



2011 OREGON REACH CODE

Based on the International Green Construction Code™ (IGCC™) Public Version 2.0



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SECTION 102 APPLICABILITY

102.1 General. This code is an overlay to the other Oregon Specialty Codes. This code is not intended to be used as a stand alone construction regulation document or to abridge or supersede safety, health or environmental requirements under other applicable codes or ordinances.

102.1.1 Code Conflicts. Where there is a conflict between a general requirement and a specific requirement of this code, the specific requirement shall be applicable. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most practical and effective requirement to meet the intent of the code shall govern.

102.1.2 Innovative Approaches. It is intended that the provisions of this code provide flexibility to allow and encourage the use of innovative approaches, techniques and technology to achieve compliance with the intent of the code.

102.2 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law.

102.3 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

102.4 Referenced codes and standards. The codes listed in Sections 102.4.2 through 102.4.11, the codes and standards referenced elsewhere in this code, and those referenced standards listed in Chapter 12, shall be considered as part of the requirements of this code to the prescribed extent of each such reference. It is the expressed intent of this code to require higher minimum standards relating to *building* performance than the corresponding minimum standards set by the referenced codes and standards, and in such cases, the higher minimum standards of this code shall take precedence.

102.4.1 Conflicting Provisions. Where the extent of the reference to referenced code or standard includes subject matter that is within the scope of this code or codes listed in Section 102.4 the provisions of this code or the code listed in section 102.4 as applicable, shall take precedence over the provisions in the referenced code or standard.

102.4.2 Building. The provisions of the *Building Code* shall apply to the extent that such provisions establish minimum requirements to safeguard public health, safety and general welfare through structural strength, means of egress facilities, sanitation, adequate light and *ventilation*, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations. The provisions of Chapter 1 of the *Building Code* shall also apply.

102.4.3 Fuel Gas. The provisions of the *Mechanical Code* shall apply to the installation, *alteration*, *repair* and replacement of gas piping systems and components, gas appliances and related accessories as covered in this code. These requirements apply to gas piping systems extending from the point of delivery to the inlet connections of appliances and the installation and operation of gas appliances and related accessories.

102.4.4 Mechanical. The provisions of the *Mechanical Code* shall apply to the installation, *alterations*, *repairs* and replacement of mechanical systems, equipment, appliances, fixtures, fittings and appurtenances, including ventilating, heating, cooling, air-conditioning and refrigeration systems, incinerators and other energy-related systems.

102.4.5 Plumbing. The provisions of the *Plumbing Code* shall apply to the installation, *alteration*, *repair* and replacement of plumbing systems, including equipment, appliances, fixtures, fittings, appurtenances, and medical gas systems.

102.4.6 Property maintenance. RESERVED

102.4.7 Energy. The provisions of the *Energy Code* shall apply to matters governing the design and construction of *buildings* for the effective use of energy.

102.4.8 Performance. RESERVED

102.4.9 Existing buildings. The provisions of the *International Existing Building Code* as amended by Oregon in Statewide Alternate Method OSSC 08-05, shall apply to matters governing the design and construction of *additions, alterations* or renovations of existing *buildings* as well as to changes in occupancy to the extent that such provisions establish minimum requirements to safeguard public health, safety and general welfare through structural strength, *means of egress* facilities sanitation, adequate light and *ventilation*, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations.

102.4.10 Zoning. RESERVED

102.4.11 Residential occupancies. The provisions of ~~Chapter 13, the ICC 700 Residential Reach Code~~ are incorporated by reference and shall apply to the design and construction of *buildings* or portions thereof of Group R, including the *building site* detached one- and two-family dwellings and townhouses not more than three stories above grade in height with a separate means of egress. Such occupancies shall achieve the minimum environmental performance level as indicated in Table 302.1 in accordance with Section 303 of ICC 700 and as noted in Table 102.4.12. The minimum energy efficiency requirements shall be based on the performance path requirements of Table 102.4.12. *Buildings* of mixed use, one of which is Group R, shall comply with Section 102.4.12.1.

Exception: ~~High rise buildings as defined by the Oregon Structural Specialty Code shall comply with the provisions of this code or ICC 700~~ Buildings permitted under the *Oregon Structural Specialty Code* shall comply with the commercial provisions.

**TABLE 102.4.11
Residential Performance Requirements**

Residential coverage issue	ICC 700 Requirement
Environmental Performance Level	Bronze, Silver, Gold or Emerald in accordance with Table 303^a
Minimum energy efficiency requirements—Performance Path	Mandatory requirements of Section 701. Performance path requirements in accordance with Section 701.1.1 that exceed the baseline minimum performance required by the 2006 IECC by 30 percent in accordance with 702.2 (2) and a minimum of two practices from Section 704.

~~a. The environmental performance level in accordance with Table 303 of ICC 700 is to be determined by the jurisdiction.~~

102.4.11.1 Residential mixed use occupancies. The design and construction of residential portions of mixed use *buildings* shall comply with Section 102.4.12.1. The remainder of the *building* and the site on which the *building* is located shall comply with the provisions of this code. Where there are specific provisions provided in ~~ICC 700 Oregon Residential Reach Code~~ that regulate the design and construction of residential portions of the mixed occupancy, the provisions of ~~the Oregon Residential Reach Code ICC 700~~ shall apply.

Exception: ~~Buildings permitted under the OSSC shall comply with the commercial provisions.~~ High-rise *buildings* as defined by the *Oregon Structural Specialty Code* shall comply with the provisions of this code or ICC 700.

102.5 Partial invalidity. In the event that any part or provision of this code is held to be illegal or void, this shall not have the effect of making void or illegal any of the other parts or provisions.

102.6 Existing structures. The legal occupancy of any *structure* existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code, *the Structural Code*, , the *International Existing Building Code as adopted by Oregon*, or the *International Fire Code*, or as is deemed necessary by the *code official* for the general safety and welfare of *building* occupants and the public.

102.7 Mixed occupancy buildings. In mixed occupancy *buildings*, each portion of a *building* shall comply with the specific requirements of this code applicable to each specific occupancy, except as provided in Section 102.4.11

PART 2 --- ADMINISTRATION AND ENFORCEMENT

Chapter 13 Residential Provisions

SECTION 1301 SCOPE

1301.1 General. The provisions of this chapter are voluntary and replace specific requirements of the Oregon Residential Specialty Code. The provisions of this code shall promote increased conservation of energy within a dwelling over the requirements of the Oregon Residential Specialty Code. Materials, methods, or techniques not addressed in this code shall be installed in accordance with the requirements set forth in the Oregon Building Code.

All conditioned spaces within low-rise residential dwellings, built to this code, shall comply with one of the following:

1. **Prescriptive Compliance Path:**

Residential dwellings using the prescriptive path shall comply with the provisions in section 1303.

2. **Selective Compliance Path:**

Residential dwellings using the selective path shall comply with the provisions in section 1304.

3. **Alternative Systems Analysis:**

Residential dwellings using the energy performance path shall comply with the provisions in section 1305.

