

City of Hillsboro

Addition/Remodel Guidelines For Residential Structures

Introduction

The purpose of these Addition/Remodel Guidelines is to assist in the preparation of the permit submittal. This handout will provide general information and includes a copy of the following:

- Residential Code Summary, based on the 2011 Oregon Residential Specialty Code (ORSC)
- Sample drawings of a Site Plan, Floor Plan, Foundation Plan and Cross-Section
- ORSC figures/tables and additional information:
 - Tables listing the required fasteners for structural members
 - Table and code section relating to mechanical ventilation
 - Post and beam connections
 - Illustrations of normal vehicle path and recommended types of protection
 - Cutting, notching and drilling
 - Minimum fixture clearances
 - Footings adjacent to public utility easements
 - Deck railing details
- Moisture content acknowledgement form
- High-efficiency interior lighting systems form
- Residential energy checklist

The following information is essential to the success of the project:

- First, existing conditions, which will be impacted by the addition/remodel; of particular importance are elements of the structure (roof trusses, floor joists, beams, etc.), for which, supporting members are to be changing.
- Second, show all elements and construction that is to be removed.
- Third, show all new elements and construction. Clearly identify all elements including the use of the areas, provide dimensions and member sizes and provide details to clarify how the construction is to be accomplished.

Please ensure that all requirements of the Residential Building Permit Application Checklist (available as a separate handout) are completed for a smooth and timely review process.

CITY OF HILLSBORO

Building Department

RESIDENTIAL CODE SUMMARY

2011 EDITION OF THE OREGON RESIDENTIAL SPECIALTY CODE (BASED ON 2009 IRC)
2011 OREGON ELECTRICAL SPECIALTY CODE (BASED ON THE 2011 NEC)
2011 OREGON PLUMBING SPECIALTY CODE (BASED ON THE 2009 UPC)

STRUCTURAL, MECHANICAL, ELECTRICAL AND PLUMBING REQUIREMENTS

This checklist becomes part of the approved plans and permit. Construction must comply with applicable code requirements. Approved plans must be kept on the job site. Buildings must be built to conform to the approved plans. Plan changes require Building Department approval and may require designer approval. Refer to the building permit card for required inspections. Final Inspection and approval required before occupancy.

CERTIFICATE OF OCCUPANCY

OAR 918-480-0140 Residential Certificate of Occupancy (See complete OAR for additional information.)

- (1) 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, unless a temporary certificate of occupancy is issued by the building official.
- (2) This rule applies to a new residential dwelling or townhouse, if the structural permit for construction of the residential dwelling or townhouse was applied for on or after April 1, 2008.

See Oregon Residential Specialty Code (ORSC) Section R110 for complete information.

BUILDING PLANNING

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. Section R202

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

PROPERTY LINE is the demarcation of separate ownership and the line used to determine Fire Separation Distance. An imaginary property line is used to determine the fire separation distance for adjacent buildings on the same property.

EXTERIOR WALL LOCATION:

1. Construction, projections, opening and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1. See Section R302.1
EXCEPTION:
 1. Walls, projections, openings or penetrations in walls perpendicular to the line used to determine the fire separation distance.
 2. Walls of dwellings and accessory structures located on the same lot.
 3. Detached tool sheds and storage sheds, playhouses and similar structures exempted from permits are not required to provide wall protection based on location on the lot. Projections beyond the exterior wall shall not extend over the property line.
 4. Detached garages accessory to a dwelling located within 2 feet of a lot line are permitted to have roof eave projections not exceeding 4 inches.
 5. Foundation vents installed in compliance with this code are permitted.

SITE ADDRESS:

2. **Site address.** Buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Where access is by means on a private road and the building address cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure. Section R319

LIGHT AND VENTILATION:

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 *Emergency Escape and Rescue Openings* and an approved mechanical ventilation system is provided capable of producing 0.35 air change per hour in the room or a whole-house mechanical ventilation system is installed capable of supplying outdoor ventilation air of 15 cubic feet per minute (cfm) per occupant computed on the basis of two occupants for the first bedroom and one occupant for each additional bedroom.
 2. The glazed areas need not be provided in rooms where EXCEPTION 1 above is satisfied and artificial light is provided capable of producing an average illumination of 6 footcandles (6.46 lux) over the area of the room at a height of 30 inches above the floor level.
 3. Use of sunroom additions and patio covers, as defined in Section R202, shall be permitted for natural ventilation if in excess of 40 percent of the exterior sunroom walls are open, or 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
5. **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 are provided. The minimum ventilation rate shall be in accordance with Table M1507.3.
6. **Required heating.** Every dwelling unit shall be provided with heating facilities capable of maintaining a minimum room temperature of 68^oF (20^oC) 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 R303.8

MINIMUM ROOM AREAS AND CEILING HEIGHT:

7. Every dwelling unit shall have at least one habitable room that shall have not less than 120 square feet of floor area. Other habitable rooms shall have a floor area of not less than 70 square feet. Habitable rooms, except kitchens, shall not be less than 7 feet in any horizontal dimension. See Section R304
8. Habitable space, hallways, bathrooms, toilet rooms, laundry rooms and portions of basements, shall have a ceiling height of not less than 7 feet. Section R305
EXCEPTIONS:
 1. Beams and girders spaced not less than 4 feet on center may project not more than 6 inches below the required ceiling height.
 2. Not more than 50 percent of the required floor area of a room or space is permitted to have a sloped ceiling less than 7 feet in height with no portion of the required floor area less than 5 feet in height.
 3. 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 is 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 is 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
9. **Basements.** Portions of basements that do not contain habitable space, hallways, bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches. Section R305.1.1
EXCEPTIONS: Beams, girders, ducts or other obstructions may project to within 6 feet 4 inches of the finished floor.

TOILET, BATH AND SHOWER SPACES:

10. **Space Required.** Fixtures shall be spaced in accordance with Figure R307.1 Minimum Fixture Clearances, and in accordance with the requirements of the *Plumbing Code*. Section R307.1
11. **Bathtub and shower spaces.** Bathtub and shower floors and walls above bathtubs with installed showerheads and in shower compartments shall be finished with a nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet above the floor. Section R307.2

EXITS:

12. **Egress Door.** At least one egress door shall be provided for each dwelling unit. The egress door shall be side-hinged and shall provide a minimum clear width of 32 inches when measured between the face of the door and the stop, with the door open 90

degrees. The minimum clear height of the door opening shall not be less than 78 inches in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. The egress door shall be readily operable from inside the dwelling without the use of a key or special knowledge or effort. Section R311.2

13. **Hallway.** The minimum width of a hallway shall be not less than 3 feet. Section R311.6
14. **Attachment.** Exterior landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal. Section R311.5.1

EMERGENCY ESCAPE AND RESCUE OPENINGS:

15. **Emergency Escape and Rescue.** 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. Where emergency escape and rescue openings are provided they shall have a sill height of not more than 44 inches above the floor. 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 and rescue openings with a finished sill height below the adjacent ground elevation shall be provided with a window well in accordance with Section R310.2. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way. Section R310.1 **EXCEPTION:** Basements used only to house mechanical equipment and not exceeding total floor area of 200 square feet.
 - a) **Minimum opening area.** All emergency escape and rescue openings shall have a minimum net clear opening of 5.7 square feet. Section R310.1.1 **EXCEPTION:** Grade floor openings (sill height not more than 44 inches above or below finished ground level) shall have a minimum net clear opening of 5 square feet.
 - b) **Minimum opening height.** The minimum net clear opening height shall be 24 inches. Section R310.1.2
 - c) **Minimum opening width.** The minimum net clear opening width shall be 20 inches. Section R310.1.3
 - d) **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 R310.1.4

WINDOW REQUIREMENTS:

16. **Window Sills.** In dwelling units, where the opening of an operable window is located more than 72 inches (1829 mm) above the finished grade or surface below, the lowest part of the clear opening of the window shall be a minimum of 24 inches (610 mm) above the finished floor of the room in which the window is located. Glazing between the floor and 24 inches (610 mm) shall be fixed or have openings through which a 4- inch diameter sphere cannot pass. Operable sections of windows shall not permit openings that allow passage of a 4 inch diameter sphere where such openings are located within 24 inches of the finished floor. Section R612.2
 - Exceptions:**
 1. Windows whose openings will not allow a 4- inch-diameter (102 mm) sphere to pass through the opening when the opening is in its largest opened position.
 2. Openings that are provided with window fall prevention devices that comply with Section R612.3.
 3. Openings that are provided with window fall prevention devices that comply with the requirements of ASTM F 2090.
 4. Windows that are provided with opening limiting devices that comply with Section R612.4
17. **Operation for Emergency Escape.** For windows required as emergency escape and rescue openings the window opening limiting device shall be designed with release without key, tool or special knowledge. Window opening limiting devices shall comply with all of the following:
 1. Release of the window opening limiting device shall require no more than 15 pounds of force.
 2. The window opening limiting device shall operate properly in all types of weather.
 3. The window opening limiting device shall have their release mechanisms clearly identified for proper use in an emergency.
 4. The window opening limiting device shall not reduce the minimum net clear opening area of the window unit below emergency escape and rescue openings requirements.
18. **SAFETY GLAZING.** Safety glazing shall be installed in all locations considered to be hazardous – Refer to Section R308.4.
 - Hazardous locations are as follows:**
 1. Glazing in all fixed and operable panels of swinging, sliding and bifold doors.
 - EXCEPTIONS:**
 1. Glazed openings of a size through which a 3-inch diameter sphere is unable to pass.
 2. Decorative glazing.
 2. Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge is within a 24-inch arc of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface.
 - EXCEPTIONS:**
 1. Decorative glazing.
 2. When there is an intervening wall or other permanent barrier between the door and the glazing.
 3. Glazing in walls on the latch side of and perpendicular to the plane of the door in a closed position.

4. Glazing adjacent to a door where access through the door is to a closet or storage area 3 feet or less in depth.
5. Glazing that is adjacent to the fixed panel of patio doors.
3. Glazing in an individual fixed or operable panel that meets all of the following conditions:
 - 3.1. The exposed area of an individual pane is larger than 9 square feet; and
 - 3.2. The bottom edge of the glazing less than 18 inches above the floor; and
 - 3.3. Top edge of the glazing is more than 36 inches above the floor; and
 - 3.4. One or more walking surfaces are within 36 inches, measured horizontally and in a straight line, of the glazing.

- EXCEPTIONS:**
1. Decorative glazing
 2. When a horizontal rail is installed on the accessible side of the glazing 34 to 38 inches above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1½ inches in cross sectional height.
 3. Outboard panes in insulating glass units and other multiple glazed panels when the bottom edge of the glass is 25 feet or more above grade, a roof, walking surfaces or other horizontal [within 45 degrees of horizontal] surface adjacent to the glass exterior.

4. All glazing in railings regardless of an area or height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.
5. Glazing in enclosures for or walls facing hot tubs, whirl-pools, saunas, steam rooms bathtubs and showers where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface.

EXCEPTION: Glazing that is more than 60 inches, measured horizontally and in a straight line, from the water's edge of a hot tub, whirlpool, saunas, steam rooms or bathtubs and showers.

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

- EXCEPTIONS:**
1. When a rail is installed on the accessible side of the glazing 34 to 38 inches above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1½ inches in cross sectional height.
 2. The side of the stairway has a guardrail or handrail, including balusters or in-fill panels, complying with Sections R311.7.7 and R312 and the plane of the glazing is more than 18 inches from the railing; or
 3. When a solid wall or panel extends from the plane of the adjacent walking surface to 34 inches to 36 inches above the walking surface and the construction at the top of that wall or panel is capable of withstanding the same horizontal load as a guard.

8. Glazing adjacent to stair ways within 60 inches horizontally of the bottom tread of the stairway in any direction when exposed surface of the glass is less than 60 inches above the nose of the tread.

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

LANDINGS:

19. **Floors and 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 landing shall be permitted to have a slope not to exceed 0.25 units vertical in 12 units horizontal (2-percent). Section R311.3
20. **Floor elevations at the required egress doors.** Landings or floors at the required egress door shall not be more than 1½ inches lower than the top of the threshold. Section R311.3.1
Exception: The exterior landing or floor shall not be more than 8 inches below the top of the threshold provided the door does not swing over the landing or floor.
21. **Floor elevations for other exterior doors.** Doors other than the required egress door shall be provided with landings or floors not more than 8 inches below the top of the threshold. Section R311.3.2
Exception: A landing is not required where a stairway of three or fewer risers is located on the exterior side of the door, provided the door does not swing over the stairway.
22. **Storm and screen doors.** Storm and screen doors shall be permitted to swing over all exterior stairs and landings. Section R311.3.3

STAIRWAYS:

23. **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. Any handrail may encroach a maximum of 4.5 inches into the clear width. Section R311.7.1
24. **Treads and risers.** The maximum riser height shall be 8 inches and the minimum tread depth shall be 9 inches. The riser height shall be measured vertically between the leading edges of the adjacent treads. 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 riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch. Sections R311.7.4.1, R311.7.4.2, R311.7.6
25. **Profile.** The radius of curvature at the leading edge of the tread shall be no greater than 9/16 inch. A nosing not less than 3/4 inch but 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 1/2 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 R311.7.4.3
- EXCEPTIONS:**
1. A nosing is not required where the tread depth is a minimum of 10 inches.
 2. The opening between adjacent treads is not limited on stairs with a total rise of 30 inches or less.
26. **Steps.** The rise of a step or steps exclusive of a threshold shall not be less than 4 inches or greater than 8 inches. Section R311.7.4.5
27. **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
28. **Headroom.** The minimum headroom in all parts of the stairway shall not be less than 6 feet 8 inches measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway. Section R311.7.2
29. **Winders.** Winder treads shall have a minimum tread depth of 9 inches measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walk line. Winder treads shall have a minimum tread depth of 6 inches at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth of the walk line shall not exceed the smallest winder tread by more than 3/8 inch. Section R911.7.4.2
30. **Stairway Illumination.** All interior and exterior stairways shall be provided with a means to illuminate the stair, including landing and treads. Section R303.6

RAMPS:

31. **Ramps.** Ramps shall have a minimum width of 3 foot with a 3 foot landing at the top and bottom and a maximum slope of one unit vertical in twelve units horizontal (8.3 percent slope). See Section R311.8.
32. **Accessibility.** Dwelling units required to have accessible ramps shall comply with Chapter 11 of the *Oregon Structural Specialty Code*.

DECKS:

33. **Protection-decay.** Approved naturally durable or pressure-treated wood shall be used for those portions of wood members which form the structural supports of balconies, porches or decks exposed to the weather without adequate protection from a roof, eave, overhang or other covering which would prevent moisture or water accumulation on the surface or at joints between members. Section R317.1.3
34. **Posts and columns.** Approved column cap required for positive connection between post and beam. Approved column base required for positive connection at the bottom of the post or column over 4 feet in height. The columns shall be adequately anchored to prevent lateral displacement. Wood columns shall be not less in nominal size than 4 inches by 4 inches and steel columns shall be not less than 3-inch diameter standard pipe or approved equivalent (Section R407).
35. **Deck ledger attachment.** Where supported by attachment to an exterior wall, decks shall be positively anchored to the structure and designed for both vertical and lateral loads as applicable. Such attachment shall be by 1/2 inch lag screws or bolts with washers through a minimum 2x8 pressure treated ledger. The lags or bolts shall be staggered and shall not be placed within 2 inches from the bottom or top of the ledger. Lags or bolts shall start between 2 and 5 inches from the ends of each ledger. Lags, bolts and washers shall be hot-dipped galvanized or stainless steel. Section R502.2.2
36. **Tension Hold-Down Attachments.** Each deck shall have not less than two 1500 pound hold-down tension attachments.

Each attachment shall be by approved hold-down devices attached by all-thread with one connected to the interior floor joist system and the other to the exterior deck joist in accordance with the listing of the device and Figure R502.2.2.3. Section R502.2.2.3

HANDRAILS AND GUARDS:

37. **Handrails** shall be provided on at least one side of each continuous run of treads or flight with four or more risers. The continuous handrail required for winders shall be located on the side where the tread is narrower. Sec. R311.7.7
- a) **Handrails height.** The handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 30 inches and not more than 38 inches. Section R311.7.7.1
- EXCEPTIONS:**
1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
 2. When handrail fittings or bendings are used to provide continuous transition between flights, the transition from handrail to guardrail, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed the maximum height.
- b) **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. 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. Section R311.7.7.2
- 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 tread.
- c) **Handrail grip size.** All required handrails shall be of one of the following types or provide equivalent graspability. Section R311.7.7.3
- Type I.** Handrails with a circular cross section shall have an outside diameter of at least 1 1/4 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 6 1/4 inches with a maximum cross section of dimension of 2 1/4 inches. Edges shall have a minimum radius of 0.01 inches.
- Type II.** Handrails with a perimeter greater than 6 1/4 inches shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of 3/4 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 1 1/4 inches to a maximum of 2 1/4 inches. Edges shall have a minimum radius of 0.01 inches.
38. **Guards:**
- a) **Where required.** 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. Insect screening shall not be considered as a guard. Section R312.1
- b) **Height.** Required guards at open sided walking surfaces, including stairs, porches, balconies or landings shall be not less than 36 inches high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connection the leading edges of the treads. Section R312.2
- EXCEPTIONS:**
1. Guards on the open sides of stairs shall have a height not less than 34 inches measured vertically from a line connecting the leading edges of the treads.
 2. Where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall be not less than 34 inches and not more than 38 inches measured vertically from a line connecting the leading edges of the treads.
- c) **Opening limitations.** Required guards shall not have openings from the walking surface to the required guard height which allow passage of a sphere 4 inches in diameter. Section R312.3
- EXCEPTIONS:**
1. The triangular openings at the open side of a stair, formed by the riser, tread and bottom rail of a guard, shall not allow passage of a sphere 6 inches in diameter.
 2. Guards on the open sides of stairs shall not have openings which allow passage of a sphere 5 inches in diameter. Opening limitations for required guardrails on open sides of stairways are applicable above the second riser of the stair.
- d) **Exterior wood plastic composite guards.** Wood plastic composite guards shall comply with the provisions of section R317.4 Section R312.4

SMOKE AND CARBON MONOXIDE ALARMS:

39. **Smoke Alarms.** Section R314:
- a) **Single- and multiple-station smoke alarms** shall be installed in the following locations:
1. In each sleeping rooms.
 2. Outside of each separate sleeping area in the immediate vicinity of the bedrooms.
 3. On each additional story of the dwelling, including basements and cellars 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.
- b) **Activation.** When more than one smoke alarm is required to be installed within an individual dwelling unit the alarm device shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual unit. All smoke alarms shall be listed and installed with the provisions of this code.

