation. **Some general requirements for insulation are:**

Loose-fill insulation. Blown, poured and spray-on type insulation complying with Section R316 may be used in attic spaces where roof slope is 4 units vertical in 12 units horizontal (33.3 percent slope) or greater and there is at least 44 inches (1 118 mm) of headroom at the roof ridge. (Clear headroom is defined as the distance from the top of the bottom chord of the truss or ceiling joists to the underside of the roof sheathing.) Adequate baffling of the vent opening shall be provided so as to deflect the incoming air above the surface of the blown or poured insulation. Baffles shall be of weather-resistant, rigid material capable of retaining the insulation and shall be in place at the time of framing inspection. Section N1104.2.1

Batt-type insulation. Batt-type insulation shall be installed flush against the warm side of the cavity insofar as practicable. Section N1104.2.2

Foam plastic materials shall meet the general and application-specific requirements provided within Section R316.

Insulation protection. Insulation exposed to the exterior shall be protected from physical and solar damage. Section N1104.2.3

Clearances. Recessed light fixtures shall be IC labeled for direct insulation contact. Thermal insulation shall not be installed within 3 inches (76 2. mm) of any metal chimney or gas vent that is not listed for insulation clearances. Thermal insulation shall not be installed in a manner that would obstruct openings required for attic ventilation. A permanent sleeve of fine wire mesh screen, sheet metal or other noncombustible material shall be installed to maintain the required clearances. Section N1104.2

Flame spread. All exposed insulation materials, including facings, shall have a flame-spread index not to exceed 25 with an accompanying smoke developed index not to exceed 450 when tested in accordance with ASTM E84 except for insulation facing in contact with unexposed ceiling, floor & wall surfaces. Section R302.9 complete requirements.

132. **Slab-on-grade floors.** For slab-on-grade floors, the perimeter of the floor shall be insulated. The insulation shall extend downward from the top of the slab for a minimum of 24 inches or downward to the bottom of the slab, then horizontally beneath the slab for a minimum total distance of 24 inches. Section N1104.7

Exception: For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the thickened edge.

Slab-on-grade floors with hydronic heat. For slab-on-grade floors that incorporate hydronic heating, in addition to perimeter insulation, the entire underside of slab shall be insulated to R-10. Section N1104.7.1

133. **Exterior doors.** Doors shall be tested according to the requirements of Section N1104.4. When calculating the energy performance of the exterior envelop, the area of doors shall be the actual unit size. Section N1104.3

Exceptions:

1. Unglazed doors that are not tested according to the requirements of Section N1104.4 shall be assigned a default U-value of 0.54.

2. Sliding glass doors and swinging glass doors shall meet the specification for windows and shall be treated as such.

3. Doors that incorporate glazed areas more than 2.5 square feet in area shall be considered exterior doors with greater than or equal to 2.5 square feet glazing. Doors shall meet the air leakage requirements of section N1104.8.

134. **Windows.** All windows installed in Oregon shall meet the requirements of Part III, Fenestration Standard. Section N1104.4

1. Decorative or unique architectural feature glazing not exceeding 1 percent of the heated space floor area is exempt from thermal performance requirements and does not need to be included in Table N1104.1(1) thermal performance calculations.
2. Glass block assemblies may use a U-factor of 0.51
3. The U-factor for windows may be a weighted average of total window area when all other building envelope measures are in compliance with performance requirements specified in this code. This calculation shall be provided to the building official and the windows that are less than required for prescriptive compliance shall be identified on the plans.

Thermal performance labeling. All windows shall have performance labels. See N1104.4.1 and N1104.4.2 for requirements.

135. **Air leakage.** All windows and doors must meet the air leakage requirements of Section N1104.8.

136. **Sealing required.** Exterior joints around window and doorframes, between wall cavities and windows or door frames, between wall and foundation, between wall and roof, between wall panels, at penetrations of utility services through walls, floors and roofs and all other openings in the exterior envelope shall be sealed in a manner approved by the building official. Section N1104.8.2

137. **Air Barriers.** An air barrier shall be provided on every vertical portion of air-permeable insulation and on the warm side of horizontal, air-permeable insulation. Section N1104.2.6

Exception: Unvented attics, continuous insulation walls and similar conditions where an impermeable insulation layer forms an air barrier.