4. **Additions, Alterations, and Change of Occupancies shall comply with the provisions of 1306.**

SECTION 1302 DEFINITIONS

AFUE (ANNUAL FUEL UTILIZATION EFFICIENCY). The energy output divided by the energy input, calculated on an annual basis and including part load and cycling effects. AFUE ratings shall be determined using the U.S. Department of Energy test procedures (10 CFR Part 430) and listings in the Gas Appliance Manufacturers Association (GAMA) Consumer Directory of Certified Furnace and Boiler Efficiency Ratings.

ASHRAE. The American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc.

AUTOMATIC. A self-acting device, operating by its own mechanism when actuated by some impersonal influence, such as a change in current strength, pressure, temperature or mechanical configuration. (See also "Manual.")

BASEMENT WALL. The opaque portion of walls which encloses a basement and is partially or totally below grade walls.

BELOW GRADE WALLS. The walls or the portion of walls entirely below the finished grade or which extend 2 feet (610 mm) or less above the finish grade.

BTU (British Thermal Unit). The amount of heat required to raise the temperature of 1 pound (0.454 kg) of water (about 1 pint) from 59°F to 60°F (15°C to 16°C).

BUILDING ENVELOPE. That element of a building which encloses conditioned spaces through which thermal energy may be transmitted to or from the exterior or to or from unconditioned spaces.

CLAY. Soil that contains a majority of particles smaller than 2 µm. (per ISO 14688) that also exhibit a high plasticity Index (per ASTM D 4318).

CLAY SLIP. A suspension of clay particles in water.

CLAY SOIL. Soil containing 50% or more clay per volume.

COLLECTION METHOD. The method of transport between the Commode and the Composting Chamber.

COMMODOE. The lavatory fixture exposed to Composting Toilet System users.

COMPOST ADDITIVES. Carbonaceous bulking material such as sawdust, leaves, or any other material added to Composting Chamber to maintain aerobic conditions within Composting Toilet System.

COMPOSTING CHAMBER. Container in which human wastes, toilet paper, and organic matter is transformed into Humus through aerobic decomposition.

COMPOSTING TOILET SYSTEM. The Commode, Collection Method, Composting Chamber, and Management Plan for the decomposition of human wastes, toilet paper, and organic matter into Humus through aerobic decomposition.

CONDITIONED SPACE. A space within the building, separated from unconditioned space by the exterior envelope which by introduction of conditioned air, by heated and/or cooled surfaces, or by air or heat transfer from directly conditioned spaces is maintained at temperatures of 55°F (13°C) or higher for heating and/or 85°F (29.4°C) or below for cooling. (Enclosed corridors between conditioned spaces shall be considered as conditioned space. Spaces where temperatures fall between this range by virtue of ambient conditions shall not be considered as conditioned space.)

ENERGY CONTROL DEVICE. A device which is installed within a dwelling that can provide near real-time data on whole dwelling energy consumption and is intended to operate energy consuming appliances and/or devices for a dwelling in order to reduce energy consumption. Consumption control systems are also known as Building Automation Control (BAC) or Building Management Control Systems (BMCS).

EXTERIOR DOOR. A permanently installed operable barrier by which an entry is closed and opened. Exterior doors include doors between conditioned and unconditioned spaces, such as a door between a kitchen and garage.

EXTERIOR ENVELOPE. See “Building Envelope.”

EXTERIOR WALL. Any member or group of members, which defines the exterior boundaries of the conditioned space and which has a slope of 60 degrees or greater with the horizontal plane.

EXTERIOR WINDOW. An opening, especially in the wall of a building, for admission of light or air that is usually closed by casement or sashes containing transparent material (such as glass) and in some cases capable of being opened and shut. All areas, including frames, in the shell of a conditioned space that let in natural light, including skylights, sliding glass doors, glass block walls and the glazed portions of the doors.

When calculating the energy performance of the exterior envelope, the area of the window shall be the total area of glazing measured using the rough opening dimensions, and including the glass, sash and frame.

FENESTRATION. Windows and doors in the exterior envelope. See the definitions for “Exterior Door” and “Exterior Window.”.

FLOOR AREA. The area included within the surrounding exterior walls of a building or portion thereof, exclusive courts. The floor area of a building or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above.

GLAZING. All areas including frames in the shell of a conditioned space that let in natural light, including windows, clerestories, skylights, sliding glass doors, glass block walls and the glazed portion of doors.

GROSS AREA OF EXTERIOR WALLS. Consists of wall areas, as measured on the exterior, including foundation walls above grade; peripheral edges of floors; window areas, including sash; and door areas, where such surfaces are exposed to outdoor air and enclose a heated or mechanically cooled space.

HEATED SPACE. A space within a building served by a mechanical, electrical or combustion source of heat. Spaces within a basement shall be defined as heated when any of the following apply: the space is finished, or has heating registers or contains heating devices.

HIGH-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps or lamps with a minimum efficacy of:

- 1. 60 lumens per watt for lamps over 40 watts.**
- 2. 50 lumens per watt for lamps over 15 watts to 40 watts.**
- 3. 40 lumens per watt for lamps 15 watts or less.**

HSPF (HEATING SEASONAL PERFORMANCE FACTOR). The total heating output of a heat pump during its normal annual usage period for heating divided by the total electric power input in watt-hours during the same period.

HUMUS. Soil-like product created through the decomposition of wastes, toilet paper, and organic matter.

HVAC (HEATING, VENTILATING AND AIR-CONDITIONING) SYSTEM. Refers to the equipment, distribution network, and terminals that provide either collectively or individually the processes of heating, ventilating, and/or air-conditioning processes to a building.

INFILL. Light Straw Clay mixture which is placed between the structural members of a building.

LIGHT STRAW CLAY. A mixture of straw and clay compacted to form an insulated wall between or around structural members and around wall openings. Also known as Clay-Straw, Clay-Fiber, Straw-Clay, or SLC.

LIQUID DIVERSION. Method for separating liquid and solid components.: method for separating liquid and solid components.

MANUAL. (non-automatic) Action that requires human intervention as the basis for control. (See “Automatic.”)

MANAGEMENT PLAN. A plan for regularly scheduled actions that maintain safety and aerobic conditions within the Composting Toilet System.

MONOLITHIC. A continuous wall without seams.

NON-LOAD BEARING. Not bearing the weight of the building other than the weight of the light straw clay itself and its finish.

R (THERMAL RESISTANCE). See “Thermal Resistance.”

RESIDENTIAL BUILDINGS. Buildings and structures, or portions thereof, housing Group R, occupancies which are three stories or less in height.

STRAW. The dry stems of cereal grains after the seed heads have been removed.

THERMAL RESISTANCE (R). The measure of the resistance of a material or building component to the passage of heat, has the value of (hr.-ft.²-°F)/Btu, and is the reciprocal of thermal conductance.

THERMAL TRANSMITTANCE (U). The coefficient of heat transfer. It is the time rate of heat flow per unit area under steady state conditions from the fluid on the warm side of the barrier to the fluid on the cold side, per unit temperature difference between the two fluids, Btu/(hr.-ft.²-°F).