- c) **Prohibited locations.** Required smoke alarms shall not be located within kitchens or garages, or in other spaces where temperatures can fall below 40° F (5°C). Ionization smoke alarms shall not be located closer than 3 feet horizontally from the following:
 - 1. The door to a kitchen.
 - 2. The door to a bathroom containing a tub or shower;
 - 3. The supply registers of a forced air heating or cooling system, outside the airflow from those registers.
 - d) A smoke alarm installed within 20 feet (direct linear path) of a cooking appliance shall be a photoelectric-type smoke alarm or the alarm shall have an approved alarm silencing means.
 - e) **Alterations, repairs and additions.** When alterations, repairs or additions requiring a structural permit occur, or when one or more sleeping rooms are added or created in existing dwellings, the individual dwelling unit shall be equipped with smoke alarms located as required for new dwellings. Section 314.3.1 **EXCEPTION:** Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements of this section.
 - f) **Power source.** Smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for over current protection. Smoke alarms shall be interconnected. Section R314.4
EXCEPTIONS:
 - 1. Smoke alarms shall be permitted to be battery operated when installed in buildings without commercial power.
 - 2. Interconnection and hard wiring of smoke alarms in existing areas shall not be required where the alterations or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure.
40. **Carbon monoxide alarms.** Section R315:
- a) **Location.** Carbon monoxide alarms shall be located in the following locations:
 - 1. In each bedroom or within 15 feet outside of each bedroom door.
 - 2. Bedrooms on separate floor levels in a structure consisting of two or more stories shall have separate carbon monoxide alarms serving each story.
 - b) **Power Source.** Single station carbon monoxide alarms shall be battery operated, or may receive their primary power from the building wiring system. Plug in devices securely fastened to the structure and installed in accordance with the manufacturer's installation instructions are deemed to satisfy this requirements. Hard wired and plug-in carbon monoxide alarms shall be equipped with battery backup.
 - c) **Combination smoke/carbon monoxide alarms/detectors.** Combination smoke/carbon monoxide alarm/detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when the primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke alarms/detectors shall be interconnected. **EXCEPTION:** Interconnection and hard-wiring of combination smoke/carbon monoxide alarms/detectors in existing areas shall not be required where the alteration or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure.
 - d) **Existing dwellings.** Where a new carbon monoxide source is introduced or work requiring a structural permit occurs in existing dwelling, carbon monoxide alarms shall be provided in accordance with Section R315.5. **EXCEPTION:** Work involving the exterior surface of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, are exempt from the requirements.

GARAGES AND CARPORTS:

- 41. **Garage separation.** The garage shall be separated from the residence and its attic area by not less than 1/2-inch gypsum board applied to the garage side. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 5/8-inch Type X gypsum board or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall also be protected by not less than 1/2-inch gypsum board or equivalent. Garages located less than 3 feet (914mm) from a dwelling unit on the same lot shall be protected with not less than 1/2 inch gypsum board applied to the interior side of exterior walls that are within this area. Openings in these walls shall be regulated by Section R302.5. This provision does not apply to garage walls that are perpendicular to the adjacent dwelling unit wall. Sections R302.5 and R302.6
- 42. **Openings.** Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Section R309.1
 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
- 43. **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. Section R309.1 and R309.2
EXCEPTION: Asphalt surfaces shall be permitted at ground level in carports. Section R309.2
- 44. **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

45. **Protection from impact.** Appliances located in a garage or carport shall be protected from impact by automobiles. Figure M1307.1 contains examples of acceptable types of protection. Section M1307.3.1

FOOTINGS AND FOUNDATIONS: RESIDENTIAL CONCRETE:

46. Bottoms of exterior wall, bearing wall, pier and column footings shall be not less than 12 inches below finished grade (Section 403.1.5). **Footings** shall be placed on undisturbed natural soil or engineered fill (Section R403.1). The top surfaces of footings shall be level. The bottom surface of footings may have a slope not exceeding 1 in 10. Footings shall be stepped where the ground surface is more than 1 in 10. Section 403.1.6
47. **Ground clearance.** Foundation walls shall extend above the finish grade by not less than 4 inches (Section R404.1.6). 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 unless pressure treated or naturally resistant to decay. See Section R317.1 Item 5
48. **Minimum sizes.** Continuous concrete footings shall be 12" x 6" at 1-story, 15" x 7" at 2-story and 18" x 8" at 3-story structures. Foundation wall thickness shall be not less than 6" at 1-story, 8" at 2-story and 10" at 3-story structures. Isolated footings in the crawl space shall be 18" diameter by 8" minimum. See R403.1.1 and R403.1.2.
49. **Foundation and Retaining walls** subject to hydrostatic pressure from ground water and walls supporting more than 48 inches of unbalanced backfill that do not have permanent lateral support at the top and bottom shall be engineer designed. Refer to Sections R404.1.3 and R404.4.
50. **Compressive Strength. The required minimum compressive strength of concrete is 3000 psi at 28 days. Exception:** Slabs and steps NOT exposed to the weather except the garage floor slab may be 2500 psi. See Table R402.2 and Section R404.1.2.3.1 for SDC D1 requirements.
NOTE: Concrete shall be air entrained (5%-7%) for strengths of 3000 psi and 3500 psi, and when subject to freezing and thawing during construction for 2500 psi concrete.
51. **Seismic reinforcing. All reinforcement shall be 60,000 psi (Grade 60)** (see Section R404.1.2.3.7.1 for SDC D1 requirements). Concrete foundation walls shall be constructed in accordance with Table R404.1.2(1) for horizontal reinforcement and Tables (2) through (4) for wall thickness and vertical reinforcement. Additionally, foundation walls shall comply with the provisions of Section R404.1.4.2 for Seismic Design Category D1. Foundations with stem walls shall be provided with a minimum of one No. 4 bar within 12 inches of the top of the wall and one No. 4 bar located 3 inches to 4 inches from the bottom of the footing. Section R403.1.4.1
Where a construction joint is created between a concrete footing and stem wall, a minimum of one No. 4 bar shall be provided at no more than 4 feet on center. The vertical bar shall extend 3 inches clear of the bottom of the footing, have a standard hook and extend a minimum of 14 inches into the stem wall. See Section R403.1.4. **NOTE:** Unless otherwise detailed on plan, a 6 inch 90 degree bend on the short leg (hook) will be considered as meeting the intent of this section.
52. **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 with 3 ties. The spliced lap of the stubbed up bar to the footing bar shall be a minimum of 12 inches. Section R403.1.7
53. **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 mudsill splices or less than 7 bolt diameters from mudsill splice. Min. 2 anchor bolts per plate. See Sections R403.1.8 and R403.1.8.1. **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.
54. **Concrete slabs.** Slab on grade floors shall be not less than 3 1/2 inches thick. Slabs that are exposed to the weather and garage slabs shall be minimum 3000 psi concrete (Section R402.2). A maximum 24 inches of compacted clean sand or gravel fill is allowed under the slab unless by design for structural fill. A maximum of 8 inches of compacted earth, free of vegetation, may be under slabs without being designed as structural fill. A 6 mil polyethylene ground cover with minimum 12 inch lapped joints is required under all slabs located in heated spaces. See Section R506.
55. **Footings on or adjacent to slopes.** Sufficient distance shall be provided from ascending slopes to protect buildings from slope drainage, erosion and Shallow failure per R403.1.9.1. Footings on or adjacent to slope surfaces shall be founded in material with an embedment and vertical and lateral support for the footing without detrimental settlement. A 45 degree angle of repose is assumed to be the zone of influence for each edge of the footing. Refer to Section R403.1.9.2.

CRAWL SPACES:

56. **Access opening.** Crawl spaces shall be provided with a minimum 18 inches by 24 inches access opening. 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. Pipes, ducts and other construction must not obstruct accessibility to and within the crawl space. Section R408.3. See Section M1305.1.4 for access requirements where mechanical equipment is located under floor.
57. **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 1500 square feet of under-floor space area. One ventilating opening shall be required within 3 feet of each corner of the building. The openings shall be covered with corrosion resistant wire mesh or equivalent with 1/8-inch minimum dimension. Ventilation openings may be omitted on one side of a building. Ventilation openings may be omitted when continuously operated mechanical ventilation is provided at a rate of 1.0 cfm for each 50 square feet of crawl space floor area and ground surface is covered with an approved vapor barrier material. Sections R408.1 and R408.2.
58. **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. See Section R408.5.
59. **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 the 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 R408.4**
60. **Radon Mitigation (new buildings).** Radon mitigation shall be provided by either a mechanical crawlspace ventilations system in accordance with ORSC Section R408.2 exception 3, a crawlspace mitigation system, or a passive sub-membrane depressurization system. See ORSC Appendix F for construction details.

SURFACE AND GROUNDWATER CONTROL, DAMP PROOFING:

61. **Drainage.** Surface drainage shall be diverted to a storm sewer conveyance or other approved point of collection so as not to create a hazard. Lots shall be graded so as to drain surface water away from the foundation walls. The slope from foundation walls shall fall at least 6 inches in the first 10 feet or at least 6 inches where the horizontal distance is restricted by property line. Section 401.3
62. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or 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.. Section 401.3 – Exception
63. **Waterproofing and Damp-proofing.** Except where required by Section R406.2 to be waterproofed, foundation walls that retain earth and enclose interior spaces and floors below grade shall be damp-proofed from top of the footing to the finished grade. Masonry walls shall have not less than 3/8 inch Portland cement parging applied to the exterior of the wall. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below grade shall be waterproofed from the top of the footing to the finished grade. Sections R406.1 R406.2

PROTECTION AGAINST DECAY:

64. **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 AWP A U1 for species, product, preservative and end use. Preservatives shall be listed in Section 4 of AWP A 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 ½ inches on tops, side 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.
65. **Field Treatment.** Field-cut ends, notches and drilled holes or preservative-treated wood shall be treated in the field in accordance with AWP A M4. Section R317.1.1

66. **Ground contact.** All wood in contact with the ground, embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather that supports permanent structures intended for human occupancy shall be approved pressure-preservative-treated wood suitable for ground contact use, except untreated wood may be used where entirely below groundwater level or continuously submerged in fresh water. Section R317.1.2
67. **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.
68. **Fasteners.** Fasteners and connectors in contact with preservative-treated wood and fire-retardant-treated wood shall be in accordance with this section. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153. Section R317.3 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 copper. Coating types and weights for connectors in contact with preservative-treated wood shall be in accordance with the connector manufacturer's recommendations. In the absence of manufacturer's recommendations, a minimum of ASTM A 653 type G185 zinc-coated galvanized steel, or equivalent, shall be used. 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.
- Wood/plastic composites shall be installed in accordance with the manufacturer's instructions. Sections R317.4 and R317.4.1

FLOOR FRAMING:

69. **Grading and Fasteners.** Load bearing dimension lumber (including logs used in log home construction) shall be identified by a grade mark. Refer to Tables R602.3(1) & R602.3(2) for fastener (nails, staples, etc.) requirements. See Sections R502 and R602.
70. **Design and construction.** Floor framing shall be designed and constructed in accordance with Chapter 5, Figure R502.2 and nailed in accordance with Tables R602.3(1) and R602.3(2). See Section 502
71. **Drilling and notching.** Structural floor members shall not be cut, bored or notched in excess of the limitation specified in Section 502.8 and Figure R502.8. Wall studs and plates shall not be cut, bored or notched in excess of the limitation specified in Section 602.6.
72. **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.
73. **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
74. **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
75. **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
76. **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. Section R502.7
77. **Plywood Gussets.** Where posts and beam or girder construction is used, plywood gussets shall be provided at all post-to-beam connections. Lateral bracing is required at the bottom end of posts exceeding 4'-0" in length. Section R502.9
78. **Wood floor and roof trusses** shall be of approved design and shall be installed and braced in accordance with the design. Trusses shall not be notched drilled cut or altered unless so provided in the design. Sections R502.11 and R802.10.
79. **Cripple wall construction.** 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 supporting three stories shall be framed with 2-inch by 6-inch studs spaced not more than 16 inches on center. Section R602.9 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. Section R602.9

80. **Cripple wall bracing.** Foundation cripple walls supporting lateral braced wall lines shall be braced with 1 ½ times the amount of bracing required for the wall above in accordance with Tables R602.10.1.2(1) and R602.10.1.2(2). The maximum wall panel spacing shall be decreased to 18 feet on center from 25 feet on center for the cripple wall. Section R602.10.9

WALL FRAMING:

81. **Wall bracing.** Walls shall be braced in accordance with Section R602.10. Residential construction in Hillsboro shall be braced in accordance with Seismic Design Categories D1 and 95 mph Basic Wind requirements.
82. **Stud grade.** Studs shall be a minimum No. 3, Standard or Stud grade lumber. **EXCEPTION:** Bearing studs not supporting floors and nonbearing studs may be Utility grade lumber, provided the studs are spaced in accordance with Table R602.3(5).Section R602.2
83. **Balloon/Platform Framing.** All exterior walls shall have the wall studs continuous from the floor below to the ceiling or roof diaphragm at the top (ORSC Section R602.3). Consideration must be taken at locations such as the gable end walls at vaulted ceiling rooms and spaces. As an alternative, a design by an Oregon licensed Engineer for minimum deflection may be provided to the building department for review and approval (ORSC Section R301.1).
84. **Fire-blocking** 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 fire-blocking 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, mineral wool, glass fiber or other noncombustible material securely fastened in place. Where unfaced fiberglass is used as fire-blocking, it must fill the entire cross section of the wall cavity to a minimum height of 16". Sections R302.11 and R602.8
- Locations.** Fire-blocking 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 fire-blocking 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 and cove ceilings.
 3. In concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaced under stairs shall comply with Section R302.7.
 4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion.
 5. For the fire-blocking of chimneys and fireplaces see Sections R1001.12 and R1003.19.
 6. Fire-blocking of cornices of a two-family dwelling is required at the line of dwelling unit separation.
85. **Draft stopping required.** When there is usable space both above and below the concealed space of a floor/ceiling assembly. Draft stops shall be installed so that the area of the concealed space does not exceed 1,000 square feet. Draft-stopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below draft-stopping shall be provided in floor/ceiling assemblies under the following circumstances: Section R302. 12.
1. Ceiling is suspended under the floor framing.
 2. Floor framing is constructed of truss-type open-web or perforated members.
- Draft-stopping 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. Draft-stops shall be installed parallel to the floor framing members. Sections R302.12

WALL AND CEILING COVERING:

86. **Gypsum wallboard shall be** installed in accordance with Table R702.3.5. See Section R702.3.
87. **Flame spread:** Wall and ceiling finishes shall have a flame spread classification of not greater than 200 and a smoke-developed index of not greater than 450. Sections R302.9
88. **Installation.** Exterior sheathing shall be dry before applying exterior cover. Section R701.2
89. **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.
90. **Rain Screen.** A minimum of 1/8 inch space between the water-resistive barrier and the exterior veneer shall be maintained with non-corrodible furring strips, drainage mat or drainage board. The space provided shall provide a means of draining

water that enters the assembly to the exterior. **Exception:** The required 1/8 inch space is not required where the water-resistive barrier meets ASTM E2273 drainage efficiency requirements. Section R703.1

91. **Siding.** Weather resistant siding shall be installed per Table R703.4. **Stone and Masonry Veneer.** See section R703.7
92. **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 R703.8
 1. Exterior window and door openings. Flashing at exterior window and door openings shall extend to the surface of the exterior **wall finish or to the water-resistive barrier for subsequent drainage.**
 2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
 3. Under and at the ends of masonry, wood or metal copings and sills.
 4. Continuously above all projecting wood trim.
 5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
 6. At wall and roof intersections.
 7. At built-in gutters.

ROOF / CEILING CONSTRUCTION AND ATTIC SPACES:

93. **Grade mark. Load bearing dimensional lumber shall be identified by a grade mark.** See Section R802.1
94. **Drainage control.** Where required by the building official, all dwellings shall have a controlled method of water deposal from roofs that will collect and discharge all roof drainage in accordance with Plumbing Code. See Sections R801.3 and R801.4.
95. **Framing details.** Rafters shall be framed to ridge board or to each other with a gusset plate as a tie. Ridge board shall be at least 1-inch nominal thickness and not less in depth than the cut end of the rafter. At all valley 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.
96. **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
97. **Ceiling joists lapped.** Ends of ceiling joists shall be lapped a minimum of 3 inches or butted over bearing partitions or beams and toenail 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
98. **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
99. **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
100. **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 and R905.8. Spaced lumber sheathing is not allowed in Seismic Design Category D₂. Section R803.1
101. **Attic access.** Attics with a clear height of 30 inches or more must be provided with an access. 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. Section R807.1.
102. **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. Section R806.1 (For unvented attic assemblies, see Section R806.4)
103. **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 if at least 50 percent but not more than 80 percent of the openings are in the upper part of the ventilated

space and at least 3 feet above the eave or cornice vents or when a vapor barrier not exceeding 1 perm transmission rate is installed on the warm-in-winter side of the ceiling. Section R806.2

ROOF COVERINGS:

104. **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 and R905.3.6
105. **Flashing** shall be installed at junctions of chimneys and roofs, in roof valleys and around all roof openings. See Chapter 9 of the Oregon Residential Specialty Code for specific requirements.
106. **Roof covering application.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacture's installation instructions. Section R905.1.

