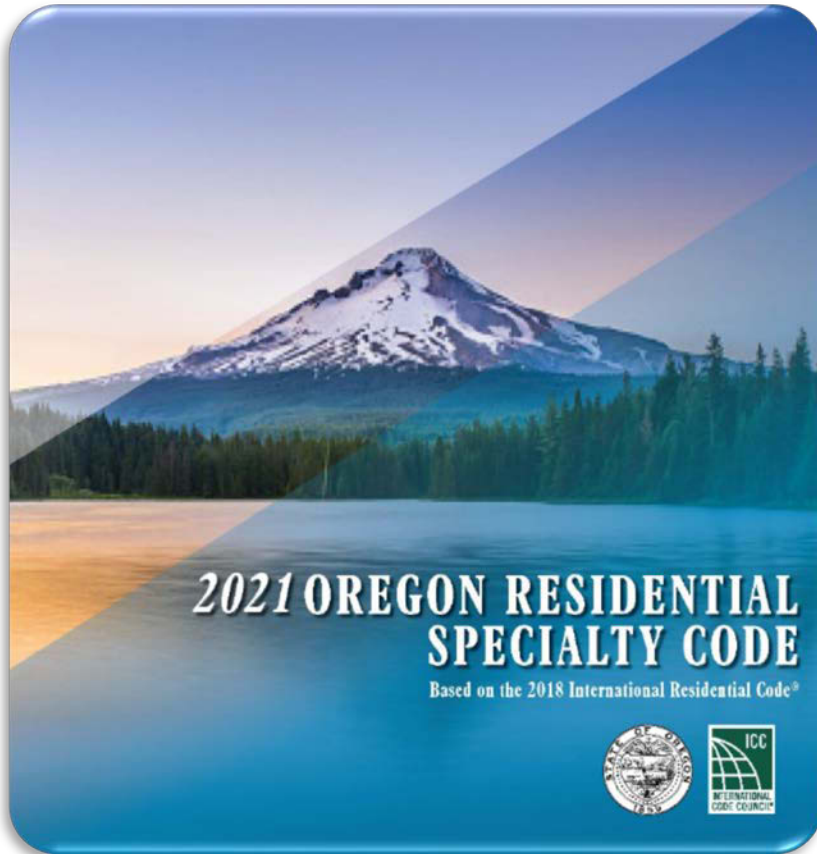


CODE UPDATE TRAINING



2021 ORSC

Energy Mechanical & Fuel Gas

Based on the 2018 International Residential Code
(including portions of the 2021 IRC)

2021 ORSC UPDATE TRAINING

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Course goal:

- ✓ Broad view of updates in the 2021 Oregon Residential Specialty Code (ORSC) for Chapters 11 thru 24.
- ✓ Identify the significant technical changes of the 2021 ORSC regarding energy, mechanical and fuel gas.

Course questions:

Please email specific *technical content* inquiries to:

BCD.PTSPtech@oregon.gov

Our team plans to organize and offer a “Q&A session” in the near future to address submitted inquiries regarding the 2021 ORSC significant changes. Advanced notification will be provided to our local government partners.

To ensure you receive notification, please visit our homepage and click on “Email updates” in the upper ribbon.

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General Presentation Format

Model code revisions from 2018 IRC are shown as:

- ✓ Red underline for additions
- ✓ Red ~~double strikethrough~~ for Oregon model code deletions.

Oregon amendments are shown as:

- ✓ Blue underline for additions
- ✓ Blue ~~double strikethrough~~ for existing amendment deletions
- ✓ Pink for new amendments

Broad Energy Code Change Perspectives

While the energy, mechanical, and fuel gas code changes include many technical provisions, there are broad policy perspectives which are important to recognize:

- Continuing Oregon's Leadership.
- Executive Order 17-20.
 - Zero Energy Ready Home (ZERH) Equivalency by 2023
- Executive Order 20-04.

Chapters We'll Review in this Presentation

1. ORSC Chapter 11 – Energy.
2. ORSC Chapters 12 thru 23 – Mechanical.
3. ORSC Chapter 24 - Fuel Gas.

Chapter 1 – Administrative Updates - Scope

CHANGE SUMMARY: Chapter 1 has been updated to accurately reflect scoping policy, delegated authority, local allowances and applicable construction standards.