THERMOSTAT. An instrument which measures changes in temperature and controls a device or devices to maintain a desired temperature.

TOTAL SOLAR RESOURCE FRACTION. The fraction of usable solar energy that is received by the solar panel/collector throughout the year. This accounts for the impacts due to external shading, collector tilt and collector orientation.

U (THERMAL TRANSMITTANCE). See “Thermal Transmittance.”

VAULTED CEILING. A residential building with a ceiling with a minimum slope of 2 in 12.

VOID. Any space in a light straw clay wall that allows a 2” sphere to be inserted.

WINDOW. See “Exterior Window.”

ZONE. A space or group of spaces within a building with heating or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device.

Section 1303

Prescriptive Compliance Path

1303.1 Prescriptive Compliance Path. Residential dwellings shall comply with Table 1303.1(1), one “Envelope Enhancement Measure” from Table 1303.1(2) and one “Conservation Measure” from Table 1303.1(2), and the requirements of this section.

Exception:

- 1. Dwelling units that are 1500 square feet or less of conditioned floor area, shall not be required to meet the envelope requirements specified in Table 1303.1(1). Dwelling units using this exception**

shall comply with Table N1101.1(1), Prescriptive Envelope Requirements, of the Oregon Residential Specialty Code.

2. Dwelling that are greater than 5,000 square feet of conditioned floor area shall select one additional measure from the "Conservation Measure" section of Table 1303.1(2).

1303.1.1 Residential dwellings built to this section, shall provide a means for the installation of future onsite energy generation facilities. The means shall be provided by complying with either of the following:

1. Photovoltaic: The dwelling shall be provided with a minimum ¾ inch conduit or a ¾ inch chase terminating, in accordance with the building code, in an accessible area of the attic space and near the electrical panel. Electrical panels shall be sized to accommodate a minimum 40 Amp solar feed, and room shall be reserved for a double pole, 40 amp 240 volt breaker on the opposite end from the main service feeder. Each termination shall be clearly labeled, "Future Renewable Access"; or
2. Solar Hot Water: The dwelling shall be provided with a space for at least a ¾ inch supply and return pipe and insulation. Proposed route shall have a minimum ¼ inch per foot slope from accessible attic space or roof and the water heater location. Terminating ends of the chase shall be capped and labeled clearly, "Future Renewable Access", in accordance with the building code. The installation of an insulated ¾ inch supply and return pipe, capped, terminated, and labeled at each end shall be considered an acceptable alternative to a chase.

Exception:

1. Where using available tools for calculating the solar resource, the solar resource fraction is less than 75.
2. Where solar photovoltaic or solar hot water is installed under Table 1303.1(2).

1303.2 Envelope

1303.2.1 EXTERIOR ENVELOPE REQUIREMENTS. Exterior building envelope shall comply with Table 1303.1(1) or may be demonstrated using Table 1303.2(1). The requirements specified in Table 1303.1(2) shall apply to both Tables 1303.1(1) and 1303.2(1).

1303.3 Plumbing

Reserved

1303.4 Mechanical

Reserved

1303.5 Electrical

1303.5.1 High-efficacy lighting. 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. A minimum of seventy-five (75) percent of the permanently installed lighting fixtures shall contain high-efficacy lamps. Screw-in compact florescent lamps comply with this requirement.

The building official shall be notified in writing at the final inspection that a minimum of seventy-five (75) percent of the permanently installed lighting fixtures have met this requirement.

TABLE 1303.1(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>U-0.060</u>	<u>R-21^c</u>	<u> ^d</u>	<u> ^d</u>
Wall insulation-below grade ^c	<u>F-0.565</u>	<u>R-15</u>	<u>F-0.565</u>	<u>R-15</u>
Flat ceilings, or ^f	<u>U-0.025</u>	<u>R-49</u>	<u>???</u>	<u>???</u>
Advanced framed flat ceilings ^f	<u>U-0.026</u>	<u>R-38</u>	<u>U-0.025</u>	<u>R-49</u>
Vaulted ceilings ^g	<u>U-0.042</u>	<u>R-38^g</u>	<u>U-0.027</u>	<u>R-38A^h</u>
Under floors	<u>U-0.028</u>	<u>R-30</u>	<u>U-0.028</u>	<u>R-30</u>
Slab edge perimeter	<u>F-0.520</u>	<u>R-15</u>	<u>F-0.520</u>	<u>R-15</u>
Heated slab interior ⁱ	<u>n/a</u>	<u>R-10</u>	<u>n/a</u>	<u>R-10</u>
Windows ^j	<u>U-0.30</u>	<u>U-0.30</u>	<u>U-0.30</u>	<u>U-0.30</u>
Window area limitation ^{i,k}	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>
Skylights ^l	<u>U-0.50</u>	<u>U-0.50</u>	<u>U-0.50</u>	<u>U-0.50</u>
Exterior doors ^m	<u>U-0.20</u>	<u>U-0.20</u>	<u>U-0.54</u>	<u>U-0.54</u>
Exterior doors w/>2.5 ft ² glazing ⁿ	<u>U-0.32</u>	<u>U-0.32</u>	<u>U-0.32</u>	<u>U-0.32</u>
Forced air duct insulation	<u>n/a</u>	<u>R-8</u>	<u>n/a</u>	<u>R-8</u>

- ^a As allowed in Section RC201.2.1, 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 RC201.1(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.
- ^e Below-grade wood, concrete or masonry walls include all walls that are below grade and does not include those portions of such wall that extend more than 24 inches 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 in area may be reduced to not less than R-21. When reduced, the cavity shall be filled (except for required ventilation spaces). Advanced framing construction for ceilings as defined in Section N1104.6 of the Oregon Residential Specialty Code.
- ^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 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 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 N1303.2(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% or less of total heated space floor area may have a U-factor of 0.60. Skylight U-factor is tested in the 20 degree overhead plane per NFRC standards.
- ^m A maximum of 28 square feet 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-0.32 requirement.