CHIMNEYS AND FIREPLACES:

107. **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 point where the chimney passes through the roof. Section R1003.9
108. **Flue lining.** Chimneys may also be lined with listed chimney lining systems complying with UL 1777 or factory built chimneys or chimney units listed for installation with masonry chimneys. See Section R1003.11.1.

Flue liners shall extend from a point not less than 8 inches below the lowest inlet or, in the case of fireplaces, from the top of the smoke chamber, to a point above the enclosing walls. Refer to Section R1003.12.
109. **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
110. **Hearth extension dimensions.** Hearth extensions shall extend at least 16 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
111. **Factory built fireplaces, factory built chimneys, hearth extensions and decorative shrouds** shall be listed and labeled and shall be installed in accordance with the conditions of the listing. See Section R1004 for additional information.
112. Fireplace stoves shall be listed, labeled and installed in accordance with the terms of the listing. Fireplace stoves shall be tested in accordance with UL 737. Section M1414.1
113. **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.
114. **Factory-built fireplaces.** Exterior combustion air ducts for factory-built fireplaces shall be a listed component of the fireplace and shall be installed in accordance with the fireplace manufacturer's instructions. See Section R1005.1.
115. **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

ENERGY EFFICIENCY: Chapter 11

NOTE: A link to ORSC Chapter 11 is available on line as "read only" on the **Oregon Building Codes Division (BCD)** web site <http://www.oregonbcd.org/>. See **Oregon Department of Energy** at <http://www.oregon.gov/ENERGY/index.shtml>, *Building Codes* for additional information including several Residential Publications.

116. **N1101.4 Information on plans and specifications.** Plans and specification shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed, including, but not limited to: exterior envelop component materials; R-values of insulation materials; HVAC equipment performance and system controls, lighting and other pertinent data to indicate conformance with the requirements of Chapter 11.
117. **N1101.1 General.** The provisions of this chapter (ORSC Chapter 11) regulate the exterior envelope as well as the design, construction and selection of heating, ventilating and air-conditioning systems, lighting and piping insulation required for the purpose of effective conservation of energy within a building or structure governed by this code.

All conditioned spaces within residential buildings shall comply with Table N1101.1(1) and two additional measures from Table N1101.1(2).

- EXCEPTION:**
1. Application to existing buildings shall comply with Section N1101.2.
 2. Application to additions shall comply with Section N1101.3.

118. **N1101.2.1 Alteration and repair.** Alterations and repairs affecting energy conservation measures shall conform to the requirements specified in this chapter. Alterations or repairs which affect components of existing conditioned spaces regulated in this chapter shall comply with this chapter (ORSC Chapter 11). **EXCEPTION:** The minimum component requirements as specified in Table N1101.2 may be used to the maximum extent practical.
119. **N1101.3 Additions.** Additions to existing buildings or structures may be made without making the entire building or structure comply, if the new additions comply with the requirements of this chapter.
- a. **Large Additions.** Additions that are 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).
 - b. **Small Additions.** Additions that are less than 40 percent of existing building heated space 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 existing building heated space floor area or less than 200 square feet in area, whichever is less, shall NOT be required to select one measure from Table N1101.1(2) or comply with Table N1101.3.

ENERGY - EXTERIOR ENVELOPE REQUIREMENTS:

120. **N1104.2 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:**
121. **N1104.2.1 Loose-fill insulation.** Blown, poured and spray-on type insulation complying with Section R302.10 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.
122. **N1104.2.2 Batt-type insulation.** Batt-type insulation shall be installed flush against the warm side of the cavity insofar as practicable.
123. **N1104.2.3 Insulation protection.** Insulation exposed to the exterior shall be protected from physical and solar damage.
124. **N1104.2.4 Clearances.** Recessed light fixtures shall not be installed in cavities intended to be insulated. **EXCEPTION:** Fixtures designed and labeled as suitable for being installed in direct contact with insulation; i.e., insulation coverage (IC) rated.
125. 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. Section N1104.2.4
126. Thermal insulation shall not be installed in a manner that would obstruct openings required for attic ventilation. Section N1104.2.4
127. A permanent sleeve of fine wire mesh screen, sheet metal or other noncombustible material shall be installed to maintain the required clearances. Section N1104.2.4
128. Cellulose insulation shall conform to Interim Safety Standard for Cellulose Insulation (16 CFR Part 1209) issued by the Consumer Product Safety Commission July 6, 1979 (44FR39938). For other insulation, see Section R302.10. Foam plastic shall be as specified in Section R316. Section N1104.2.4

**TABLE N1101.1(1)
PRESCRIPTIVE ENVELOPE REQUIREMENTS^a**

BUILDING COMPONENT	STANDARD BASE CASE		LOG HOMES ONLY	
	Required Performance	Equiv. Value ^b	Required Performance	Equiv. Value ^b
Wall insulation-above grade	U-0.060	R-21 ^c	Note d	Note d
Wall insulation-below grade ^e	F-0.565	R-15	F-0.565	R-15
Flat ceilings ^f	U-0.031	R-38	U-0.025	R-49
Vaulted ceilings ^g	U-0.042	R-38 ^h	U-0.027	R-38A ^h
Underfloors	U-0.028	R-30	U-0.028	R-30
Slab edge perimeter	F-0.520	R-15	F-0.520	R-15
Heated slab interior ⁱ	n/a	R-10	n/a	R-10
Windows ^j	U-0.35	U-0.35	U-0.35	U-0.35
Window area limitation ^{j, k}	n/a	n/a	n/a	n/a
Skylights ^l	U-0.60	U-0.60	U-0.60	U-0.60
Exterior doors ^m	U-0.20	U-0.20	U-0.54	U-0.54
Exterior doors w/ > 2.5 ft ² glazing ⁿ	U-0.40	U-0.40	U-0.40	U-0.40
Forced air duct insulation	n/a	R-8	n/a	R-8

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m², 1 degree = 0.0175 rad.

- a. As allowed in Section N1104.1, thermal performance of a component may be adjusted provided that overall heat loss does not exceed the total resulting from conformance to the required *U*-value standards. Calculations to document equivalent heat loss shall be performed using the procedure and approved *U*-values contained in Table N1104.1(1).
- b. *R*-values used in this table are nominal for the insulation only in standard wood framed construction and not for the entire assembly.
- c. Wall insulation requirements apply to all exterior wood framed, concrete or masonry walls that are above grade. This includes cripple walls and rim joist areas. R-19 Advanced Frame or 2 x 4 wall with rigid insulation may be substituted if total nominal insulation *R*-value is 18.5 or greater.
- d. The wall component shall be a minimum solid log or timber wall thickness of 3.5 inches (90 mm).
- e. Below-grade wood, concrete or masonry walls include all walls that are below grade and do not include those portions of such wall that extend more than 24 inches (609.6 mm) above grade.
- f. Insulation levels for ceilings that have limited attic/rafter depth such as dormers, bay windows or similar architectural features totaling not more than 150 square feet (13.9 m²) in area may be reduced to not less than R-21. When reduced, the cavity shall be filled (except for required ventilation spaces).
- g. The maximum vaulted ceiling surface area shall not be greater than 50 percent of the total heated space floor area unless area has a *U*-factor no greater than U-0.031. The *U*-factor of 0.042 is representative of a vaulted scissor truss. A 10-inch (254 mm) deep rafter vaulted ceiling with R-30 insulation is U-0.033 and complies with this requirement, not to exceed 50 percent of the total heated space floor area.
- h. A = Advanced frame construction, which shall provide full required insulating value to the outside of exterior walls.
- i. Heated slab interior applies to concrete slab floors (both on and below grade) that incorporate a radiant heating system within the slab. Insulation shall be installed underneath the entire slab.
- j. Sliding glass doors shall comply with window performance requirements. Windows exempt from testing in accordance with Section NF1111.2, Item 3 shall comply with window performance requirements if constructed with thermal break aluminum or wood, or vinyl, or fiberglass frames and double-pane glazing with low-emissivity coatings of 0.10 or less. Buildings designed to incorporate passive solar elements may include glazing with a *U*-factor greater than 0.35 by using Table N1104.1(1) to demonstrate equivalence to building envelope requirements.
- k. Reduced window area may not be used as a trade-off criterion for thermal performance of any component.
- l. Skylight area installed at 2 percent or less of total heated space floor area shall be deemed to satisfy this requirement with vinyl, wood or thermally broken aluminum frames and double-pane glazing with low-emissivity coatings. Skylight *U*-factor is tested in the 20 degree (0.35 rad) overhead plane in accordance with NFRC standards.
- m. A maximum of 28 square feet (2.6 m²) of exterior door area per dwelling unit can have a *U*-factor of 0.54 or less.
- n. Glazing that is either double pane with low-e coating on one surface, or triple pane shall be deemed to comply with this U-0.40 requirement.

**TABLE N1101.1(2)
ADDITIONAL MEASURES**

Envelope Enhancement Measure (Select One)	1	High efficiency walls & windows: Exterior walls—U-0.047/R-19+5 (insulation sheathing)/SIPS, and one of the following options: Windows—Max 15 percent of conditioned area; or Windows—U-0.30
	2	High efficiency envelope: Exterior walls—U-0.058/R-21 Intermediate framing, and Vaulted ceilings—U-0.033/R-30A ^{d,e} , and Flat ceilings—U-0.025/R-49, and Framed floors—U-0.025/R-38, and Windows—U-0.30; and Doors—All doors U-0.20, or Additional 15 percent of permanently installed lighting fixtures as high-efficacy lamps or Conservation Measure D and E
	3	High efficiency ceiling, windows & duct sealing: (Cannot be used with Conservation Measure E) Vaulted ceilings—U-0.033/R-30A ^{d,e} , and Flat ceilings—U-0.025/R-49, and Windows—U-0.30, and Performance tested duct systems ^b
	4	High efficiency thermal envelope UA: Proposed UA is 15% lower than the Code UA when calculated in Table N1104.1(1)
	5	Building tightness testing, ventilation & duct sealing: A mechanical exhaust, supply, or combination system providing whole-building ventilation rates specified in Table N1101.1(3), or ASHRAE 62.2, and The dwelling shall be tested with a blower door and found to exhibit no more than 1. 6.0 air changes per hour ^f , or 2. 5.0 air changes per hour ^f when used with Conservation Measure E, and Performance tested duct systems ^b
	6	Ducted HVAC systems within conditioned space: (Cannot be used with Conservation Measure B or C) All ducts and air handler are contained within building envelope ^d
Conservation Measure (Select One)	A	High efficiency HVAC system: Gas-fired furnace or boiler with minimum AFUE of 90% a, or Air-source heat pump with minimum HSPF of 8.5 or Closed-loop ground source heat pump with minimum COP of 3.0
	B	Ducted HVAC systems within conditioned space: All ducts and air handler are contained within building envelope ^d
	C	Ductless heat pump: Replace electric resistance heating in at least the primary zone of dwelling with at least one ductless mini-split heat pump having a minimum HSPF of 8.5. Unit shall not have integrated backup resistance heat, and the unit (or units, if more than one is installed in the dwelling) shall be sized to have capacity to meet the entire dwelling design heat loss rate at outdoor design temperature condition. Conventional electric resistance heating may be provided for any secondary zones in the dwelling. A packaged terminal heat pump (PTHP) with comparable efficiency ratings may be used when no supplemental zonal heaters are installed in the building and integrated backup resistant heat is allowed in a PTHP
	D	High efficiency water heating & lighting: Natural gas/propane, on-demand water heating with min EF of 0.80, and A minimum 75 percent of permanently installed lighting fixtures as CFL or linear fluorescent or a min efficacy of 40 lumens per watt as specified in Section N1107.2 ^e
	E	Energy management device & duct sealing: Whole building energy management device that is capable of monitoring or controlling energy consumption, and Performance tested duct systems ^b , and A minimum 75 percent of permanently installed lighting fixtures as high-efficacy lamps
	F	Solar photovoltaic: Minimum 1 watt/sq ft conditioned floor space ^g
	G	Solar water heating: Minimum of 40 ft ² of gross collector area ^h

For SI: 1 square foot = 0.093 m², 1 watt per square foot = 10.8 W/m².

- a. Furnaces located within the building envelope shall have sealed combustion air installed. Combustion air shall be ducted directly from the outdoors.
- b. Documentation of Performance Tested Ductwork shall be submitted to the building official upon completion of work. This work shall be performed by a contractor certified by the Oregon Department of Energy's (ODOE) Residential Energy Tax Credit program and documentation shall be provided that work demonstrates conformance to ODOE duct performance standards.
- c. Section N1107.2 requires 50 percent of permanently installed lighting fixtures to contain high efficacy lamps. Each of these additional measures adds an additional percent to the Section N1107.2 requirement.
- d. A = advanced frame construction, which shall provide full required ceiling insulation value to the outside of exterior walls.
- e. The maximum vaulted ceiling surface area shall not be greater than 50 percent of the total heated space floor area unless vaulted area has a U-factor no greater than U-0.026.
- f. Building tightness test shall be conducted with a blower door depressurizing the dwelling 50 Pascal's from ambient conditions. Documentation of blower door test shall be submitted to the Building Official upon completion of work.
- g. Solar electric system size shall include documentation indicating that Total Solar Resource Fraction is not less than 75 percent.
- h. Solar water heating panels shall be Solar Rating and Certification Corporation (SRCC) Standard OG-300 certified and labeled, with documentation indicating that Total Solar Resource Fraction is not less than 75 percent.
- i. A total of 5 percent of an HVAC systems ductwork shall be permitted to be located outside of the conditioned space. Ducts located outside the conditioned space shall have insulation installed as required in this code.

**TABLE N1101.2
EXISTING BUILDING COMPONENT REQUIREMENTS**

BUILDING COMPONENTS	REQUIRED PERFORMANCE	EQUIV. VALUE
Wall insulation	U-0.80	R-15
Flat ceiling	U-0.025	R-49
Vaulted ceiling > 10 inches nominal rafter depth	U-0.040	R-25
Vaulted ceiling > 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-0.032	R-25
Slab edge perimeter	F-0.52	R-15
Windows	U-0.35	U-0.35
Skylights	U-0.60	U-0.60
Exterior doors	U-0.20	R-5
Exterior doors w/> 2.5 ft ² glazing	U-0.40	R-2.5
Forced air ducts	n/a	R-8

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m².

**TABLE N1101.3
SMALL ADDITION ADDITIONAL MEASURES (Select one)**

1	Increase the ceiling insulation of the existing portion of the home as specified in Table N1101.2.
2	Replace all existing single-pane wood or aluminum windows to the U-value as specified in Table N1101.2.
3	Insulate the floor system as specified in Table N1101.2 & install 50 percent of permanently installed lighting fixtures as CFL or linear fluorescent or a min. efficacy of 40 lumens per watt as specified in Section N1107.2.
4	Test the entire dwelling with a blower door and exhibit no more than 7.0 air changes per hour @ 50 Pascals.
5	Seal and performance test the duct system.
6	Replace existing 78 percent AFUE or less gas furnace with a 92 percent AFUE or greater system.
7	Replace existing electric radiant space heaters with a ductless mini split system with a minimum HSPF of 8.5.
8	Replace existing electric forced air furnace with an air source heat pump with a minimum HSPF of 8.5.
9	Replace existing water heater for a natural gas/propane water heater with a minimum EF of 0.67.
10	Install a solar water heating system with a minimum of 40 ft ² of gross collector area.

129. **N1104.2.6 Recessed lighting fixtures.** Recessed light fixtures installed within the building envelop shall meet one of the following requirements.
1. Type IC rated, manufacture with no penetrations between the inside of the recessed fixture and ceiling cavity, and the annular space between the ceiling cutout and lighting fixture shall be sealed.
 2. Type IC rated in accordance with ASTM E283 with not more than 2.0 cubic feet per minute (cfm) air movement from the conditioned space to the ceiling cavity at 1.57 psi pressure (75Pa) difference and shall be labeled and the annular space between the ceiling cutout and lighting fixture shall be sealed.
 3. Type IC rated installed inside a sealed box constructed from a minimum 0.5-inch-thick gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other air-tight assembly manufactured for this purpose.
130. **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. See ORSC Section R302.10 complete requirements.
131. **Foam plastic insulation** shall be as specified in Section R316.

ENERGY - WINDOWS AND DOORS (GENERAL)

132. **N1104.3 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. Doors shall meet the air leakage requirements of Section N1104.8.
- 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 glazing and shall be treated as such.
 3. Doors that incorporate glazed areas more than 2.5 square feet in area shall be considered windows.
133. **N1104.4 Windows.** All windows installed in Oregon shall meet the requirements of Part 111, Fenestration Standard.
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.
134. **Thermal performance labeling.** All windows shall have performance labels. See N1104.4.1 and N1104.4.2 for requirements.
135. **Air leakage requirement.** All windows and doors must meet the air leakage requirements of Section N1104.8.
136. **N1104.8.2 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.