R101.2.1 Application. The provisions of this code shall apply to the construction, *alteration*, movement, enlargement, replacement, *repair*, *equipment*, use, occupancy and location of the following:

1. Detached one- and two-family *dwelling*s and *townhouses* classified as Group R-3, not more than three stories above *grade plane* in height, and their *accessory structures*.
2. Detached owner-occupied *lodging houses* containing not more than five guest rooms.
3. Residential aircraft hangars as defined in Section R202.
4. Live/work units located in detached one- and two-family *dwelling*s and *townhouses* and complying with the requirements of Section 419 of the *Building Code*.

The following uses shall comply with the *Building Code*:

1. New “family childcare” uses and new “foster care” uses identified in ORS Chapters 418, 443 and 329A, located within detached one-family *dwelling*s, shall be classified as Group R-3 occupancies.
2. *Congregate living facilities*.

2021 ORSC Energy Provisions - Chapter 11

SUMMARY: Structure and content of ORSC Chapter 11.

- **Part I - Energy Conservation**
 - N1101 Scope
 - N1102 Definitions
 - N1103 Alternative Systems
 - N1104 Exterior Envelope Requirements
 - N1105 Heating, Ventilating and Air-Conditioning Systems
 - N1106 Piping Insulation
 - N1107 Lighting & Power
 - N1108 Plumbing Fixture Efficiency
- **Part II - Alternative Systems Analysis**
- **Part III - Fenestration Standard**

2021 ORSC Energy Provisions - Chapter 11

SUMMARY: Sections changed within Chapter 11.

- **N1101 Scope**
- **N1104 Exterior Envelope Requirements**
 - Existing Buildings & Table N1101.2
 - Additions - Additional Measures & Table N1101.3
 - Additional Measures & Table N1101.1(2)
 - Thermal Performance Calculations & Table N1104.1(1)
 - Prescriptive Envelope Requirements & Table N1101.1(1)
 - Advanced and Intermediate Framing Header Insulation
 - Air Leakage & Table N1104.8
- **N1105 HVAC System Requirements**
 - Insulation & Installation of Ducts
 - Ventilation & Furnace Fan Efficiency
- **N1106 Piping Insulation**
- **N1107 Lighting & Power Requirements**
- **N1108 Plumbing Fixture Efficiency**

Scope & Additional Measures

CHANGE SUMMARY: Selection of ONE additional measure from Table N1101.1(2), instead of two. ORSC 2017 additional measure #5 is prescriptive path.

N1101.1 General. The provisions of this chapter 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~~one additional measures from Table N1101.1(2).

Exceptions:

1. Application to existing buildings shall comply with Section N1101.2.
2. Application to additions shall comply with Section N1101.3.
3. Heated or cooled detached *accessory structures* that are not habitable shall meet the following envelope requirements without any additional measures: Walls: R-21/U-0.064; Roofs: R-38/U-0.027 (attic) or R-20 continuous insulation/U-0.048 (above deck); Windows: U-0.35; Opaque doors: U-0.70; Roll-up doors: U-0.50.



Existing Buildings & Table N1101.2

CHANGE SUMMARY: Skylight U-Value performance improvement.

N1101.2 Application to existing buildings. Alteration and repairs, historic buildings and change of use or occupancy to buildings, structures or portions thereof shall comply with the requirements in Sections N1101.2.1 through N1101.2.3.

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, those components shall comply with this chapter.

Exception: The minimum component requirements as specified in Table N1101.2 may be used to the **maximum extent practical**.

N1101.2.3.1 Change of use. A building that changes use, without any changes to the components regulated in this chapter, is required to comply with Table N1101.2 to the **greatest extent practical**. Changes of use that are greater than 30 percent of the existing building heated floor area or more than 400 square feet (37 m²) in area, whichever is less, shall be required to select one measure from Table N1101.3.

N1101.2.3.2 Change of occupancy. Alteration and repair of conditioned nonresidential buildings, such as a small church or school, that are changing occupancy to residential shall use Table N1101.2 to the **greatest extent practical** and select one measure from Table N1101.1(2), or one measure from Table N1101.3.

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

BUILDING COMPONENTS	REQUIRED PERFORMANCE	EQUIV. VALUE
Wall insulation	<i>U</i> -0.083	R-15
Flat ceiling	<i>U</i> -0.025	R-49
Vaulted ceiling > 10 inches nominal rafter depth	<i>U</i> -0.040	R-25
Vaulted ceiling > 8 inches nominal rafter depth	<i>U</i> -0.047	R-21
Underfloor > 10 inches nominal joist depth	<i>U</i> -0.028	R-30
Underfloor > 8 inches nominal joist depth	<i>U</i> -0.039	R-25
Slab edge perimeter	F-0.52	R-15
Windows	<i>U</i> -0.30	<i>U</i> -0.30
Skylights	<i>U</i>-0.60 <u><i>U</i>-0.50</u>	<i>U</i>-0.60 <u><i>U</i>-0.50</u>
Exterior doors	<i>U</i> -0.20	R-5
Exterior doors with > 2.5 ft ² glazing	<i>U</i> -0.40	R-2.5
Forced air ducts	n/a	R-8

“Slab edge perimeter” is almost never practical.