**Table 1303.1(2)
Additional Measures**

Envelope Enhancement Measure (Select One)	
1	High efficiency walls & windows: (Cannot be used with Conservation Measure 2) <u>Exterior walls – U-0.047 / (See Table 1303.2(2) for examples)</u> <u>Windows – Max 15% of conditioned area; or</u> <u>Windows – U-0.25</u>
2	High efficiency thermal envelope UA: (Cannot be used with Conservation Measure 2) <u>Proposed UA is 15% lower than the Code UA when calculated in Table N1104.1(1)</u>
3	Building tightness testing, ventilation & duct sealing: (Cannot be used with Conservation Measure 1 or 6) <u>A mechanical exhaust, supply, or combination system providing whole-building ventilation rates specified in table 1303.1(3), or ASHRAE 62.2, and</u> <u>The dwelling shall be tested with a blower door and found to exhibit no more than 4.0 air changes per hour^d and Performance tested duct systems^b</u>
4	HVAC within conditioned space: (Cannot be used with Conservation Measure 1 or 3) <u>All ducts and air handler are contained within building envelope^a</u>
Conservation Measure (Select One)	
1	High efficiency gas forced air system and Duct Sealing: <u>Gas-fired furnace with minimum AFUE of 90%^a, and</u> <u>Performance tested duct systems^b</u>
2	High efficiency gas forced air system: <u>Gas-fired furnace with minimum AFUE of 95%^a,</u>
3	High efficiency electric forced air system: <u>Air-source heat pump with minimum HSPF of 9.0, designed at 30° balance point, or</u> <u>Closed-loop ground source heat pump with minimum COP of 3.0; and</u> <u>Performance tested duct systems^b,</u>
4	HVAC within conditioned space: <u>All ducts and air handlers are contained within building envelope^a</u>
5	Ductless mini-split heat pump: <u>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. Conventional electric resistance heating may be provided for any secondary zones in the dwelling.</u>
6	High efficiency water heating & lighting: <u>Natural gas/propane water heating with minimum EF of 0.81, and</u> <u>A minimum 90 percent of permanently installed lighting fixtures as CFL or linear fluorescent or a minimum efficacy of 40 lumens per watt as specified in section RC201.5^c</u>
7	Energy management device, windows and duct sealing: <u>Whole building energy management device that is capable of monitoring or controlling energy consumption, and</u> <u>Performance tested duct systems^b and</u> <u>Windows U-Value= 0.25</u>
8	Solar photovoltaic: <u>Minimum 1.5 watt / sq ft conditioned floor space^e</u>
9	Solar water heating: <u>Minimum of 40 ft² of gross collector area^f</u>

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 1303.5.1 requires 75 percent of permanently installed lighting fixtures to be CFL or linear fluorescent or a min. efficacy of 40 lumens per watt. Each of these additional measures adds an additional percent to the 1303.5.1 requirement.
- d. Building tightness test shall be conducted with a blower door depressurizing the dwelling 50 Pascals from ambient conditions. Documentation of blower door test shall be submitted to the Building Official upon completion of work.
- e. Solar electric system size shall include documentation indicating that Total Solar Resource Fraction is not less than 75%.
- f. 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%.
- g. A total of 5%, five 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 1303.1(3)
VENTILATION AIR REQUIREMENTS, cfm

<u>Floor Area</u> (ft ²)	<u>Bedrooms</u>				
	<u>0-1</u>	<u>2-3</u>	<u>4-5</u>	<u>6-7</u>	<u>>7</u>
<u><1500</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
<u>1501-3000</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>	<u>105</u>
<u>3001-4500</u>	<u>60</u>	<u>75</u>	<u>90</u>	<u>105</u>	<u>120</u>
<u>4501-6000</u>	<u>75</u>	<u>90</u>	<u>105</u>	<u>120</u>	<u>135</u>
<u>6001-7500</u>	<u>90</u>	<u>105</u>	<u>120</u>	<u>135</u>	<u>150</u>
<u>>7501</u>	<u>105</u>	<u>120</u>	<u>135</u>	<u>160</u>	<u>185</u>

TABLE 1303.2(1)
RESIDENTIAL THERMAL PERFORMANCE CALCULATIONS

<u>BUILDING COMPONENTS</u> ^b	<u>Standard base case</u> ^a			<u>Proposed alternative</u>			
	<u>Areas</u> ^c	<u>U-factor</u>	<u>Areas x U</u>	<u>R-value</u> ^d	<u>Areas</u> ^c	<u>U-factor</u> ^e	<u>Areas x U</u>
<u>Flat ceilings</u>		<u>0.025</u>					
<u>Vaulted ceilings</u> ^f		<u>0.042</u>					
<u>Conventional wood-framed walls</u>		<u>0.060</u>					
<u>Underfloor</u>		<u>0.028</u>					
<u>Slab edge</u>		(perimeter ft. =) <u>F=0.52</u> ^g					
<u>Windows</u>		<u>0.30</u>					
<u>Skylights</u>		<u>0.50</u>					
<u>Exterior doors</u> ^h		<u>0.20</u>					
<u>Doors with >2.5 ft² glazing</u>		<u>0.32</u>					
		<u>CODE UA =</u>			<u>Proposed UA</u> ⁱ		

^a Base path 1 represents Standard Base Case from Table ORSC N1101.1(1).

^b Performance trade-offs are limited to those listed in column 1. Heat plant efficiency, duct insulation levels, passive and active solar heating, air infiltration and similar measures including those not regulated by code may not be considered in this method of calculation.

^c Areas from plan take-offs. All areas must be the same for both Standard Base Case and Proposed Alternate. The vaulted ceiling surface area for Standard Base Case must be the actual surface area from the plan take-off not to exceed 50 percent of the total heated space floor area. Any areas in excess of 50 percent for Base Case must be entered at U-0.031 (R-38) with "Flat Ceilings" area.

^d Minimum Component Requirements: Walls R-15; Floors R-21; Flat Ceilings R-38; Vaults R-21; Below-Grade Wood, Concrete or Masonry Walls R-15; Slab Edge R-10; Duct Insulation R-8. R-values used in this table are nominal, for the insulation only and not for the entire assembly. Window and skylight U-values shall not exceed 0.65 (CL65). Door U-values shall not exceed 0.54 (Nominal R-2). A maximum of 28 square feet of exterior door area per dwelling unit can have a U-factor of 0.54 or less and shall not be included in calculations.

^e U-values for wood frame ceilings, walls and floor assemblies shall be as specified in Table N1303.1(2). U-values for other assemblies, which include steel framing, brick or other masonry, stucco, etc., shall be calculated using standard ASHRAE procedures.

^f Vaulted area, unless insulated to R-38, U-0.031, may not exceed 50 percent of the total heated space floor area.

^g F=The heat loss coefficient, BTU/hr./ft.²/°F, per foot of perimeter.

^h A maximum of 28 square feet of exterior door area per dwelling unit can have a U-factor of 0.54 or less. Default U-factor for an unglazed wood door is 0.54.

ⁱ Proposed UA must be less than or equal to Code UA.

Section 1304 Selective Compliance Path

1304.1 Selective Compliance Path. Residential dwellings electing to build to the selective compliance path shall comply with the requirements of the Oregon Residential Specialty Code and follow the additional requirements of this section.

1304.1.1 Residential dwellings, built to this section, shall provide a means for the installation of future onsite energy generation facilities. The means shall be provided by complying with either of the following:

1. **Photovoltaic: The dwelling shall be provided with a minimum 3/4 inch conduit or a 3/4 inch chase terminating, in accordance with the building code, in an accessible area of the attic space and near the electrical panel. Electrical panels shall be sized to accommodate a minimum 40 Amp solar feed, and room shall be reserved for a double pole, 40 amp 240 volt breaker on the opposite end from the main service feeder. Each termination shall be clearly labeled, "Future Renewable Access"; or**
2. **Solar Hot Water: The dwelling shall be provided with a space for at least a 3/4 inch supply and return pipe and insulation. Proposed route shall have a minimum 1/4 inch per foot slope from accessible attic space or roof and the water heater location. Terminating ends of the chase shall be capped and labeled clearly, "Future Renewable Access", in accordance with the building code. The installation of an insulated 3/4 inch supply and return pipe, capped, terminated, and labeled at each end shall be considered an acceptable alternative to a chase.**

Exception:

1. **Where using available tools for calculating the solar resource, the solar resource fraction is less than 75.**
2. **Where solar or another renewable is actually installed per Table 1304.2(2).**

1304.2 Additional measures. In addition to the requirements of Chapter 11 of the Oregon Residential Specialty Code, dwellings shall install additional energy conservation measures, in accordance with Table RC301.2(1), from the provisions in Table RC301.2(2).