ENERGY - MOISTURE CONTROL (VAPOR BARRIERS):

137. **N1104.9.1 Vapor retarders.** A 1-perm, dry cup rating vapor retarder shall be installed on the warm side (in winter) of all insulation.
- 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.
138. **N1104.9.2 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.

ENERGY - SLAB-ON-GRADE FLOORS:

139. **N1104.7 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 (610 mm) or downward to the bottom of the slab, then horizontally beneath the slab for a minimum total distance of 24 inches (610 mm). **EXCEPTION:** For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the thickened edge.
140. **N1104.7.1 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**.

ENERGY - HEATING, VENTILATION AND AIR-CONDITIONING SYSTEMS:

141. **N1105.2 Insulation of ducts.** All new duct systems, or new portions thereof, exposed to unconditioned spaces shall be insulated according to Table N1101.1(1). **EXCEPTION:** The replacement or addition of a furnace, air conditioner or heat pump shall not require existing ducts to be insulated to current code.
142. **N1105.3 HVAC controls.** All heating, ventilating and air-conditioning systems shall be provided controls as specified herein.
143. **N1105.3.1 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.
144. **N1105.3.2 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.
145. **N1105.3.3 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.
146. **N1105.3.4 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.
- EXCEPTION:**
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.
- Lowering thermostat set points to reduce energy consumption of the heating system shall not cause energy to be expended to reach the reduced setting.
147. **N1105.3.4.1 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.
148. **N1105.3.4.1.1 Outdoor thermostat required.** The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat.
149. **N1105.4 Outside combustion air.** See R1006 for required outside combustion air for masonry fireplaces, factory-built fireplaces(s) and factory-built stoves.

ENERGY - LIGHTING:

150. **N1107.1 General.** The provisions of this section apply to lighting equipment, related controls and electric circuits serving all conditioned and unconditioned interior floor space and exterior building facades of all dwelling units and guest rooms within residential buildings and structures, or portions thereof.
151. **N1107.2 High-efficiency lighting systems.** A minimum of fifty percent of the permanently installed lighting fixtures shall be compactor linear fluorescent, or a lighting source that has a minimum efficacy of 40 lumens per input watt. Screw-in compact florescent lamps comply with this requirement.
- The building official shall be notified in writing at the final inspection that a minimum of fifty percent of the permanently installed lighting fixtures are compact or linear florescent, or a minimum efficacy of 40 lumens per input watt.

MECHANICAL SYSTEM REQUIREMENTS:

152. **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
153. **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
154. **Central furnaces.** Central furnaces within compartments, alcoves or similar spaces shall conform to Sections M1305.1.1 and M1305.1.2.

155. **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. Section M1305.1.3. **Additionally, attic insulation shall be maintained continuous under the appliances.**
- EXCEPTIONS:**
1. The passageway and level service space are not required where the appliance is capable of being serviced while standing on a portable ladder extending 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.
156. **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
157. **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.
158. **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 J or other approved heating and cooling calculation methodologies. Section M1401.1 and M1401.3.
159. **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 private attics shall be permitted.
160. **Range hoods general.** All domestic kitchen cooking appliances shall be equipped with minimum 150 cfm ducted range hoods or down-draft exhaust systems. Range hoods shall discharge to the outdoors by a single-wall pipe constructed of galvanized steel, stainless steel, or copper. The duct serving the hood shall have a smooth interior surface, be substantially airtight and shall be equipped with a back-draft damper. Ducts serving range hoods shall not terminate in an attic or crawl space or any area inside the building. Section M1503
161. **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.
162. **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
163. **Rooms with bathing and spa facilities.** All rooms containing bathing or spa facilities shall be provided with a mechanical ventilation system controlled by dehumidistat, timer or similar means of automatic control. M1507.4
164. **Duct systems.** 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.
165. **Combustion air:** Liquid and solid fuel-burning appliances shall be provided with a supply of air for fuel combustion, draft hood dilution and ventilation of the space in which the appliance is installed, in accordance with Sections M1701 and G2407.1.
166. **Test Pressure.** Gas piping systems under 14 inches water column pressure, shall be tested at a pressure of not less than 10 pounds per square inch gage. Test pressures shall be held for not less than 15 minutes with no perceptible drop in pressure. For welded piping, and for piping carrying gas at pressures exceeding 14 inches water column pressure, the test pressure shall be at least 60 pounds per square inch for not less than 30 minutes. Section G2418.4.1
167. **Locking access port caps.** Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps. Section G1411.6

CLOTHES DRYER EXHAUST:

168. **Dryer exhaust systems.** Clothes dryers shall be exhausted in accordance with the manufacturer's instructions. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture to the outdoors. Exhaust ducts 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. If the manufacturer's instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet in any direction from openings into buildings. Exhaust ducts shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination. Sections M1502.2 & M1502.3
- a) **Material and size.** Exhaust ducts shall have a smooth interior finish and shall be constructed of metal a minimum 0.016-inch thick. The exhaust duct size shall be 4 inches nominal in diameter. Section M1502.4.1

- b) **Duct installation.** Exhaust ducts shall be supported at 4 foot intervals and secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct. Section M1502.4.2
- c) **Duct length.** The maximum length of the exhaust duct shall be 35 feet from the connection to the transition duct from the dryer to the outlet terminal. The maximum length of the duct shall be reduced 2.5 feet for each 45-degree bend and 5 feet for each 90-degree bend. Section M1502.4.4.1 & Table M1502.4.4.1
- d) **Length identification.** Where the exhaust duct is concealed within the building construction, the equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet of the exhaust duct connection. Section M1502.4.5
- e) **Exhaust duct required.** Where space for a clothes dryer is provided, an exhaust duct system shall be installed. Where the clothes dryer is not installed at the time of occupancy, the exhaust duct shall be capped or plugged in the space in which it originates and identified and marked "Future Use." Section M1502.4.6
- f) **Protection required.** Protective shield plates shall be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct. Shield plates shall be placed on the finished face of all framing members where there is less than 1/4 inches between the duct and the finished face of the framing member. Section M1502.5

PLUMBING REQUIREMENTS:

- 169. **Plastic Fittings.** Female PVC screwed fittings for water piping shall be used with plastic male fittings and plastic male threads only. See Section OPSC 606.2.2
- 170. Plastic and copper piping within 1 inch of the face of a stud or exposed framing surface shall be protected with an 18 gauge steel nail plate. The Steel plate shall extend along the framing member a minimum 1 1/2 inches beyond the outside diameter of the pipe or tubing. See Section OPSC 313.9
- 171. Support PEX horizontal plastic water pipe, 32 inches on center. See Section OPSC 314.5 and Table 3-2.
- 172. Exterior water lines shall be a minimum of 24 inches deep. Refer to Section OPSC 609.1.
- 173. Water piping shall be tested to not less than the working pressure under which is to be used, or if the piping is suitable, an air test of 50 PSI may be substituted. Either test shall be not less than 15 minutes. Refer to Section OPSC 609.4
- 174. Test gauges for all required tests between 10 and 100 PSI are to be in one pound per square inch increments and shall have a pressure range of not greater than twice the test pressure applied. Section OPSC 319.2 and OSPC 319.4
- 175. Support ABS plastic piping every 4 feet. Refer to Section OSPC Table 3-2.
- 176. Water test for drainage systems shall be applied to the entire system to the point of overflow through the roof or highest point for at least 15 minutes. Refer to section OSPC 712.2.
- 177. A 5 pound air test for drainage systems shall be applied to the entire system for a period of 15 minutes without pressure drop. See Section OSPC 712.3
- 178. Hangers shall be strong enough to support the pipe and its contents. Piping shall be isolated from incompatible materials. See Section OSPC 314.4
- 179. Testable backflow devices for domestic irrigation systems must be tested by a certified backflow tester and the results shall be provided to the inspector at the time of the inspection. Refer to Section OSPC 603.3.3

ELECTRICAL REQUIREMENTS:

- 180. A lighting fixture controlled by a switch located at the required access passageway opening and a receptacle outlet shall be provided at or near a mechanical appliance location in accordance with NEC 210.70 (A)(3). See also M1305.1.3.1.
- 181. Each single family dwelling or each unit of a two family dwelling shall have, at grade level, at least one GFCI protected (reference NEC 210.8) receptacle at front and back of the dwelling unit. Refer to Section NEC 210.52(E)(1) & (2). Also, a receptacle shall be required within 25 feet of an A/C unit. Refer to Section NEC 210.63.
- 182. Where lighting outlets are installed in interior stairways, there shall be a wall switch at each floor level to control the lighting outlet where the stairways has 6 or more risers. Section NEC 210.70(A)(2)(c).
- 183. **Concrete encased electrodes for footing and foundations.** The required concrete encased electrode shall be surrounded by at least 2 inches of concrete located within and near the bottom of the concrete footing. The electrode shall consist of at least 20 feet of continuous reinforcing bars of not less than 1/2 inch in diameter. The 1/2 inch reinforcing bar or rod shall be stubbed up a minimum 12 inches above the floor plate line or floor level, whichever is highest and near the service panel location. An alternate material is 20 feet minimum of bare copper conductor no smaller than No. 4, which shall be continuous to the service disconnecting means. Refer to NEC 250.52(A)(3) and OESC 250.52(A)(3).

184. **Equipment located in the crawl space**, which may require service (i.e. sump pumps, sewage pumps and furnaces) shall have at least one point of lighting control at or near the equipment as per NEC 210.70(A)(3). A receptacle may also be required.
185. **Electrical panel-boards, equipment locations and clearances:** per the requirements of NEC 110.26 and NEC 210.70(A)(3)
1. Working clearances for panel-boards shall be a minimum of 36 inches deep, 30 inches wide and 61/2 feet high. The equipment doors shall open a minimum of 90 degrees.
 2. Panel-boards shall not be located in areas designated for storage: clothes closets, NEC 240.24(D) or bathrooms per NEC 240.24(E) or over steps of a stairway per NEC 240.24(F).
 3. Access to the electrical equipment shall be of sufficient area to provide access to the required work area around the equipment or to provide the minimum required work area.
 4. Illumination shall be provided for the work space at service equipment and panel boards, which are installed indoors.
186. The minimum length of conductor for splicing or termination is 6 inches from the point in the box from where the conductor(s) emerges. Additionally, each conductor shall be long enough to extend at least 3 inches outside the box opening. See Section NEC 300.14.
187. The service disconnecting means are required and shall be installed in a readily accessible location, inside or outside of the building or structure, nearest the service conductors' entrance point. Additionally, the service disconnecting means shall be installed as per 150 above and it shall be suitable for the prevailing conditions per Section NEC230.70. Each occupant of a dwelling shall have access to the disconnect serving that dwelling per NEC240.24 (B).
188. The interior metal water piping system (if metallic) shall be bonded to the service equipment enclosure and to the grounded conductor at the service, and it shall be sized in accordance with Table NEC 250.66. The points of attachment of the bonding jumpers shall be accessible per Section NEC 250.104(A).
189. Where installed in or attached to a building or structure, metal piping, including gas piping, which may become energized, shall be connected to the service equipment enclosure and to the grounded conductor at the service, and it shall be sized in accordance with NEC Table 250.66, using the rating of the circuit that may energize the piping to serve as the bonding means. The points of attachments of the bonding jumpers shall be accessible per Section NEC 250.104(B).
190. Required branch circuits: 1) a minimum of two 20-amp rated branch circuits shall be provided to serve receptacles located in the kitchen, pantry, breakfast area and dining area; 2) a minimum of one 20-amp rated branch circuit for only receptacles in the laundry area; and 3) a minimum of one 20-amp branch circuit shall be provided to supply the bathroom receptacles and shall have no other outlets. See Section NEC 210.11(C).
191. Kitchen receptacles for counter tops shall be installed when the counter space at the wall is 12 inches or wider and shall be spaced such that no point is more than 24 inches horizontally from a receptacle outlet in that space. Each island counter space which is a minimum of 12 inches and a maximum of 24 inches shall have at least one receptacle. A sink or range top shall be considered a division and may create two island spaces. Peninsula counters shall have at least one receptacle for each 12 inch minimum to 42 inch maximum of counter as measured from the connecting edge. Refer to Section NEC 210.52(B) & (C) and OESC 210.52(C)(3).
192. Wall receptacles shall be spaced such that no point along the horizontal line is more than 6 feet from an outlet. Any unbroken wall space 2 feet or more in length shall have a receptacle installed. Fixed panels in the exterior wall or fixed room dividers shall have receptacles installed. Floor receptacles shall be counted along with wall receptacles when located within 18 inches of the wall as per NEC 210.52 Outdoor receptacles, crawl space receptacles, unfinished basement receptacles, kitchen receptacles and bar sink receptacles. See Section NEC 210.8(A) and OESC 210.8(2).
193. Arc-fault devices shall be installed for all branch circuits that supply 125-volt, single phase, 15 and 20 amp outlets (receptacles and lighting) installed in dwelling unit bedrooms to provide protection to the entire branch circuit. See Section NEC 210.12(B) and OESC 210.12(B)

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

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER ^{a, b, c}	SPACING OF FASTENERS
Roof			
1	Blocking between joists or rafters to top plate, toe nail	3-8d (2½" × 0.113")	—
2	Ceiling joists to plate, toe nail	3-8d (2½" × 0.113")	—
3	Ceiling joists not attached to parallel rafter, laps over partitions, face nail	3-10d	—
4	Collar tie rafter, face nail or 1¼" × 20 gage ridge strap	3-10d (3" × 0.128")	—
5	Rafter to plate, toe nail	2-16d (3½" × 0.135")	—
6	Roof rafters to ridge, valley or hip rafters: toe nail face nail	4-16d (3½" × 0.135") 3-16d (3½" × 0.135")	— —
Wall			
7	Built-up corner studs	10d (3" × 0.128")	24" o.c.
8	Built-up header, two pieces with ½" spacer	16d (3½" × 0.135")	16" o.c. along each edge
9	Continued header, two pieces	16d (3½" × 0.135")	16" o.c. along each edge
10	Continuous header to stud, toe nail	4-8d (2½" × 0.113")	—
11	Double studs, face nail	10d (3" × 0.128")	24" o.c.
12	Double top plates, face nail	10d (3" × 0.128")	24" o.c.
13	Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	8-16d ^j (3½" × 0.135")	—
14	Sole plate to joist, solid deck or blocking, face nail	16d (3½" × 0.135")	16" o.c.
15	Sole plate to joist, solid deck or blocking at braced wall panels	3-16d per 16" (3½" × 0.135")	—
16	Stud to sole plate, toe nail	3-8d (2½" × 0.113") or 2-16d 3½" × 0.135")	— —
17	Top or sole plate to stud, end nail	2-16d (3½" × 0.135")	—
18	Top plates, laps at corners and intersections, face nail	2-10d (3" × 0.128")	—
19	1" brace to each stud and plate, face nail	2-8d (2½" × 0.113") 2 staples 1¾"	— —
20	1" × 6" sheathing to each bearing, face nail	2-8d (2½" × 0.113") 2 staples 1¾"	— —
21	1" × 8" sheathing to each bearing, face nail	2-8d (2½" × 0.113") 3 staples 1¾"	— —
22	Wider than 1" × 8" sheathing to each bearing, face nail	3-8d (2½" × 0.113") 4 staples 1¾"	— —
Floor			
23	Joist to sill or girder, toe nail	3-8d (2½" × 0.113")	—
24	1" × 6" subfloor or less to each joist, face nail	2-8d (2½" × 0.113") 2 staples 1¾"	— —
25	2" subfloor to joist or girder, blind and face nail	2-16d (3½" × 0.135")	—
26	Rim joist to top plate, toe nail (roof applications also)	8d (2½" × 0.113")	6" o.c.
27	2" planks (plank & beam – floor & roof)	2-16d (3½" × 0.135")	at each bearing
28	Built-up girders and beams, 2-inch lumber layers	10d (3" × 0.128")	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.