Large and Small Additions

CHANGE SUMMARY: Clarification of large and small addition sizes.

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.

N1101.3.1 Large additions. Additions that are equal to or more than ~~40 percent of the existing building heated floor area or~~ 600 square feet (55 m²) in area, ~~whichever is less,~~ shall be required to comply with Table N1101.1(2).

N1101.3.2 Small additions. Additions that are less than ~~40 percent of the existing building heated floor area or less than~~ 600 square feet (55 m²) 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 floor area or 200-225~~ square feet (~~18.58-20.9~~ m²) in area, whichever is less, shall not be required to comply with Table N1101.1(2) or Table N1101.3.



Small Additions Table N1101.3

CHANGE SUMMARY: Reduced ACH, increased furnace & H2O heating efficiency.



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-factor as specified in Table N1101.2
3	Insulate the <u>existing floor, crawl space or basement wall systems</u> as specified in Table N1101.2 and install 100 percent of permanently installed lighting fixtures as CFL, LED or linear fluorescent, or a minimum 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 6-04.5 air changes per hour @ 50 Pascals.
5	Seal and performance test the duct system.
6	Replace existing 78 80-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 10.0.
8	Replace existing electric forced air furnace with an air source heat pump with a minimum HSPF of 9.5.
9	Replace existing water heater with a water heater meeting: <u>Natural gas/propane water heater with minimum UEF 0.90, or Electric heat pump water heater with minimum 2.0 COP.</u>

Additional Measures Table N1101.1(2)

CHANGE SUMMARY: Choose ONE requirement. Calculator available for AM #6.

TABLE N1101.1(2)
ADDITIONAL MEASURES

1	<p>HIGH EFFICIENCY HVAC SYSTEM^a</p> <p>a. Gas-fired furnace or boiler AFUE 94 percent, or b. Air source heat pump HSPF 10.0/14.0 SEER cooling, or c. Ground source heat pump COP 3.5 or Energy Star rated</p>
2	<p>HIGH EFFICIENCY WATER HEATING SYSTEM</p> <p>a. Natural gas/propane water heater with minimum UEF 0.90, or b. Electric heat pump water heater with minimum 2.0 COP, or c. Natural gas/propane tankless/instantaneous heater with minimum 0.80 UEF and Drain Water Heat Recovery Unit installed on minimum of one shower/tub-shower</p>
3	<p>WALL INSULATION UPGRADE</p> <p>Exterior walls—U-0.045/R-21 conventional framing with R-5.0 continuous insulation</p>
4	<p>ADVANCED ENVELOPE</p> <p>Windows—U-0.21 (Area weighted average), and Flat ceiling^b—U-0.017/R-60, and Framed floors—U-0.026/R-38 or slab edge insulation to F-0.48 or less (R-10 for 48"; R-15 for 36" or R-5 fully insulated slab)</p>
5	<p>DUCTLESS HEAT PUMP</p> <p>For dwelling units with all-electric heat provide: Ductless heat pump of minimum HSPF 10 in primary zone replaces zonal electric heat sources, and Programmable thermostat for all heaters in bedrooms</p>
6	<p>HIGH EFFICIENCY THERMAL ENVELOPE UA^c</p> <p>Proposed UA is 8 percent lower than the code UA</p>
7	<p>GLAZING AREA</p> <p>Glazing area, measured as the total of framed openings is less than 12 percent of conditioned floor area</p>
8	<p>3 ACH AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION</p> <p>Achieve a maximum of 3.0 ACH50 whole-house air leakage when third-party tested and provide a whole-house ventilation system including heat recovery with a minimum sensible heat recovery efficiency of not less than 66 percent.</p>

Calculators

Residential thermal performance calculator

- New: 2017 ORSC Measure 6 thermal performance calculator

Additional Measures Table: Measure #6

CHANGE SUMMARY: Performance Path. Proposed U*A is 8% better than Base U*A.