138. **Vapor retarders.** A 1-perm, dry cup rating vapor retarder shall be installed on the warm side (in winter) of all insulation. Section N1104.9.1

Exceptions:
1. When insulation is installed in ceilings in an existing structure and ventilation is provided as specified in Section R806, a vapor retarder need not be installed.
2. Below-grade walls are not required to have a vapor retarder.
3. Slab-on-grade floors need not have a warm-side vapor retarder.

139. **Ground cover.** A ground cover shall be installed in the crawl space for both new and existing buildings when insulation is installed. Ground cover shall be 6-mil (0.15 mm) black polyethylene or other approved material of equivalent perm rating. Ground cover shall be lapped 12 inches (305 mm) at all joints and cover the entire surface area extending full width and length of the crawl space and turn 12 inches (305 mm) up the foundation wall. Ground cover of 6-mil (0.15 mm) polyethylene or an approved equal (that is as durable) shall be installed on the ground beneath concrete floor slabs located in conditioned spaces. Section N1104.9.2

140. **High-efficacy lamps.** All permanently installed lighting fixtures shall contain high-efficacy lamps. Screw-in compact florescent lamps comply with this requirement. The building official shall be notified in writing at the final inspection that the permanently installed lighting fixtures have met this requirement. Section N1107.2

Exception: High-efficacy lamps are not required at 2 indoor and 2 outdoor fixtures.

141. **Solar ready.** This section will be updated with an interim amendment. See Oregon.gov/bcd. Section N1107.4

142. **Electric vehicles.** This section will be updated with an interim amendment. See Oregon.gov/bcd. Section N1107.5

143. **Plumbing fixture efficiency.** Water closets shall be EPA WaterSense labeled, with an effective flush volume not exceeding 1.28 gallons per flush. Shower heads shall be EPA WaterSense labeled, with a maximum flow rate not exceeding 2.0 gallons per minute. Section N1108

Heating, Ventilation, and Air-Conditioning Systems

144. **Insulation of ducts**. All new duct systems, or new portions thereof, exposed to unconditioned spaces shall be insulated to R8. Sections N1101.1 and N1105.2.

Exception: The replacement or addition of a furnace, air conditioner or heat pump shall not require existing ducts to be insulated to current code.

145. **HVAC controls**. All heating, ventilating and air-conditioning systems shall be provided controls in accordance with Section N1105.3.

146. **Temperature.** Each heating, ventilating and air-conditioning system shall be provided with at least one thermostat for the regulation of temperature. Each thermostat shall be capable of being set from 55°F to 75°F (13°C to 24°C) where used to control heating only and from 70°F to 85°F (21°C to 29°C) where used to control cooling only. Where used to control both heating and cooling, it shall be capable of being set from 55°F to 85°F (13°C to 29°C) and shall be capable of operating the system heating and cooling in sequence. It shall be capable of providing a temperature range of at least 5°F (3°C) within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum. Section N1105.3.1

147. **Humidity.** If a heating, ventilating and air-conditioning system is equipped with a means for adding moisture to maintain specific selected relative humidity in spaces or zones, a humidistat shall be provided. This device shall be capable of being set to prevent new energy from being used to produce space relative humidity above 30 percent. Where a humidistat is used in a heating, ventilating and air-conditioning system for controlling moisture removal to maintain specific selected relative humidity in spaces or zones, it shall be capable of being set to prevent new energy from being used to produce a space relative humidity below 60 percent. Section N1105.3.2

148. **Temperature zoning.** Each separate heating, ventilating and air-conditioning system shall be provided at least one thermostat for regulation of space temperature. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating or cooling input to each zone or floor, excluding unheated or noncooled basements and garages. Section N1105.3.3

149. **Setback and shutoff.** The thermostat, or an alternate means such as a switch or clock, shall provide a readily accessible manual or automatic means for reducing the energy required for heating and cooling during periods of nonuse or reduced need. Lowering thermostat set points to reduce energy consumption of the heating system shall not cause energy to be expended to reach the reduced setting. Section N1105.3.4

Exceptions:

1. Where it can be shown that setback or shutdown will not result in a decrease in overall building energy.
2. Equipment with full load demand of 2 kilowatt (6.826 Btu/h) or less may be controlled by readily accessible off-hour controls.

Outdoor thermostat required. An outdoor thermostat or factory installed temperature sensor with electronic controls shall be used to lock-out supplemental heat based on outdoor air temperature. The lock-out temperature shall be set at 400 degree F. There shall be no compressor lock-out temperature. Section N1105.3.4.1.1

Heat pump controls. All heat pump system thermostats shall be capable of manual setback and limiting the use of supplemental heat during warm-up periods. Section N1105.3.4.1