(continued)

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

ITEM	DESCRIPTION OF BUILDING MATERIALS	DESCRIPTION OF FASTENER ^{b, c, e}	SPACING OF FASTENERS	
			Edges (inches) ⁱ	Intermediate supports ^{c, e} (inches)
Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing				
30	$3/8'' - 1/2''$	6d common ($2'' \times 0.113''$) nail (subfloor wall) 8d common ($2 1/2'' \times 0.131''$) nail (roof) ^f	6	12 ^g
31	$19/32'' - 1''$	8d common nail ($2 1/2'' \times 0.131''$)	6	12 ^g
32	$1 1/8'' - 1 1/4''$	10d common ($3'' \times 0.148''$) nail or 8d ($2 1/2'' \times 0.131''$) deformed nail	6	12
Other wall sheathing^h				
33	$1/2''$ structural cellulose fiberboard sheathing	$1/2''$ galvanized roofing nail, $7/16''$ crown or 1" crown staple 16 ga., $1 1/4''$ long	3	6
34	$25/32''$ structural cellulose fiberboard sheathing	$1 3/4''$ galvanized roofing nail, $7/16''$ crown or 1" crown staple 16 ga., $1 1/2''$ long	3	6
35	$1/2''$ gypsum sheathing ^d	$1 1/2''$ galvanized roofing nail; staple galvanized, $1 1/2''$ long; $1 1/4''$ screws, Type W or S	7	7
36	$5/8''$ gypsum sheathing ^d	$1 3/4''$ galvanized roofing nail; staple galvanized, $1 5/8''$ long; $1 5/8''$ screws, Type W or S	7	7
Wood structural panels, combination subfloor underlayment to framing				
37	$3/4''$ and less	6d deformed ($2'' \times 0.120''$) nail or 8d common ($2 1/2'' \times 0.131''$) nail	6	12
38	$7/8'' - 1''$	8d common ($2 1/2'' \times 0.131''$) nail or 8d deformed ($2 1/2'' \times 0.120''$) nail	6	12
39	$1 1/8'' - 1 1/4''$	10d common ($3'' \times 0.148''$) nail or 8d deformed ($2 1/2'' \times 0.120''$) nail	6	12

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

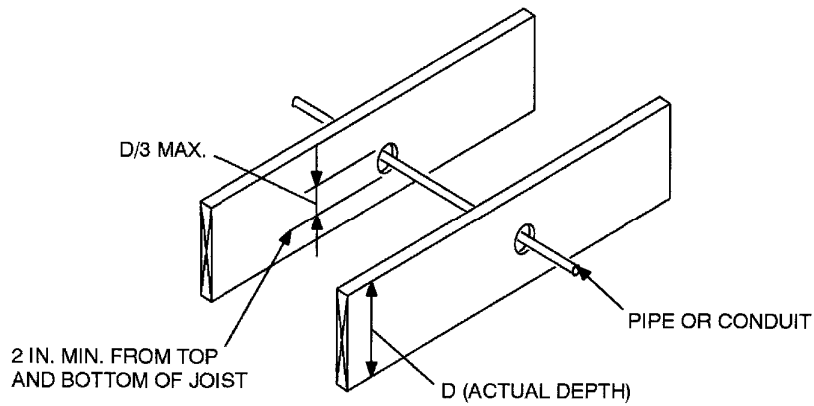
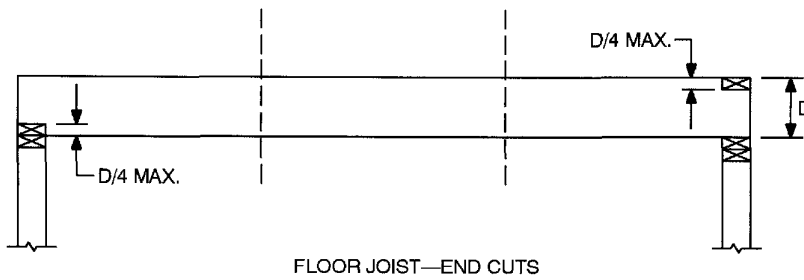
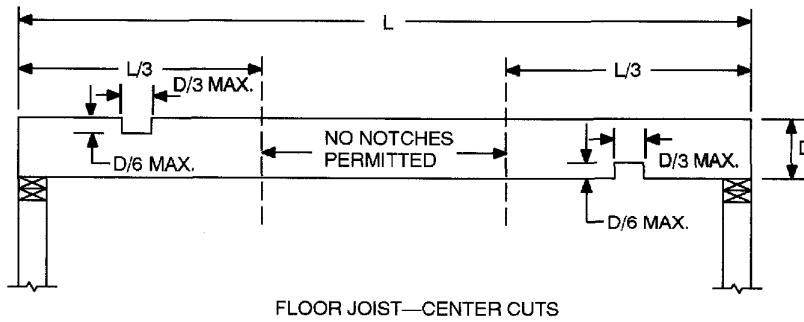
- a. All nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.
- b. Staples are 16 gage wire and have a minimum $7/16''$ -inch on diameter crown width.
- c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
- d. Four-foot-by-8-foot or 4-foot-by-9-foot panels shall be applied vertically.
- e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).
- f. For regions having basic wind speed of 110 mph or greater, 8d deformed ($2 1/2'' \times 0.120''$) nails shall be used for attaching plywood and wood structural panel roof sheathing to framing within minimum 48-inch distance from gable end walls, if mean roof height is more than 25 feet, up to 35 feet maximum.
- g. For regions having basic wind speed of less than 110 mph, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. When basic wind speed is greater than 100 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.
- h. Gypsum sheathing shall conform to ASTM C 1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C 208.
- i. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at all floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.
- j. Interior non-braced wall lines may be nailed with a minimum 4-10d nails.

**TABLE R602.3(2)
ALTERNATE ATTACHMENTS**

NOMINAL MATERIAL THICKNESS (inches)	DESCRIPTION ^{a,b} OF FASTENER AND LENGTH (inches)	SPACING ^c OF FASTENERS	
		Edges (inches)	Intermediate supports (inches)
Wood structural panels subfloor, roof and wall sheathing to framing and particleboard wall sheathing to framing^f			
up to 1/2	Staple 15 ga. 1 3/4	4	8
	0.097 - 0.099 Nail 2 1/4	3	6
	Staple 16 ga. 1 3/4	3	6
19/32 and 5/8	0.113 Nail 2	3	6
	Staple 15 and 16 ga. 2	4	8
	0.097 - 0.099 Nail 2 1/4	4	8
23/32 and 3/4	Staple 14 ga. 2	4	8
	Staple 15 ga. 1 3/4	3	6
	0.097 - 0.099 Nail 2 1/4	4	8
	Staple 16 ga. 2	4	8
1	Staple 14 ga. 2 1/4	4	8
	0.113 Nail 2 1/4	3	6
	Staple 15 ga. 2 1/4	4	8
	0.097 - 0.099 Nail 2 1/2	4	8
NOMINAL MATERIAL THICKNESS (Inches)	DESCRIPTION ^{a,b} OF FASTENER AND LENGTH (inches)	SPACING ^c OF FASTENERS	
		Edges (inches)	Body of panel ^d (inches)
Floor underlayment; plywood-hardboard-particleboard^f			
Plywood			
1/4 and 5/16	1 1/4 ring or screw shank nail—minimum 12 1/2 ga. (0.099") shank diameter	3	6
	Staple 18 ga., 7/8, 3/16 crown width	2	5
11/32, 3/8, 15/32, and 1/2	1 1/4 ring or screw shank nail—minimum 12 1/2 ga. (0.099") shank diameter	6	8 ^e
19/32, 5/8, 23/32 and 3/4	1 1/2 ring or screw shank nail—minimum 12 1/2 ga. (0.099") shank diameter	6	8
	Staple 16 ga. 1 1/2	6	8
Hardboard^f			
0.200	1 1/2 long ring-grooved underlayment nail	6	6
	4d cement-coated sinker nail	6	6
	Staple 18 ga., 7/8 long (plastic coated)	3	6
Particleboard			
1/4	4d ring-grooved underlayment nail	3	6
	Staple 18 ga., 7/8 long, 3/16 crown	3	6
3/8	6d ring-grooved underlayment nail	6	10
	Staple 16 ga., 1 1/8 long, 3/8 crown	3	6
1/2, 5/8	6d ring-grooved underlayment nail	6	10
	Staple 16 ga., 1 5/8 long, 3/8 crown	3	6

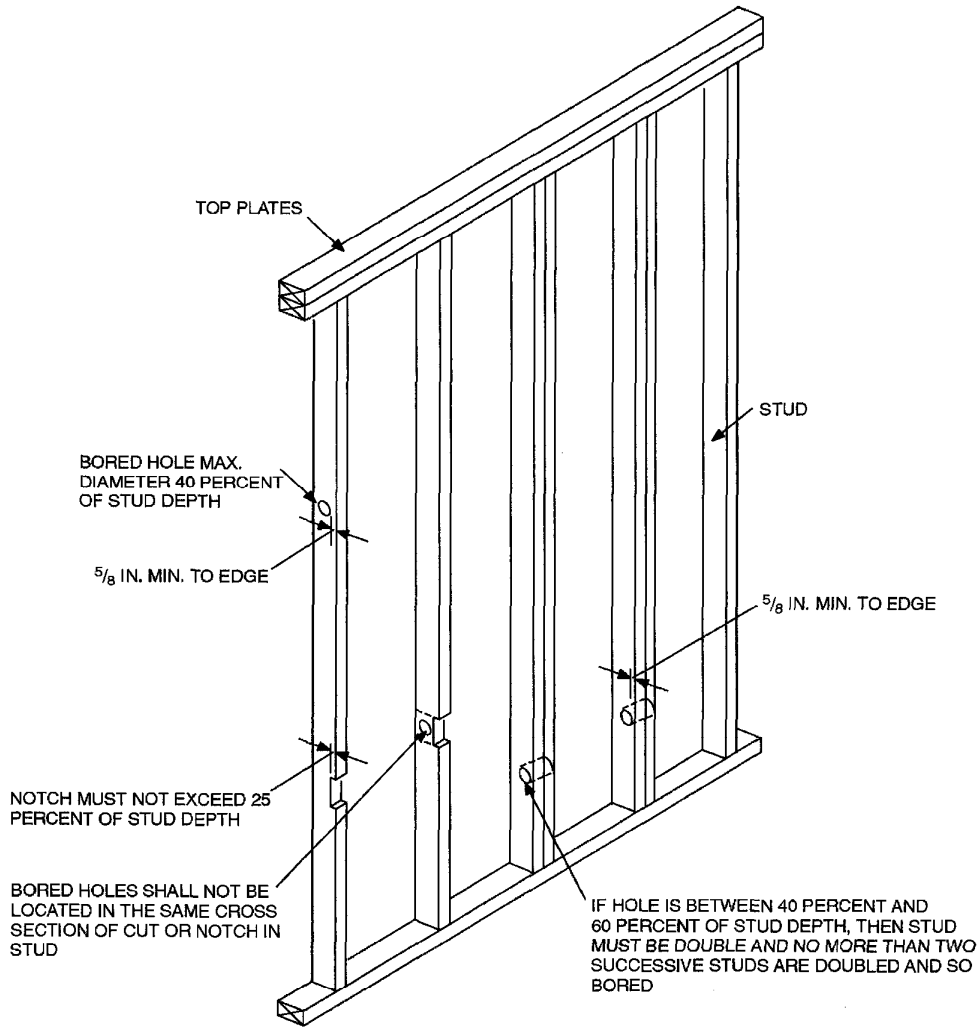
For SI: 1 inch = 25.4 mm.

- a. Nail is a general description and may be T-head, modified round head or round head.
- b. Staples shall have a minimum crown width of 7/16-inch on diameter except as noted.
- c. Nails or staples shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater. Nails or staples shall be spaced at not more than 12 inches on center at intermediate supports for floors.
- d. Fasteners shall be placed in a grid pattern throughout the body of the panel.
- e. For 5-ply panels, intermediate nails shall be spaced not more than 12 inches on center each way.
- f. Hardboard underlayment shall conform to ANSI/AHA A135.4.



For SI: 1 inch = 25.4 mm.

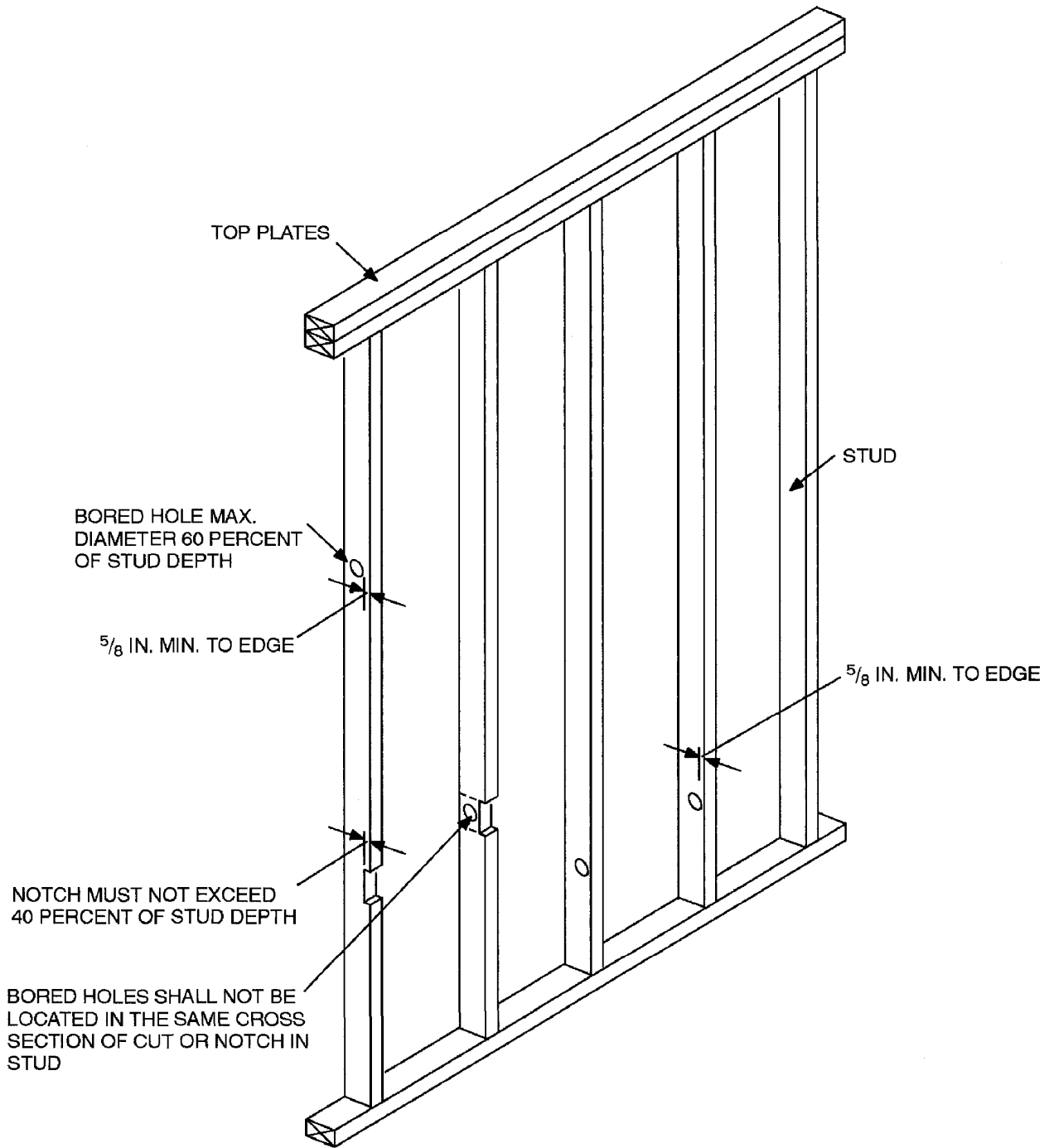
**FIGURE R502.8
CUTTING, NOTCHING AND DRILLING**



For SI: 1 inch = 25.4 mm.

NOTE: Condition for exterior and bearing walls.

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



For SI: 1 inch = 25.4 mm.

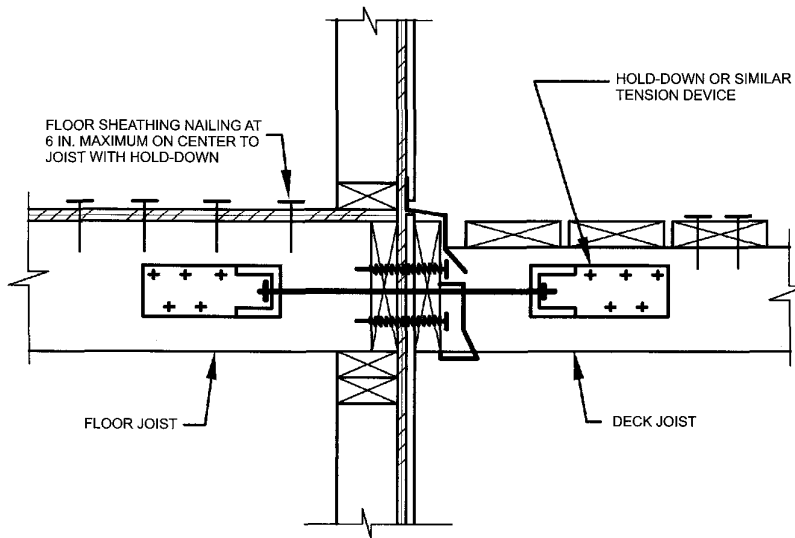
FIGURE R602.6(2)
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS

TABLE R502.2.2.1
FASTENER SPACING FOR A DECK LEDGER AND A 2-INCH NOMINAL SOLID-SAWN BAND JOIST^{c, f, g}
 (Deck live load = 40 psf, deck dead load = 10 psf)

JOIST SPAN	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'
Connection details	On-center spacing of fasteners^{d, e}						
1/2 inch diameter lag screw with 15/32 inch maximum sheathing ^a	30	23	18	15	13	11	10
1/2 inch diameter bolt with 15/32 inch maximum sheathing	36	36	34	29	24	21	19
1/2 inch diameter bolt with 15/32 inch maximum sheathing and 1/2 inch stacked washers ^{b, h}	36	36	29	24	21	18	16

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

- a. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- b. The maximum gap between the face of the ledger board and face of the wall sheathing shall be 1/2".
- c. Ledgers shall be flashed to prevent water from contacting the house band joist.
- d. Lag screws and bolts shall be staggered in accordance with Section R502.2.2.1.1.
- e. Deck ledger shall be minimum 2 x 8 pressure-preservative-treated No.2 grade lumber, or other approved materials as established by standard engineering practice.
- f. When solid-sawn pressure-preservative-treated deck ledgers are attached to a minimum 1 inch thick engineered wood product (structural composite lumber, laminated veneer lumber or wood structural panel band joist), the ledger attachment shall be designed in accordance with accepted engineering practice.
- g. A minimum 1 x 9 1/2 Douglas Fir laminated veneer lumber rimboard shall be permitted in lieu of the 2-inch nominal band joist.
- h. Wood structural panel sheathing, gypsum board sheathing or foam sheathing not exceeding 1 inch in thickness shall be permitted. The maximum distance between the face of the ledger board and the face of the band joist shall be 1 inch.