TABLE N1104.1(1)
RESIDENTIAL THERMAL PERFORMANCE CALCULATIONS

BUILDING COMPONENTS ^b	STANDARD BASE CASE ^a			PROPOSED ALTERNATIVE			
	Areas ^c	U-factor	Areas × U	R-value ^d	Areas ^c	U-factor ^e	Areas × U
Flat ceilings		0.021					
Vaulted ceilings ^f		0.033					
Conventional wood-framed walls		0.059					
Underfloor		0.033					
Slab edge		F = 0.52 ^g					
Below-grade walls		C = 0.063 ^g					
Windows		0.30 0.27					
Skylights		0.50					
Exterior doors ^h		0.2					
Doors with > 2.5 ft ² glazing		0.4					
CODE UA =				Proposed UA ⁱ =			

- Proposed design must achieve an overall U-factor multiplied by the Area (U*A) which is 8% less than the baseline U*A.
- Allows for creativity. Any combination of upgraded materials may be able to achieve envelope compliance.

Prescriptive Envelope Requirements

CHANGE SUMMARY: Window U-Value performance improvement. Applies to new buildings AND large additions.

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-0.059 ^c	R-21 Intermediate ^c	Note d	Note d
Wall insulation—below grade ^e	C-0.063	R-15 c.i. /R-21	C-0.063	R-15/R-21
Flat ceilings ^f	U-0.021	R-49	U-0.020	R-49 A ^h
Vaulted ceilings ^g	U-0.033	R-30 Rafter or R-30A ^{g, h} Scissor Truss	U-0.027	R-38A ^h
Underfloors	U-0.033	R-30	U-0.033	R-30
Slab-edge perimeter ^m	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-0.30 <u>U-0.27</u>	U-0.30 <u>U-0.27</u>	U-0.30 <u>U-0.27</u>	U-0.30 <u>U-0.27</u>
Window area limitation^h	n/a	n/a	n/a	n/a
Skylights ^l	U-0.50	U-0.50	U-0.50	U-0.50
Exterior doors ^{mk}	U-0.20	U-0.20	U-0.54	U-0.54
Exterior doors with > 2.5 ft ² glazing ^{nl}	U-0.40	U-0.40	U-0.40	U-0.40
Forced-air duct insulation	n/a	R-8	n/a	R-8

Footnotes - Table N1101.1(1)

CHANGE SUMMARY: Clarifying slab edge perimeter insulation. Technical guide forthcoming.

- 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-factor standards. Calculations to document equivalent heat loss shall be performed using the procedure and approved U-factors 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. Nominal compliance with R-21 insulation and Intermediate Framing (N1104.5.2) with insulated headers.
- 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 do not include those portions of such wall that extend more than 24 inches above grade. R-21 for insulation in framed cavity; R-15 continuous insulation.
- 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). R-49 insulation installed to minimum 6-inches depth at top plate at exterior of structure to achieve U-factor.
- g. Vaulted ceiling surface area exceeding 50 percent of the total heated space floor area shall have a U-factor no greater than U-0.026 (equivalent to R-38 rafter or scissor truss with R-38 advanced framing).
- h. A = Advanced frame construction. See Section N1104.6.
- 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.
Exception: Table N1101.1(2), Envelope Measure 6: calculation allows baseline case 15 percent of total wall area as window when design case utilizes window area of less than 15 percent.~~
- ~~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.~~
- ~~k.m.~~ A maximum of 28 square feet of exterior door area per dwelling unit can have a U-factor of 0.54 or less.
- ~~l.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-0.30~~ requirement.
- m. Minimum 24-inch horizontal or vertical below-grade.

Advanced and Intermediate Framing

CHANGE SUMMARY: Specifies R-10 insulation for voids in headers 2” or greater.

N1104.5.1 Advanced framing for walls. Advanced framing for walls is an optional construction method. Advanced framing, when used to qualify a design under the requirements of Table N1104.1(1), shall meet the following requirements:

1. Walls. Walls shall be framed with 2 × studs at 24 inches (610 mm) on center and shall include the following, as detailed in Items 2 and 3.
2. Corners and intersections. Exterior wall and ceiling corners shall be fully insulated through the use of three-stud corners configured to allow full insulation into the corner, or two-stud corners and drywall backup clips or other *approved* technique. Intersections of interior partition walls with exterior walls shall be fully insulated through the use of single backer boards, mid-height blocking with drywall clips or other approved technique.
3. Headers. Voids in headers 1 inch (25.4 mm) to 2 inches (51 mm) or greater in thickness shall be insulated with **rigid**-insulation that has a value of R-4 or greater per 1-inch (25.4 mm) thickness. Voids in headers greater than 2 inches (51 mm) in depth shall be insulated to a minimum level of R-10. Nonstructural headers (such as in gable-end walls) ~~can~~ shall be eliminated and replaced with insulation to achieve thermal performance levels equivalent to the surrounding area