**Table 1304.2(1)
Additional Measures Required**

<u>Conditioned Space (Square Footage)</u>	<u>Number of Points Required</u>
<u>≤ 1,500</u>	<u>8</u>
<u>1,501-2,250</u>	<u>10</u>
<u>2,251 – 5,000</u>	<u>15</u>
<u>≥ 5,001</u>	<u>20</u>

Measures Table

<u>Measure #</u>	<u>Measure</u>	<u>Pts</u>	<u>Measure Notes:</u>
<u>Envelope Measures</u>			
<u>1</u>	<u>Walls - U- 0.047</u>	<u>5</u>	-
	<u>Walls - U- 0.038</u>	<u>9</u>	-
	<u>Walls - U- 0.027</u>	<u>15</u>	-
<u>2</u>	<u>BIBS wall insulation (blown in blanket)</u>	<u>2</u>	-

<u>3</u>	<u>Ceiling - U- 0.027 (vaulted only)</u>	<u>2</u>	-
	<u>Ceiling - U- 0.025 (R38 advanced flat)</u>	<u>3</u>	-
	<u>Ceiling - U- 0.020 (R49 advanced flat)</u>	<u>6</u>	-
	<u>Ceiling - U- 0.017 (R60 advanced flat)</u>	<u>7</u>	-
<u>4</u>	<u>Windows - .25 (area-weighted average)</u>	<u>9</u>	-
	<u>Windows - .22 (area-weighted average)</u>	<u>11</u>	-
	<u>Windows - .20 (area-weighted average)</u>	<u>13</u>	-
	<u>Windows max 12% of floor area</u>	<u>6</u>	-
<u>5</u>	<u>Floor - R38</u>	<u>1</u>	-
<u>6</u>	<u>Envelope UA is 5% lower than 2011 code</u>	<u>6</u>	-
	<u>Envelope UA is 10% lower than 2011 code</u>	<u>10</u>	-
	<u>Envelope UA is 15% lower than 2011 code</u>	<u>15</u>	-
	<u>Envelope UA is 20% lower than 2011 code</u>	<u>18</u>	-
<u>7</u>	<u>5.0 ACH, proper ventilation required</u>	<u>6</u>	-
	<u>4.0 ACH, proper ventilation required</u>	<u>13</u>	-
	<u>3.0 ACH, balanced ventilation required</u>	<u>19</u>	-
	<u><2.0 ACH, balanced ventilation required</u>	<u>26</u>	-

HVAC Measures

<u>8</u>	<u>Gas fired furnace w/ minimum AFUE of 95%</u>	<u>5</u>	-
	<u>Air sourced heat pump w/ HSPF 8.5</u>	<u>2</u>	-
	<u>Air sourced heat pump w/ HSPF 9.0</u>	<u>3</u>	-
	<u>Ductless mini split for at least 1 living zone(w/min HSPF of 8.5)</u>	<u>10</u>	-
	<u>Closed loop ground source w/ COP 3.3</u>	<u>14</u>	-
<u>9</u>	<u>ECM motor on any forced air furnace</u>	<u>1</u>	-
<u>10</u>	<u>Ducts sealed with mastic</u>	<u>3</u>	-
	<u>Performance tested ducts and sealing with mastic</u>	<u>8</u>	-
	<u>Ducts and HVAC in condition space</u>	<u>9</u>	-
<u>11</u>	<u>Heat Recovery Ventilator</u>	<u>4</u>	-
	<u>Energy Recovery Ventilator</u>	<u>4</u>	-
<u>12</u>	<u>Direct-Vent Fireplace installed with Electronic ignition and controlled by a thermostat.</u>	<u>1</u>	<u>Points are awarded to only one fireplace if multiple are installed.</u>

Plumbing Measures

<u>13</u>	<u>Water heating gas EF > 0.88</u>	<u>15</u>	-
	<u>Water heating gas EF >= .81</u>	<u>12</u>	-
	<u>Water heating gas EF >= .67</u>	<u>5</u>	-
	<u>water heating electric EF .95</u>	<u>1</u>	-
	<u>Water heating heat pump EF 2.0 or COP 2.5</u>	<u>13</u>	-
<u>14</u>	<u>Insulate all hot water lines (R4 min)</u>	<u>1</u>	-
<u>15</u>	<u>Lower flow showerheads (< 1.75 gpm)</u>	<u>2</u>	-
<u>16</u>	<u>Drain-water heat recovery system</u>	<u>4</u>	-

Onsite Generation

<u>17</u>	<u>Solar 1.0 watt/sqft of conditioned space</u>	<u>19</u>	-
	<u>Solar 1.5 watt/sqft of conditioned space</u>	<u>28</u>	-
<u>18</u>	<u>Solar water 40 sqft of collector area</u>	<u>15</u>	-

Miscellaneous Measures

<u>19</u>	<u>75% CFL</u>	<u>1</u>	-
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	<u>90% CFL</u>	<u>2</u>	-
<u>20</u>	<u>Meets Energy Star Standards</u>	<u>12</u>	-
<u>21</u>	<u>Energy Star Thermal by-pass check list</u>	<u>3</u>	

SECTION 1305
ALTERNATIVE SYSTEMS ANALYSIS

1305.1 General. The building official shall approve alternative designs, when it has been demonstrated that the proposed annual energy consumption will be lower than the annual energy consumption if the dwelling was designed in accordance with the provisions of Chapter 11 of the Oregon Residential Specialty Code. Dwellings shall provide a reduction in the projected annual energy consumption as specified in Table 1305.1.