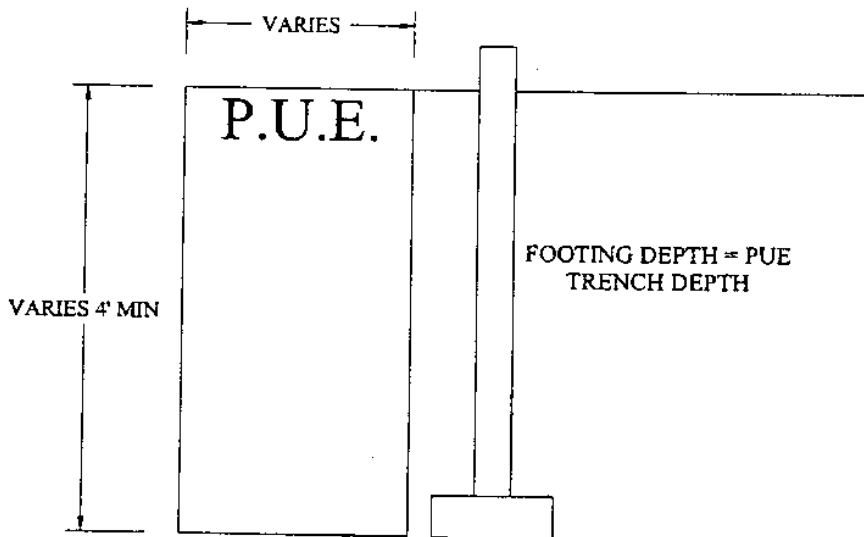
For SI: 1 inch = 25.4 mm.

FIGURE R502.2.2.3
DECK ATTACHMENT FOR LATERAL LOADS

FOOTINGS BUILT NEXT TO PUBLIC UTILITY EASEMENTS SHALL:

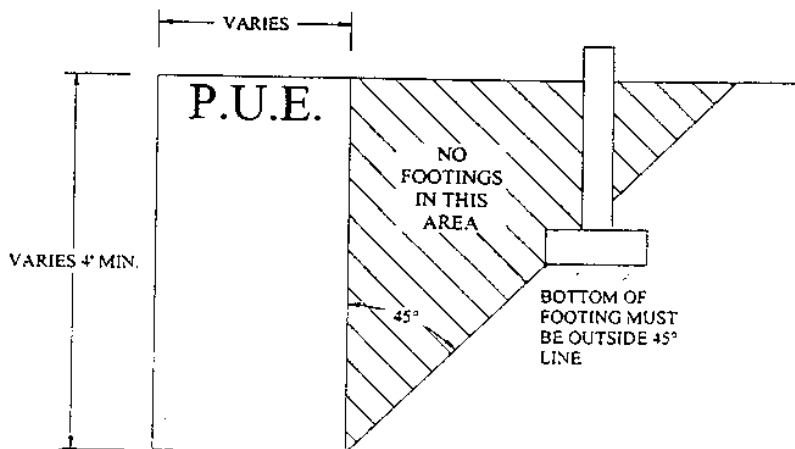
1. Either have **DEPTH** due to proximity of Public Utility Easement (PUE), or:

EXAMPLE – If footing is planned to be placed 1' from edge of PUE then the footing would have to be maximum 1' above the bottom of the PUE trench excavation.



2. **DISTANCE** on 45° to Footing:

EXAMPLE – If footing is placed 2' from the edge of the PUE, (4' deep) then the footing would be a maximum of 2' above bottom of trench.



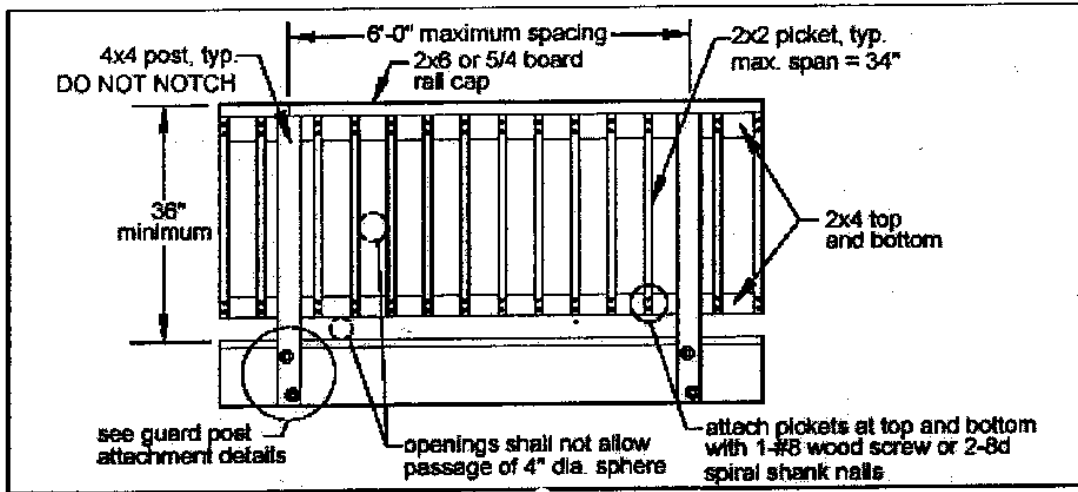


Figure 24
Typical Guardrail Detail

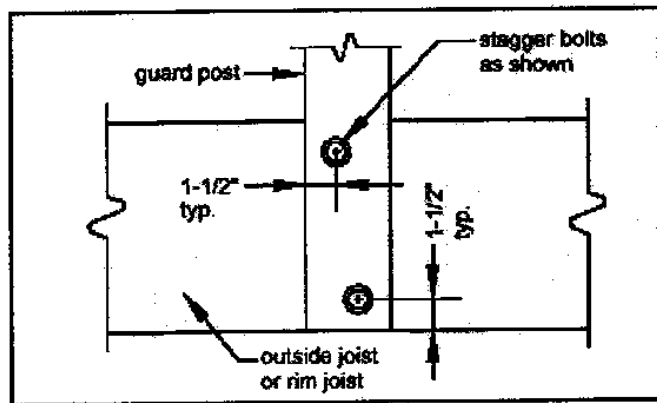


Figure 25
Guardrail Post Attachment Detail

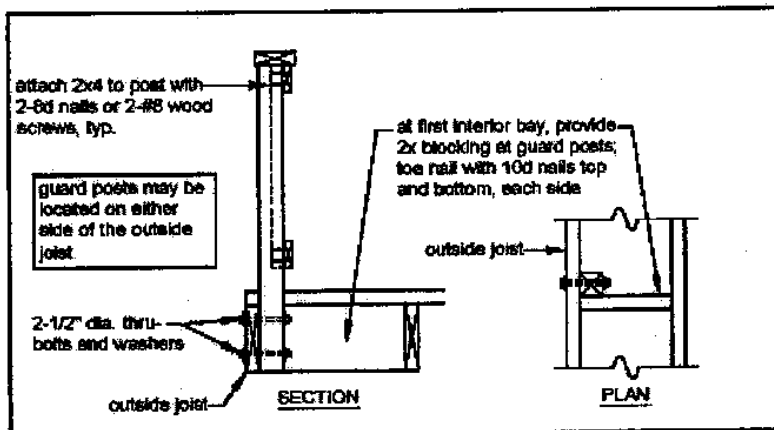


Figure 26
Guardrail Post To Outside Joist Detail

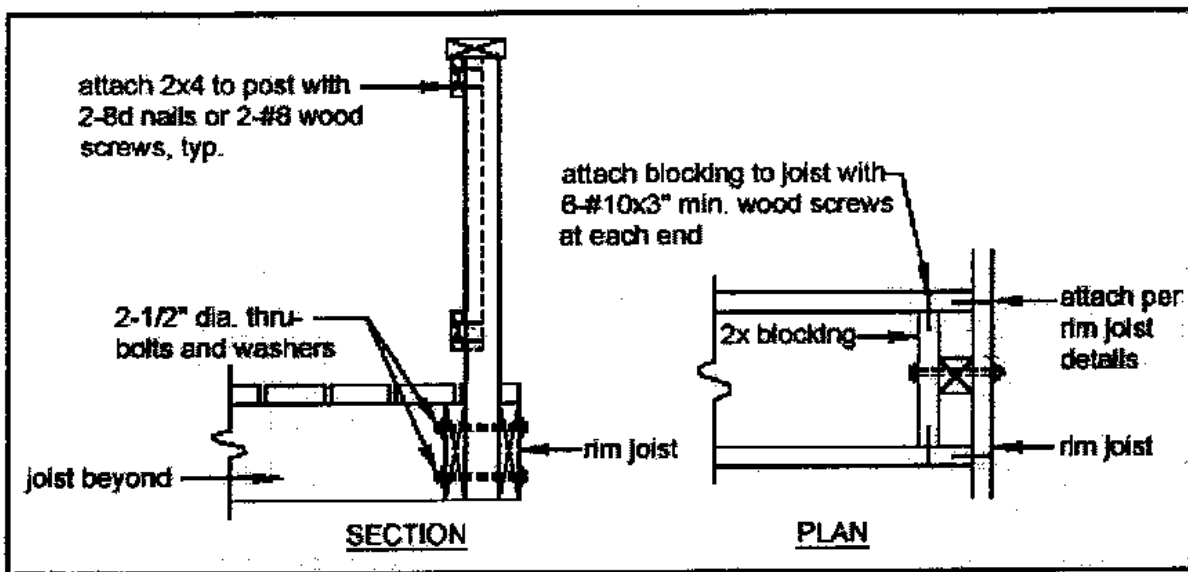


Figure 27

Guardrail Post To Rim Joist Detail, Option 1

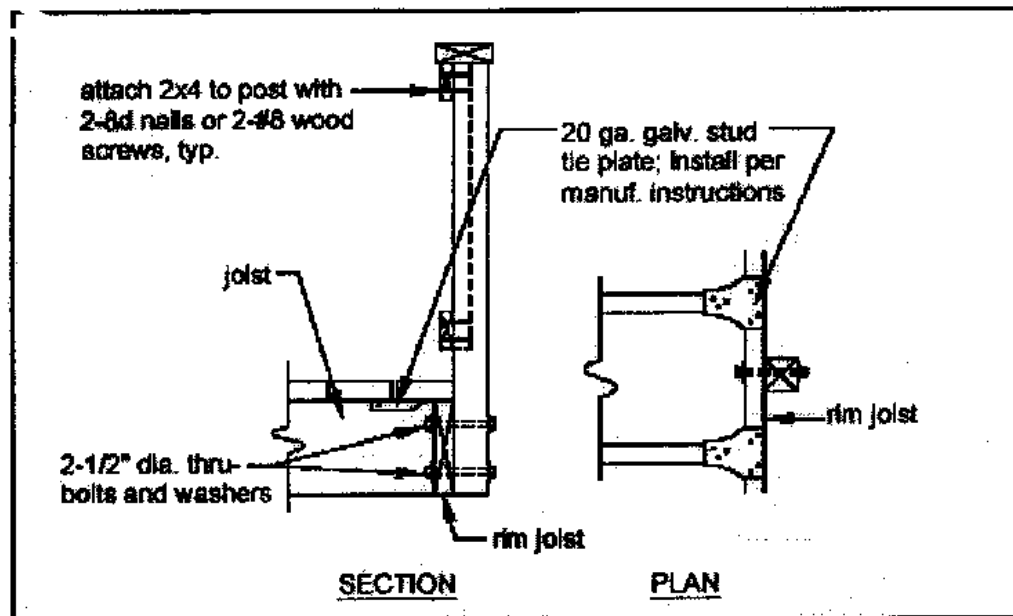
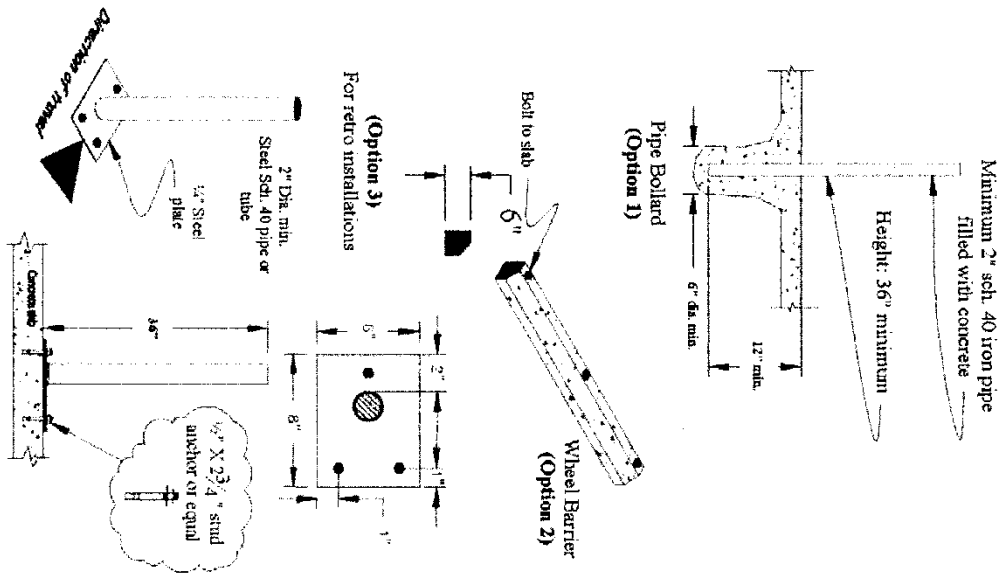
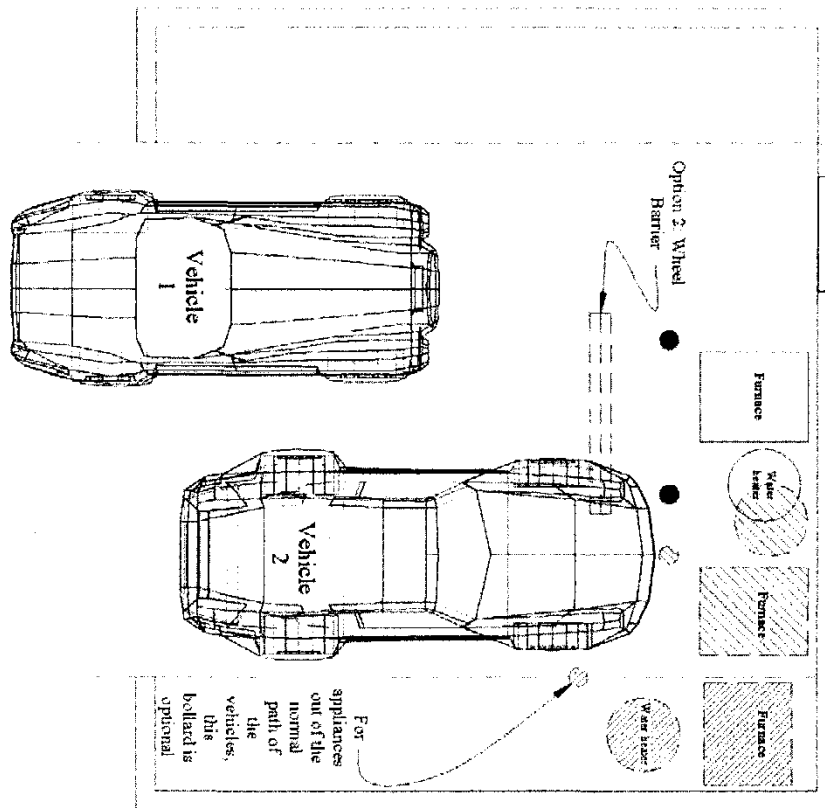


Figure 28

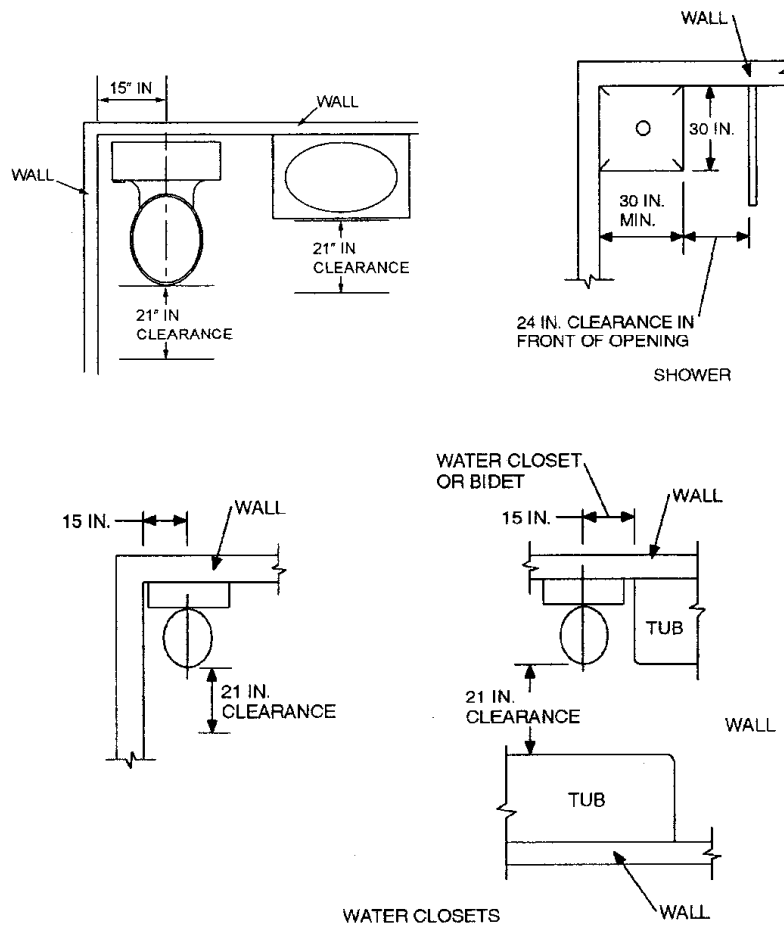
Guardrail Post To Rim Joist Detail, Option 2

Examples of barrier locations, when appliances are in the normal path of vehicles



For SI: 1 inch = 25.4 mm.