Table 1305.1
Annual Energy Consumption Reduction

<u>Conditioned Space (Square Footage)</u>	<u>Percentage Below the ORSC</u>
<u>≤ 1,500</u>	<u>8</u>
<u>1,501-2,250</u>	<u>10</u>
<u>2,251 – 5,000</u>	<u>15</u>
<u>≥ 5,001</u>	<u>20</u>

1305.1.1 Residential dwellings built to this section, shall provide a means for the installation of future onsite energy generation facilities. The means shall be provided by complying with either of the following:

1. **Photovoltaic: The dwelling shall be provided with a minimum ¾ inch conduit or a ¾ inch chase terminating, in accordance with the building code, in an accessible area of the attic space and near the electrical panel. Electrical panels shall be sized to accommodate a minimum 40 Amp solar feed, and room shall be reserved for a double pole, 40 amp 240 volt breaker on the opposite end from the main service feeder. Each termination shall be clearly labeled, "Future Renewable Access"; or**
2. **Solar Hot Water: The dwelling shall be provided with a space for at least a ¾ inch supply and return pipe and insulation. Proposed route shall have a minimum ¼ inch per foot slope from accessible attic space or roof and the water heater location. Terminating ends of the chase shall be capped and labeled clearly, "Future Renewable Access", in accordance with the building code. The installation of an insulated ¾ inch supply and return pipe, capped, terminated, and labeled at each end shall be considered an acceptable alternative to a chase.**

Exception:

1. **Where using available tools for calculating the solar resource, the solar resource fraction is less than 75.**

2. Where solar or another renewable is actually installed.

1305.1 Design parameters. The baseline design, conforming to requirements specified in the Oregon Residential Specialty Code and the proposed design shall be analyzed using the same procedures. The analyses shall use equal floor area, equal fenestration area, equal orientation, and equal environmental requirements. The foundation type of the dwelling shall be consistent between the baseline design and the proposed design. Changes in foundation materials shall be permitted within a foundation type. The comparison shall be expressed in millions of Btu (MBTU) per year.

1305.1.1 Allowable Trade-Offs. When satisfying the energy consumption savings set forth in section 13051, trade-offs to the requirements of the Oregon Residential Specialty Code shall be allowed as specified in this section. Trade-offs in this analysis shall be from building envelope components, HVAC distribution systems, or a combination thereof.

Exception: HVAC Equipment efficiencies may be allowed when the efficiencies comply with those set forth in Table 1303.1(2), and the distribution system is <5% of the duct area is outside conditioned space or tested to demonstrate duct leakage that does not exceed 7% of nominal system design flow rate.

1305.2 Documentation. Proposed alternative designs for the Reach Code shall be accompanied by an energy analysis comparison report prepared by a registered design professional, certified home energy rater/auditor, or other approved energy analysis organization. The report shall provide sufficient technical detail describing the differences between the two building, systems designs, and the data used in and resulting from the comparative analysis.

Where the dwelling proposes a u-factor for an envelope component that does not meet the performance requirements in Table N1101.1(1) of the Oregon Residential Specialty Code, the dwelling shall demonstrate compliance by completing Table N1104.1(1).

Section 1306
Additions, Alterations, and Change of Occupancies

1306.1 General. Additions, Alterations, and Change of Occupancies shall comply with the provisions of this code and the provisions of the Oregon Residential Specialty Code.

1306.1 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 section, Table RC201.1(1), and the requirements of the Oregon Residential Specialty Code.

1306.1.1 Large Additions. Additions that are equal to or more than 40 percent of the existing building heated floor area or 600 square feet in area, whichever is less, shall be required to comply with Tables RC201.1(1) and RC201.1(2).

1306.1.2 Small Additions. Additions that are less than 40 percent of the existing building heated floor area or less than 600 square feet in area, whichever is less, shall be required to select one measure from Table 1303.1(2) or comply with Table 1306.2.2.

Exception: Additions that are less than 15 percent of existing building heated floor area or 200 square feet in area, whichever is less, shall not be required to comply with Table 1303.1(2) or Table 1306.2.2.

**TABLE 1306.2.2
SMALL ADDITION ADDITIONAL MEASURES (Select Two)**

<u>1</u>	<u>Increase the ceiling insulation of the existing portion of the home as specified in Table N1101.2.</u>
<u>2</u>	<u>Replace all existing single-pane wood or aluminum windows to the u-value as specified in Table N1101.2.</u>
<u>3</u>	<u>Insulate the floor system as specified in Table N1101.2 and 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.</u>
<u>4</u>	<u>Test the entire dwelling with a blower door and exhibit no more than 7.0 air changes per hour @ 50 Pascal's.</u>
<u>5</u>	<u>Seal and performance test the duct system.</u>
<u>6</u>	<u>Replace existing 78% AFUE or less gas furnace with a 92% AFUE or greater system.</u>
<u>7</u>	<u>Replace existing electric radiant space heaters with a ductless mini split system with a minimum HSPF of 8.5.</u>
<u>8</u>	<u>Replace existing electric forced air furnace with an air source heat pump with a minimum HSPF of 8.5.</u>
<u>9</u>	<u>Replace existing water heater for a natural gas/propane water heater with min EF of 0.67.</u>
<u>10</u>	<u>Install a solar water heating system with a minimum of 40 ft² of gross collector area.</u>

1306.1 Alteration and repair. Alterations or repairs, which affect components of existing conditioned spaces, those components shall comply with chapter 11 of the Oregon Residential Specialty Code.

Exception: The minimum component requirements as specified in Table 1306.1 shall be used to the maximum extent practical.

**TABLE 1306.1
EXISTING BUILDING COMPONENT REQUIREMENTS**

<u>Building Components</u>	<u>Required Performance</u>	<u>Equiv. Value</u>
<u>Wall Insulation</u>	<u>U-0.60</u>	<u>R-15+3.5 or R-21</u>
<u>Flat Ceiling</u>	<u>U-0.025</u>	<u>R-49</u>
<u>Vaulted Ceiling > 10 inches nominal rafter depth.</u>	<u>U-0.040</u>	<u>R-25</u>
<u>Vaulted Ceiling > 8 inches nominal rafter depth.</u>	<u>U-0.047</u>	<u>R-21</u>
<u>Under floor >10 inches nominal joist</u>	<u>U-0.028</u>	<u>R-30</u>

<u>depth.</u>		
<u>Under floor >8 inches nominal joist depth.</u>	<u>U-0.032</u>	<u>R-25</u>
<u>Slab edge perimeter</u>	<u>F-0.52</u>	<u>R-15</u>
<u>Windows</u>	<u>U-0.30</u>	<u>U-0.30</u>
<u>Skylights</u>	<u>U-0.60</u>	<u>U-0.60</u>
<u>Exterior Doors</u>	<u>U-0.20</u>	<u>R-5</u>
<u>Exterior Doors w/> 2.5 ft² glazing</u>	<u>U-0.40</u>	<u>R-2.5</u>
<u>Forced Air Ducts</u>	<u>n/a</u>	<u>R-8</u>

^a The addition of exterior insulation is only required when the dwelling is also receiving a whole dwelling siding replacement. If a whole dwelling siding replacement is not being completed, the cavity shall be filled as feasible.

1306.2 Change of Use or Occupancy. A building that changes use or occupancy, without any changes to the components shall comply with Table RC503.1 to the greatest extent practical.

Section 1307 **Alternate Methods and Materials**

1307.1 Alternate Methods and Materials. The materials, methods, or techniques contained in this section maybe used when building to the provisions of the Reach Code. Materials, methods, or techniques used to satisfy the requirements of this code shall be documented within the construction documents.

1307.2 Structural.

1307.2.1 Structural Sheathing Applied Over Foam. When designed by a registered design professional, the application of structural sheathing installed over foam sheathing shall be allowed.