FIGURE M1307.1
ILLUSTRATIONS OF NORMAL VEHICLE PATH AND RECOMMENDED TYPES OF PROTECTION



For SI: 1 inch = 25.4 mm.

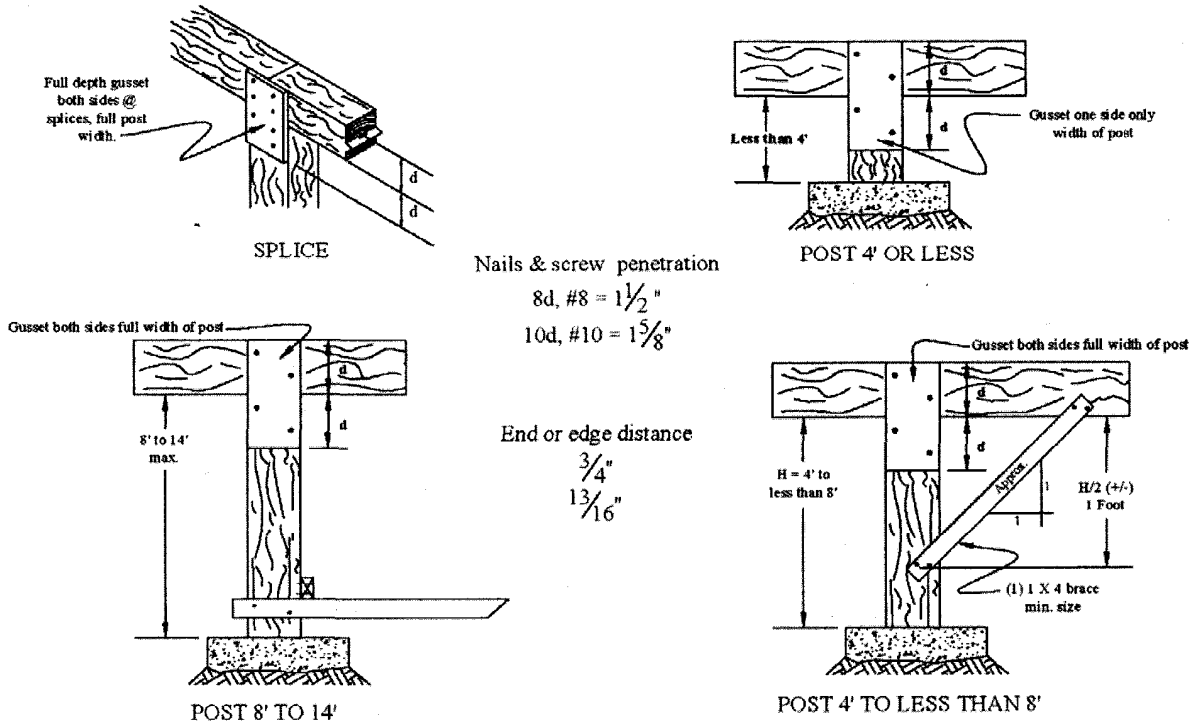
**FIGURE R307.1
MINIMUM FIXTURE CLEARANCES**

**TABLE M1507.4
PERSCRIPTIVE EXHAUST DUCT SIZING**

FAN TESTED CFM @ 0.10 in. W.G.	MINIMUM METAL FLEX (diameter)	MAXIMUM LENGTH (feet)	MINIMUM SMOOTH (diameter)	MAXIMUM LENGTH (feet)	MAXIMUM ELBOWS ^a
50	4"	25	4"	70	3
	5"	90	5"	100	3
	6"	No limit	6"	No limit	3
80	4" ^b	N/A	4"	20	3
	5"	15	5"	100	3
	6"	90	6"	No limit	3
100	5" ^b	N/A	5"	50	3
	6"	45	6"	No limit	3
125	6"	15	6"	No limit	3
	7"	70	7"	No limit	3

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

- a. For each additional elbow subtract 10 feet from length.
- b. Metal flex ducts of this diameter are not permitted with fans of this size.



NOTES:

1. Details shown apply when there is full perimeter foundation walls.
2. This is an acceptable practice pertaining to Sections R407.3 and R502.9.

CONNECTORS:

1. Quantity as shown on details.
2. Gusset plate: 1/2" structural sheathing or 1 X 4 wood lumber min. or 16 gage (0.0598") steel plate min.
3. Nails: 8d for 1/2" structural sheathing or 1 X (varies) nominal materials. 10d for 2 X (varies) nominal materials and larger.
4. Wood screws and staples are an acceptable alternate.

Exception: Girders & posts supporting exterior decks not exceeding 18" inches (457 mm) in height are not required to be laterally braced or have gussets at post and girder connections. (see Section R502.2.1)

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

**FIGURE R502.9
POST AND BEAM CONNECTIONS**

APPENDIX F

RADON CONTROL METHODS

The provisions contained in this appendix are not mandatory, except for areas specified in Section AF101.1

SECTION AF101 SCOPE

AF101.1 General. This appendix contains requirements for new construction in Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill counties where radon-mitigating construction is required. Additional counties may be added as specified in Chapter 83, 2010 Oregon Laws (Senate Bill 1025), Section 2.

Chapter 83, 2010 Oregon Laws (Senate Bill 1025) is not part of this code but is reproduced here for the reader's convenience:

SECTION 2.

(1) The Building Codes Structures Board and the Residential and Manufactured Structures Board shall adopt design and construction standards for mitigating radon levels in new residential buildings that are identified under the structural specialty code as Group R-2 or R-3 buildings and new public buildings. In adopting the standards, the boards shall give consideration to any standards recommended by the United States Environmental Protection Agency for radon mitigation systems in buildings.

(2) The boards shall make the design and construction standards for mitigating radon levels applicable in:

(a) Baker, Clackamas, Hood River, Multnomah, Polk, Washington and Yamhill Counties; and

(b) Any county for which the boards, after consultation with the Oregon Health Authority, consider the standards appropriate due to local radon levels.

(3) The Director of the Department of Consumer and Business Services may authorize a municipality that administers and enforces one or more building inspection programs under ORS 455.148 or 455.150 to also administer and enforce any applicable standards for mitigating radon that are adopted by the boards.

(4) The director, in consultation with the boards, may adopt rules for the implementation, administration and enforcement of this section.

SECTION AF102 DEFINITIONS

AF102.1 General. For the purpose of these requirements, the terms used shall be defined as follows:

SUBSLAB DEPRESSURIZATION SYSTEM (Passive). A system designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a vent pipe routed through the *conditioned space* of a building and connecting the sub-slab area with outdoor air, thereby relying on the convective flow of air upward in the vent to draw air from beneath the slab.

SUBSLAB DEPRESSURIZATION SYSTEM (Active). A system designed to achieve lower sub-slab air pressure relative to indoor air pressure by use of a fan-powered vent drawing air from beneath the slab.

DRAIN TILE LOOP. A continuous length of drain tile or perforated pipe extending around all or part of the internal or external perimeter of a *basement* or crawl space footing.

RADON GAS. A naturally-occurring, chemically inert, radioactive gas that is not detectable by human senses. As a gas, it can move readily through particles of soil and rock and can accumulate under the slabs and foundations of homes where it can easily enter into the living space through construction cracks and openings.

SOIL-GAS-RETARDER. A continuous membrane of 6-mil (0.15 mm) polyethylene or other equivalent material used to retard the flow of soil gases into a building.

SUBMEMBRANE DEPRESSURIZATION SYSTEM. A system designed to achieve lower-sub-membrane air pressure relative to crawl space air pressure by use of a vent drawing air from beneath the soil-gas-retarder membrane.

SECTION AF103 REQUIREMENTS

AF103.1 General. The following construction techniques are intended to mitigate radon entry in new construction. These techniques are required in areas where designated by Section AF101.1.

AF103.2 Subfloor preparation. A layer of gas-permeable material shall be placed under all concrete slabs and other floor systems that directly contact the ground and are within the walls of the living spaces of the building, to facilitate future installation of a sub-slab depressurization system, if needed. The gas-permeable layer shall consist of one of the following:

1. A uniform layer of clean aggregate, a minimum of 4 inches (102 mm) thick. The aggregate shall consist of material that will pass through a 2-inch (51 mm) sieve and be retained by a 1/4-inch (6.4 mm) sieve.
2. A uniform layer of sand (native or fill), a minimum of 4 inches (102 mm) thick, overlain by a layer or strips of geotextile drainage matting designed to allow the lateral flow of soil gases.
3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire sub-floor area.

AF103.3 Soil-gas-retarder. A minimum 6-mil (0.15 mm) [or 3-mil (0.075 mm) cross-laminated] polyethylene or equivalent flexible sheeting material shall be placed on top of the gas-permeable layer prior to casting the slab or placing the floor assembly to serve as a soil-gas-retarder by bridging any cracks that develop in the slab or floor assembly and to prevent concrete from entering the void spaces in the aggregate base material. The sheeting shall cover the entire floor area with separate

sections of sheeting lapped at least 12 inches (305 mm). The sheeting shall fit closely around any pipe, wire or other penetrations of the material. All punctures or tears in the material shall be sealed or covered with additional sheeting.

AF103.4 Entry routes. Potential radon entry routes shall be closed in accordance with Sections AF103.4.1 through AF103.4.10.

AF103.4.1 Floor openings. Openings around bathtubs, showers, water closets, pipes, wires or other objects that penetrate concrete slabs or other floor assemblies shall be filled with a polyurethane caulk or equivalent sealant applied in accordance with the manufacturer's recommendations.

AF103.4.2 Concrete joints. All control joints, isolation joints, construction joints and any other joints in concrete slabs or between slabs and foundation walls shall be sealed with a caulk or sealant. Gaps and joints shall be cleared of loose material and filled with polyurethane caulk or other elastomeric sealant applied in accordance with the manufacturer's recommendations.

AF103.4.3 Condensate drains. Condensate drains shall be trapped or routed through nonperforated pipe to daylight.

AF103.4.4 Sumps. Sump pits open to soil or serving as the termination point for sub-slab or exterior drain tile loops shall be covered with a gasketed or otherwise sealed lid. Sumps used as the suction point in a sub-slab depressurization system shall have a lid designed to accommodate the vent pipe. Sumps used as a floor drain shall have a lid equipped with a trapped inlet.

AF103.4.5 Foundation walls. Hollow block masonry foundation walls shall be constructed with either a continuous course of *solid masonry*, one course of masonry grouted solid, or a solid concrete beam at or above finished ground surface to prevent passage of air from the interior of the wall into the living space. Where a brick veneer or other masonry ledge is installed, the course immediately below that ledge shall be sealed. Joints, cracks or other openings around all penetrations of both exterior and interior surfaces of masonry block or wood foundation walls below the ground surface shall be filled with polyurethane caulk or equivalent sealant. Penetrations of concrete walls shall be filled.

AF103.4.6 Dampproofing. The exterior surfaces of portions of concrete and masonry block walls below the ground surface shall be dampproofed in accordance with Section R406 of this code.

AF103.4.7 Air-handling units. Air-handling units in crawl spaces shall be sealed to prevent air from being drawn into the unit.

Exception: Units with gasketed seams or units that are otherwise sealed by the manufacturer to prevent leakage.

AF103.4.8 Ducts. Ductwork passing through or beneath a slab shall be of seamless material unless the air-handling system is designed to maintain continuous positive pressure within such ducting. Joints in such ductwork shall be sealed to prevent air leakage and shall be performance tested to

demonstrate conformance to ODOE duct performance standards.

Ductwork located in crawl spaces shall have all seams and joints sealed by closure systems in accordance with Section M1601.4.1. Ductwork shall be performance tested to demonstrate conformance to ODOE duct performance standards.

AF103.4.9 Crawl space floors. Openings around all penetrations through floors above crawl spaces shall be caulked or otherwise filled to prevent air leakage.

AF103.4.10 Crawl space access. Access doors and other openings or penetrations between *basements* and adjoining crawl spaces shall be closed, gasketed or otherwise filled to prevent air leakage.

AF103.5 Crawl space mitigation system. In buildings with crawl space foundations, a system complying with Section AF103.5.1 or AF103.5.2 shall be installed during construction.

Exception: Buildings in which an approved mechanical crawl space ventilation system or other equivalent system is installed.

AF103.5.1 Passive submembrane depressurization system.

AF103.5.1.1 Ventilation. Crawl spaces shall be provided with vents to the exterior of the building. The minimum net area of ventilation openings shall comply with Section R408.1 of this code.

AF103.5.1.2 Soil-gas-retarder. The soil in crawl spaces shall be covered with a continuous layer of minimum 6-mil (0.15 mm) polyethylene soil-gas-retarder. The ground cover shall be lapped a minimum of 12 inches (305 mm) at joints and shall extend to all foundation walls enclosing the crawl space area.

AF103.5.1.3 Vent pipe. A plumbing tee or other *approved* connection shall be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch-diameter (76 mm or 102 mm) fitting with a vertical vent pipe installed through the sheeting. The vent pipe shall be extended up through the building floors, terminate at least 12 inches (305 mm) above the roof in a location at least 10 feet (3048 mm) away from any window or other opening into the *conditioned spaces* of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.

AF103.5.2 Crawl space ventilation and building tightness.

AF103.5.2.1 Ventilation. Crawl spaces shall be provided with vents to the exterior of the building that comply with Section R408.1 of this code. The minimum net area of ventilation openings shall not be less than 1 square foot (0.0929 m²) for each 150 square feet (14 m²) of under-floor space area.

AF103.5.2.2 Ventilation openings. Ventilation openings shall comply with Section R408.2. Operable louvers, dampers, or other means to temporarily stop the ventilation shall not be permitted.

AF103.5.2.3 Building tightness. Dwellings shall be tested with a blower door, depressurizing the dwelling to 50 Pascal's from ambient conditions and found to exhibit no more than 5.0 air changes per hour. A mechanical exhaust, supply, or combination ventilation system providing whole-building ventilation rates specified in Table N1101.1(3) or ASHRAE 62.2 shall be installed within the dwelling unit.

AF103.6 Passive subslab depressurization system. In *basement* or slab-on-grade buildings, the following components of a passive sub-slab depressurization system shall be installed during construction.

AF103.6.1 Vent pipe. A minimum 3-inch-diameter (76 mm) ABS, PVC or equivalent gas-tight pipe shall be embedded vertically into the sub-slab aggregate or other permeable material before the slab is cast. A "T" fitting or equivalent method shall be used to ensure that the pipe opening remains within the sub-slab permeable material. Alternatively, the 3-inch (76 mm) pipe shall be inserted directly into an interior perimeter drain tile loop or through a sealed sump cover where the sump is exposed to the sub-slab aggregate or connected to it through a drainage system.

The pipe shall be extended up through the building floors, terminate at least 12 inches (305 mm) above the surface of the roof in a location at least 10 feet (3048 mm) away from any window or other opening into the *conditioned spaces* of the building that is less than 2 feet (610 mm) below the exhaust point, and 10 feet (3048 mm) from any window or other opening in adjoining or adjacent buildings.

AF103.6.2 Multiple vent pipes. In buildings where interior footings or other barriers separate the sub-slab aggregate or other gas-permeable material, each area shall be fitted with an individual vent pipe. Vent pipes shall connect to a single vent that terminates above the roof or each individual vent pipe shall terminate separately above the roof.

AF103.7 Vent pipe drainage. All components of the radon vent pipe system shall be installed to provide positive drainage to the ground beneath the slab or soil-gas-retarder.

AF103.8 Vent pipe accessibility. Radon vent pipes shall be accessible for future fan installation through an *attic* or other area outside the *habitable space*.

Exception: The radon vent pipe need not be accessible in an *attic* space where an *approved* roof-top electrical supply is provided for future use.

AF103.9 Vent pipe identification. All exposed and visible interior radon vent pipes shall be identified with at least one *label* on each floor and in accessible *attics*. The *label* shall read: "Radon Reduction System."