1307.3 LIGHT STRAW CLAY

1307.3.1 Scope. This appendix shall govern the use of light straw clay as a non-loadbearing building material and system. Unless stated otherwise in this section, the provisions of the Oregon Residential Specialty Code, Oregon Mechanical Specialty Code, Oregon Plumbing Specialty Code, Oregon Electrical Specialty Code and all other applicable codes shall apply to buildings using light straw clay.

1307.3.2 Non-loadbearing Light Straw Clay Construction.

1307.3.2.1 General. Light straw clay shall not be used to support the weight of the building beyond the weight of the light straw clay material and its finish. The light straw clay either surrounds or acts as infill between the structural members.

1307.3.2.2 Structure. The structural support of the building shall be designed in accordance with the Oregon Residential Specialty Code.

1307.3.3 Material Specifications.

1307.3.3.1 Straw. Straw shall be wheat, rye, oats, rice or barley, and shall be free of visible decay and insects. Alternative cellulose materials such as wood chips may be substituted for straw when approved by a building official.

1307.3.3.2 Clay soil. Soil used for the clay slip in the light straw clay mix shall have a minimum clay content of 50% by volume, as determined by ASTM E2392.

1307.3.3.3 Light straw clay mixture. All straw stems shall be mixed with clay slip until they are thoroughly and evenly coated such that there is no more than 5% uncoated straw. Additionally, all straw, when compressed in the wall cavity, shall not have any excess moisture such that free water will not be squeezed from the light straw clay.

1307.3.4 Wall Construction.

1307.3.4.1 Wall thickness. Light straw clay walls shall be 12 inches thick.

1307.3.4.2 Distance above grade. Light straw clay shall not be used below grade. The foundation shall be constructed so that the bottom of the light straw clay wall is at least 8 inches above final exterior grade.

1307.3.4.3 Moisture barrier. An ORSC approved moisture barrier shall extend across the full width of the foundation stem wall between the light straw clay wall and the stem wall. All penetrations through the moisture barrier, as well as all joints in the barrier, shall be sealed with asphalt, caulking or an ORSC approved sealant.

1307.3.4.4 Sill plate. A sill plate shall be used over the moisture barrier and foundation stem wall in accordance with ORSC R319.1. Sill plates shall be fastened in accordance with the ORSC R403.1.8 and R602.11.

1307.3.4.5 Perimeter insulation: Foundation thickness may be reduced by up to 3" less than the light straw clay in order to accommodate perimeter insulation.

1307.3.4.6 Wood and light straw clay contact. Untreated wood structural and non-structural members in exterior and

interior walls may be in direct contact with light straw clay. Wood framing dryness per ORSC R109.1.4 and ORSC 318.2 prior to application of light straw clay.

1307.3.4.7 Non-wood structural members. Non-wood structural members in contact with light straw clay in exterior walls shall be resistant to corrosion or coated to prevent corrosion with an approved coating.

1307.3.5 Wall Reinforcing.

1307.3.5.1 Vertical reinforcing and blocking. Vertical wall reinforcing shall be a minimum of 2x4s at 32 inches on center, or per an approved design by an architect or an engineer. This vertical reinforcing shall be horizontally blocked every 8 feet with minimum 2x4 blocks.

1307.3.5.2 Stabilizing bars. Non-structural horizontal bars to stabilize the light straw clay infill shall be installed at 24 inches on center and secured to vertical members. Stabilizing bars may be of any of the following: ¾ in bamboo, ½ inch fiberglass rod, 1” wood dowels, wood 1x2.

1307.3.6 Monolithic Walls.

1307.3.6.1 Formwork. Formwork shall be sufficiently strong to resist bowing when the light straw clay is compacted into the forms.

1307.3.6.2 Installation of light straw clay. Forms shall be uniformly loaded with light straw clay and be evenly tamped to achieve stable, monolithic walls that are free of voids. Light straw clay shall be installed in lifts of no more than 6 inches and shall be thoroughly tamped before additional material is added.

1307.3.6.3 Removal of formwork. Formwork shall be removed from walls within 24 hours after tamping, and walls shall remain exposed until dry. Any visible voids shall be patched with light straw clay prior to plastering.

1307.3.6.4 Cold joints. Whenever a wall is not continuously built, the top of the wall shall be thoroughly coated with clay slip prior to the application of a new layer of light straw clay in order to prevent cold joints.

1307.3.7 Openings in Walls.

1307.3.7.1 Doors and windows. Rough bucks and/or frames for door and window shall be fastened securely to structural members. Windows and doors shall be flashed in accordance with ORSC R703.8.

1307.3.7.2 Window sills. An ORSC approved moisture barrier shall be installed at window sills in light straw clay walls prior to installation of windows.

1307.3.8 Wall Finishes.

1307.3.8.1 General. The interior and exterior surfaces of light straw clay walls shall be protected from mechanical damage, flames, animals and prolonged exposure to water or snow by a weather-resistant finish in accordance with this section.

1307.3.8.2 Moisture content of light straw clay prior to application of finish. Light straw clay walls shall be dry to a maximum moisture content of 20% at a depth of 4 inches, as measured from each side of the wall, prior to the application of finish on either side of the wall. Moisture content is a self-certified measurement and shall be measured with an approved moisture meter or by other approved means.

1307.3.8.3 Plaster finish. Acceptable plaster finishes include clay based and lime based plasters. These may be applied directly onto the interior and exterior surface of the light straw clay walls without reinforcement, except at the juncture of dissimilar substrate greater than 2 inches. Light straw clay walls with a plaster or stucco finish of minimum 7/8-inch thickness on both sides shall be deemed to be fire resistive; may be used between a dwelling and attached garage as required in ORSC Section R309.2.

1307.3.8.4 Bridging of dissimilar substrates. Bridging shall be installed at the juncture of dissimilar substrates greater than 2 inches prior to the application of plaster. Acceptable bridging materials include: expanded metal lath, fiberglass mesh, reed matting, or burlap. Bridging shall extend a minimum of 4 inches on either side of the juncture.

1307.3.8.5 Exterior siding. Exterior wood, metal or composite material siding shall be spaced a minimum of 3/4 inch from the light straw clay to allow for moisture diffusion. The siding shall be fastened to wood furring strips in accordance with manufacturer's recommendations. Furring strips shall be securely fastened to the vertical wall reinforcing or structural framing at a maximum spacing of 32 inches. An air barrier

shall be applied prior to application of siding, consisting of clay plaster or lime plaster or other ORSC approved air barrier. Insect screens shall be installed at top and bottom of spacing.

1307.3.9 Electrical.

1307.3.9.1 Electrical wiring. All wiring within or on light straw clay walls shall meet the electrical provisions within this code. Wiring shall be run in metallic or non-metallic conduit systems.

1307.3.9.2 Attachment. All cable, conduit systems, and junction boxes shall be securely attached to wall framing per provisions of the OESC. Additional framing members shall be installed as necessary to meet OESC requirements.

1307.3.10 Plumbing.

Water or DWV pipes within light straw clay walls shall be encased in a continuous pipe sleeve to prevent leakage within the wall.

1307.3.11 Mechanical.

Gas pipes within light straw clay walls shall be encased in a continuous pipe sleeve to prevent leakage within the wall.

1307.3.12 Fire Resistance.

1307.3.12.1 Light straw clay walls when covered with plaster shall be deemed to be fire resistive.

1307.3.12.2 Light straw clay with a minimum thickness of 7/8 inch (22.4 mm) on both sides may be used between a dwelling and an attached garage as required in ORSC R309.2

1307.3.13 Thermal Insulation.

1307.3.13.1 R-Value. Light straw clay, when installed as according to this appendix, shall be deemed to have an R-value of 1.6 per inch.

1307.3.13.2 U-Value. Light straw clay wall assemblies, when installed as according to this appendix at 12-inch thickness, shall be deemed to thermally perform to a default U-value of U=0.060.

1307.4. Plumbing

1307.4.1. Composting Toilets Scope:

The provisions of this section shall control the design, construction, maintenance, and operation of composting toilets within existing residential buildings and new

residential construction. This guide is not intended as a complete set of directions for construction of Composting Toilet Systems.

1307.4.1.2. Intent:

The intent of these requirements is to safeguard public health and waterways through defining dry equivalents to on-site tertiary water treatment (per ICC 710.3). This guide can be used by code officials, architects and other interested parties to evaluate the design and construction of Composting Toilet Systems. It is not restricted to a specific method of construction, nor does it provide the principles to be followed for the safe construction of Composting Toilet Systems.

Construction of Site-Built Composting Toilet Systems is complex, and in order to ensure their safety and performance, construction shall follow established, tested, and well-documented designs or be done by or under the supervision of a skilled and experienced composting toilet system builder.

1307.4.2. Design Guidelines:

1307.4.2.1 Design Approval:

1307.4.2.1.1 Manufactured Composting Toilet Systems approved under NSF Standard 41, CSA, or other ANSI-approved certification body are approved.

1307.4.2.1.2 Site-Built Composting Toilet Systems designed in accordance with the following specifications may be installed provisionally, pending laboratory verification. (1307.4.4.2) Site-Built means a composting toilet that is fabricated at the site of use. Manufactured toilets that have not been submitted to an ANSI-approved certification body will be treated as Site-Built Composting Toilet Systems.

1307.4.2.2 Design requirements:

1307.4.2.2.1 All components shall have footings adequately designed to support the weight of users and the Composting Toilet System.

1307.4.2.2.2 All components and fasteners must be corrosion resistant.

1307.4.2.2.3 Commode:

1307.4.2.2.3.1 Commode shall be designed to support users and provide a solid connection to the floor.

1307.4.2.2.4 Collection Method:

1307.4.2.2.4.1 The Collection Method shall connect Commode directly to Composting Chamber or present watertight barriers to user contact with human wastes during normal operation or in event of failure.

1307.4.2.2.4.2 The Collection Method shall be vented to prevent the infiltration of odors or exhaust gasses into the building during normal operation and in the event of power failure.

1307.4.2.3 Composting chamber:

1307.4.2.3.1 Composting chamber shall be sited such that:

- 1. The infiltration of rainwater and ground water is prevented;**
- 2. It is watertight, preventing the escape of liquids through other than standard openings; and**
- 3. Adequate access for regular service and removal of Humus is provided.**

1307.4.2.3.2 Biological decomposition shall be maintained at or above 42°F (6°C).

1307.4.2.3.3. Chamber shall be vented such that the termination of the vent is insulated to prevent condensation and maintain directional airflow. Vents shall be a minimum of two feet above the highest elevation of any portion of the building within ten feet of the vent.

1307.4.2.3.4 If Composting Toilet System has Liquid Diversion, liquid must drain to a sewer system, approved treatment system, or collection container. Collection container must be emptied back into the composting chamber, emptied to approved treatment system, or removed by a licensed professional as per management plan. (1307.4.2.5)

1307.4.2.4 Pest Control. All inlets and vents, must be screened or sealed against the infiltration of pests into the Composting Chamber. (per ICC708.8)

1307.4.2.4 Management Plan:

1307.4.2.4.1 Management plan must present clear instructions for maintenance and be transferred upon transfer of property or tenancy.

1307.4.2.4.2 Management plan must include:

- 1. Schedule for addition of necessary Compost Additives;**
- 2. Source or provider of necessary Compost Additives. Source may be On-Site;**

3. Schedule of any regular maintenance tasks and instructions for performing said tasks;

4. Expected input of and capacity for, human wastes, toilet paper, and other organic matter to Composting Toilet System;

5. Expected schedule for removing humus from Composting Chamber;

6. Plan for on-site disposal of Humus (1307.4.4.4) or removal by a licensed professional;

7. If Site Built Composting Toilet System is installed, plan for testing of humus by a certified laboratory; and

8. If Composting Toilet System contains Liquid Diversion, a plan for managing liquid. (1307.4.2.3.3).

1307.4.3. Installation:

1307.4.3.1 Prior to the installation of a Composting Toilet System, a permit must be obtained from a Building Official for:

- 1. A Composting Toilet System has been approved by Code Official or listed with NSF International to Standard 41 (May 1983 revised), CSA, or other ANSI approved certification body; or**
- 2. A Site-Built Composting Toilet System meets Design Guidelines of Section 1307.4.**

1307.4.3.2 Installation shall not be put into use until inspected and approved by Building Official.

1307.4.3.3 Site-Built Composting Toilet System shall be operated provisionally, pending laboratory testing. (1307.4.4.2)

1307.4.4 Operation:

1307.4.4.1 Site-Built Composting Toilet System will be available for inspection by authority having jurisdiction at the discretion of the authority having jurisdiction at any point in time. At the owner's expense, authority having jurisdiction may request results of all laboratory testing, and new tests following repairs to alleviate dangerous or insanitary condition. (1307.4.4.5).

1307.4.4.2 Testing:

1307.4.4.2.1 Site-Built Composting Toilet System's owner or owner's agent shall submit a sample of the Humus from the first treatment period to a

certified laboratory before removal of Humus from the Composting Chamber.

1307.4.4.2.2 The sample:

1. Shall not have a moisture content exceeding 75% by weight,

2. Shall not exceed 200 fecal coliforms/gram (Per NSF 41 7.1.4, Quality Criteria For Water, EPA, 1986).

1307.4.4.2.3 Owner must retain a record of fecal coliform tests.

1307.4.4.3 Upon transfer of property or tenancy, all test records must be transferred, and humus must be re-tested and a record retained. A copy of the re-test results and all records required to be transferred shall be submitted to the authority having jurisdiction.

1307.4.4.4 Humus from composting chamber may be used around ornamental shrubs, flowers, trees, or fruit trees and shall be buried under at least six inches of soil cover. Depositing humus from any composting toilet system around any edible vegetable or vegetation shall be prohibited.

1307.4.4.5 Composting toilet system shall be operated in a safe and sanitary condition in accordance with the management plan. Operation of composting toilet system may be suspended to alleviate a nuisance or dangerous or insanitary condition, until which time the owner or owner's agent shall conduct sufficient repairs or alterations to composting toilet system.

1307.5 Mechanical

RESERVED

1307.6 Electrical

RESERVED