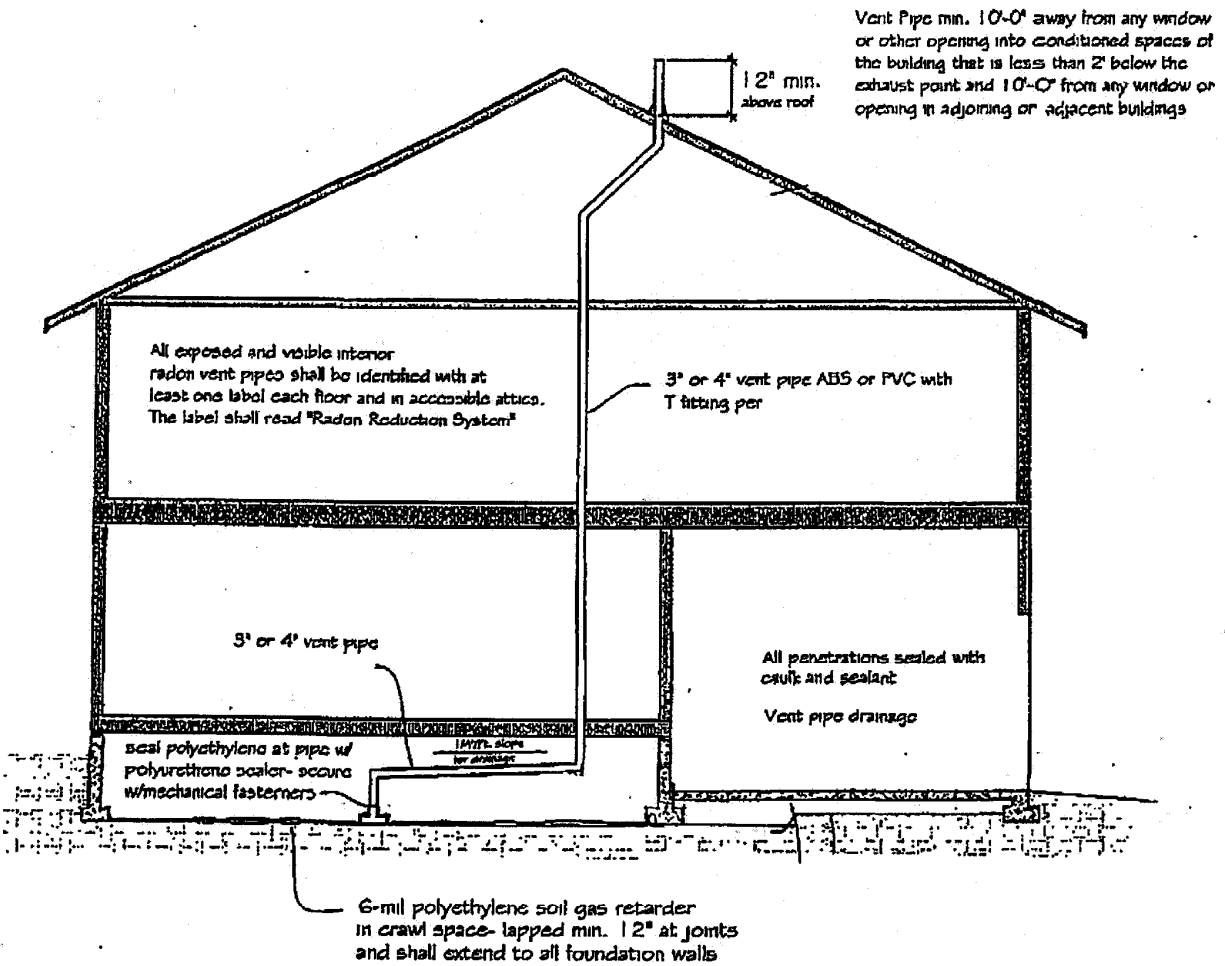
AF103.10 Combination foundations. Combination *basement/crawl* space or slab-on-grade/*crawl* space foundations shall have separate radon vent pipes installed in each type of foundation area. Each radon vent pipe shall terminate above the roof or shall be connected to a single vent that terminates above the roof.

AF103.11 Building depressurization. Joints in air ducts and plenums in *unconditioned spaces* shall meet the requirements

of Section M1601. Thermal envelope air infiltration requirements shall comply with the energy conservation provisions in Chapter 11. Fireblocking shall meet the requirements contained in Section R302.11.

AF103.12 Power source. To provide for future installation of an active sub-membrane or sub-slab depressurization system, an electrical circuit terminated in an *approved* box shall be installed during construction in the *attic* or other anticipated location of vent pipe fans. An electrical supply shall also be accessible in anticipated locations of system failure alarms.

RADON MITIGATION DETAIL

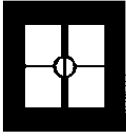


NOTE:

1. Install radon vent pipes per UPC (Chapter 7 Drain piping), for materials, fitting & installation requirements

CRAWL SPACE AND/OR UNDER SLAB

Radon Requirements



HIGH-EFFICIENCY INTERIOR LIGHTING SYSTEMS

Permit No.: _____ Jurisdiction _____

Site Address: _____

Subdivision/Lot: _____

and/or

Map And Tax Lot: _____

By my signature below, I certify that a minimum of fifty (50) percent of the permanently installed lighting fixtures in the above mentioned building have been installed with compact or linear fluorescent, or a lighting source that has a minimum efficacy of 40 lumens per input watt. (Oregon Residential Specialty Code N1107.2)¹

Signed: _____ Date: _____
Owner/General Contractor/Authorized Agent

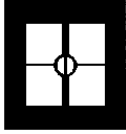
Print Name: _____

¹ ORSC Section N1107.2. High-efficiency interior lighting systems. A minimum of fifty (50) percent of the permanently installed lighting fixtures shall be installed with compact or linear fluorescent, or a lighting source that has a minimum efficacy of 40 lumens per input watt. Screw-in compact fluorescent lamps comply with this requirement.

The building official shall be notified in writing at the final inspection that a minimum of fifty percent of the permanently installed lighting fixtures are compact or linear fluorescent, or a minimum efficacy of 40 lumens per input watt.



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Moisture Content Acknowledgement Form

I, _____, am the general contractor or the owner-builder at the following address:

Street Address

City

Permit Number

If Applicable:

_____ and/or _____
Subdivision/Lot Map and Tax Lot

To conform with the 2008 Oregon residential Specialty Code (ORSC), section R318.2, I am notifying the building official that I am aware of the moisture content requirement of ORSC Section R318.2 and have taken steps to meet this code requirement. [Section R318.2 is provided for reference]

Section R318.2 Moisture content. Prior to issuance of the insulation/vapor barrier approval required by R109.1.5.2 of this code:

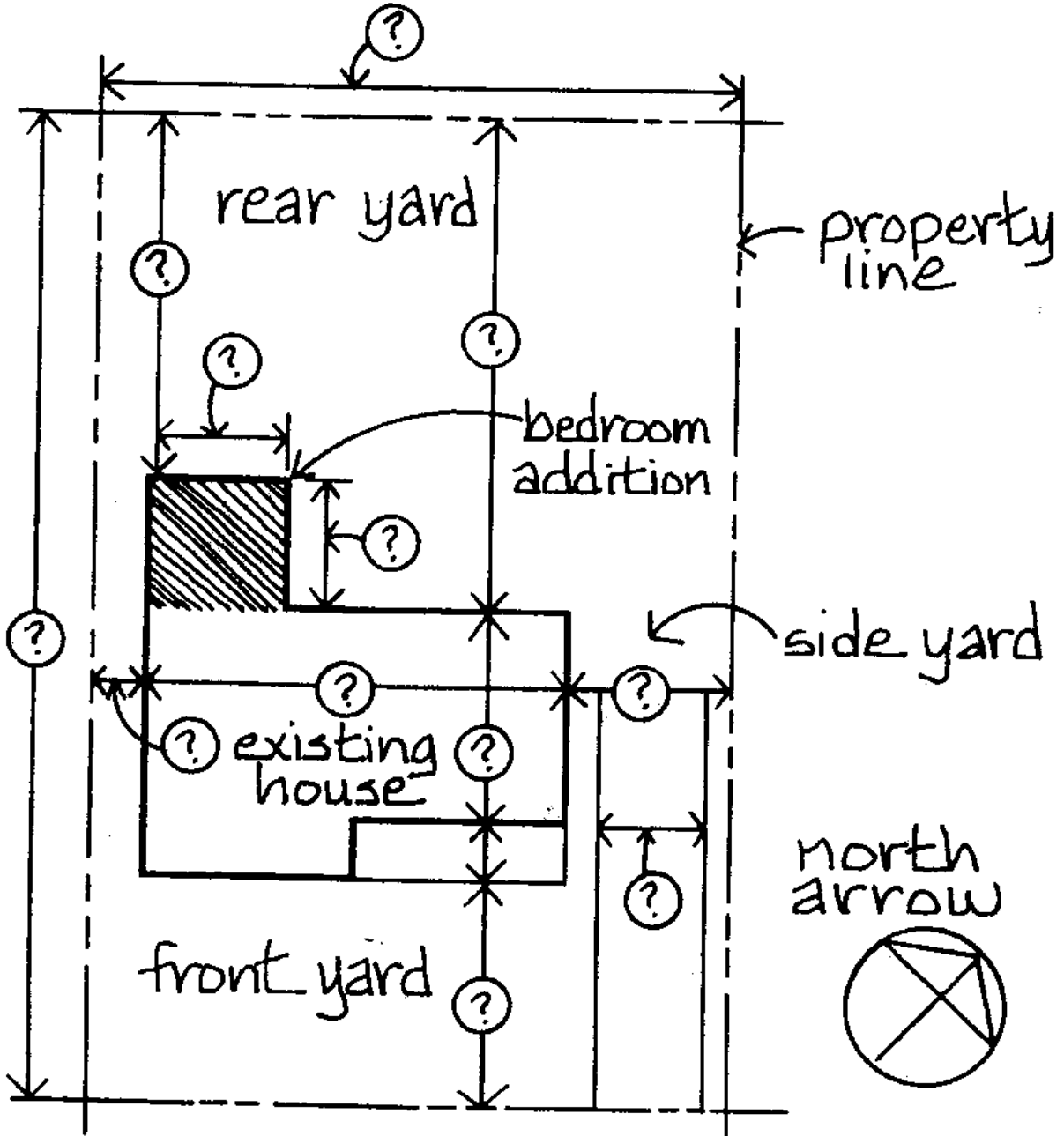
- (A) All moisture-sensitive wood framing members used in construction shall have a moisture content of not more than 19 percent of the weight of dry wood framing members.
- (B) The general contractor or the owner who was issued the structural permit shall notify the building official on a division approved form that the contractor or the owner who was issued the structural permits is aware of and has taken steps to meet the requirements in paragraph (A).

Signed: _____ Date: _____
Owner/General Contractor/Authorized Agent

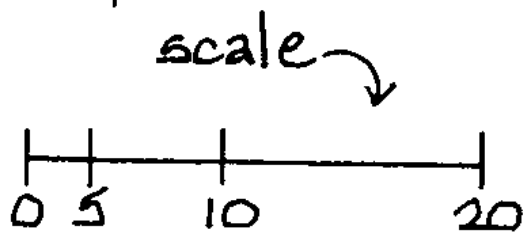
Print Name: _____



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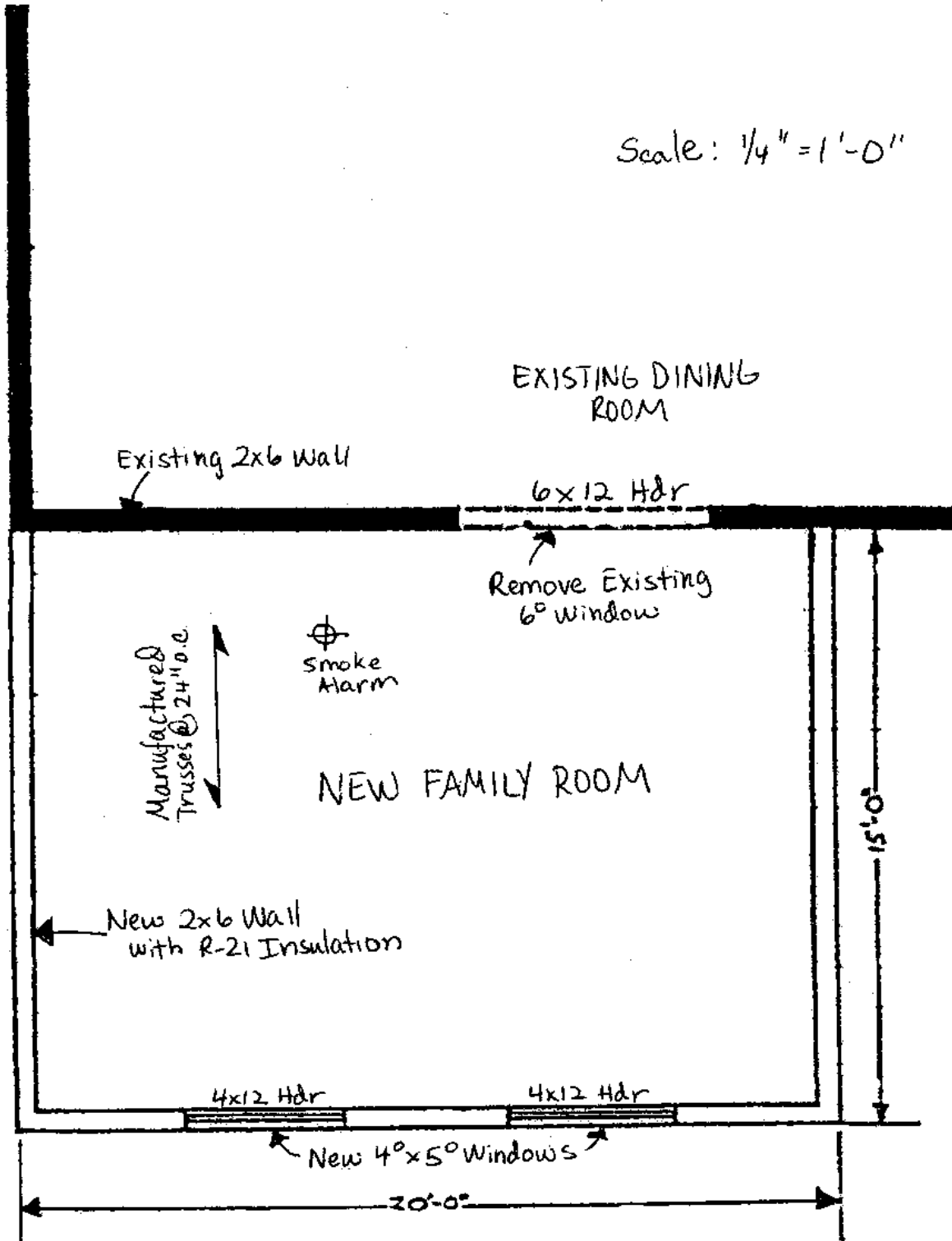


1234 OAK ST.
plot plan



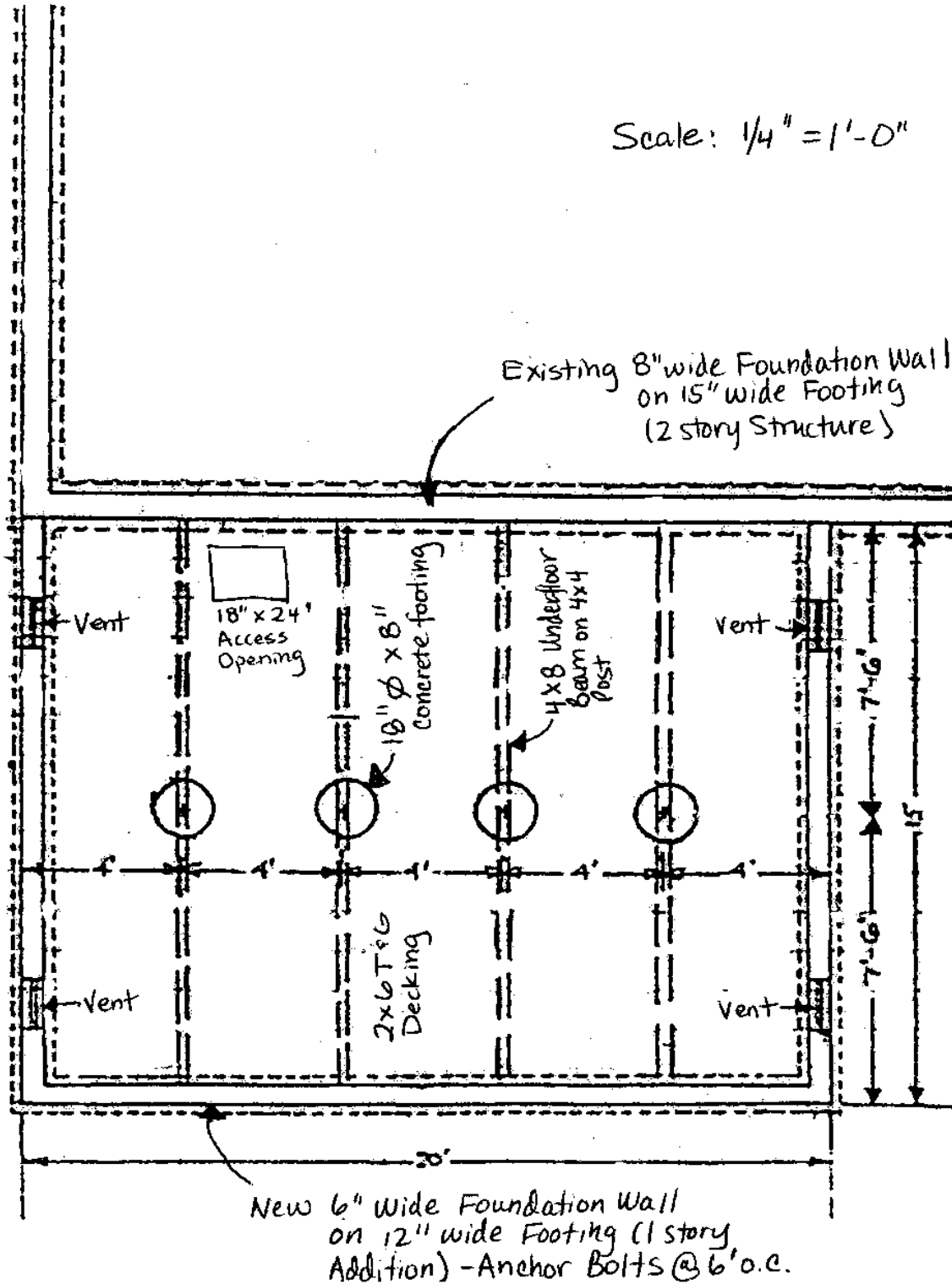
Sample FLOOR PLAN

Scale: 1/4" = 1'-0"



Sample FOUNDATION PLAN

Scale: 1/4" = 1'-0"



Sample CROSS-SECTION

Section A-A
 Scale: 1/4" = 1'-0"