N1104.5.2 Intermediate framing for walls. Intermediate framing for walls is an optional construction method. Intermediate framing, when used to achieve improved wall performance under the requirements of Table 1101.1(1) or Table N1104.1(2), shall meet the following requirements:

1. Walls. Walls shall be framed with 2 × studs at 16 inches (406 mm) on center and shall include the following, as detailed in Items 2 and 3.
2. Corners and intersections. Exterior wall and ceiling corners shall be fully insulated through the use of three-stud corners configured to allow full insulation into the corner, or two-stud corners and drywall backup clips or other approved technique. Intersections of interior partition walls with exterior walls shall be fully insulated through the use of single backer boards, mid-height blocking with drywall clips or other approved technique.
3. Headers. Voids in headers 1 inch (25.4 mm) to 2 inches (51 mm) or greater in thickness shall be insulated with **rigid**-insulation that has a value of R-4 or greater per 1 inch (25.4 mm) thickness. Voids in headers greater than 2 inches (51 mm) in depth shall be insulated to a minimum level of R-10. Nonstructural headers (such as in gable-end walls) ~~can~~ shall be eliminated and replaced with insulation to achieve thermal performance levels equivalent to the surrounding area.

Air Sealing Requirements

CHANGE SUMMARY: Incorporates former Additional Measure #5 into prescriptive language. New optional ACH testing language.

N1104.8 Air leakage. The building thermal envelope shall be constructed to limit air leakage in accordance with this section.

N1104.8.1 Air barriers. A continuous air barrier shall be installed and fully aligned with the building thermal envelope on every vertical portion of air-permeable insulation and on the warm side of horizontal, air-permeable insulation. Air-permeable insulation shall not be used as a sealing material.

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

N1104.8.2 Sealing required. Exterior joints around window and door frames, between wall cavities and window or door frames, between walls and foundation, between walls and roof, between wall panels, at penetrations or 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*.

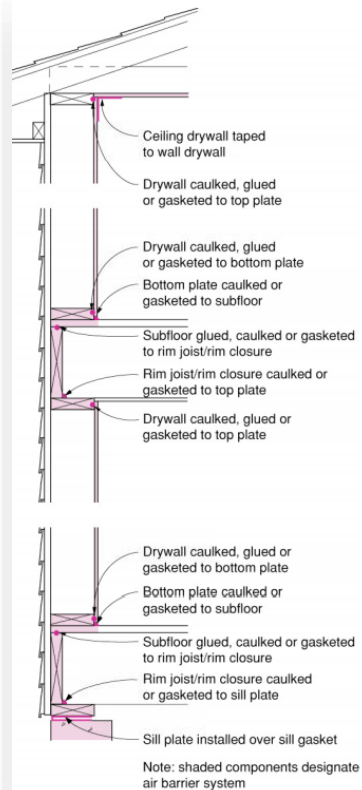
Sealing for the purpose of creating a continuous air barrier shall be in accordance with the applicable requirements of Table N1104.8, or the dwelling shall be tested to demonstrate a blower door result not greater than 4.0 ACH50.

N1104.8.2.1 Top plate sealing. At all walls in contact with vented attics, the wall covering (gypsum board or other) shall be sealed to the top plate with caulk, sealant, gasket or other approved material.



Air Barrier Installation Requirements

CHANGE SUMMARY: New Table N1104.8



Sample of an Airtight Drywall Approach: Interior Air Barrier Using Drywall and Framing

TABLE N1104.8
AIR BARRIER INSTALLATION AND AIR SEALING REQUIREMENTS

COMPONENT	AIR BARRIER CRITERIA
General requirements	A continuous air barrier shall be installed in alignment with the building thermal envelope.
	Breaks or joints in the air barrier shall be sealed.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed.
	Access openings, drop-down stairs, or knee wall doors to unconditioned attic spaces shall be gasketed and sealed.
Walls	The junction of the foundation and sill plate shall be sealed.
	The junction of the top plate and the top of walls shall be sealed per N1104.8.2.1.
	Between wall cavities and windows or doors frames shall be sealed.
	All penetrations or utility services through the top and bottom plates shall be sealed.
Knee walls shall be sealed.	
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors shall be sealed.
Rim/band joists	Rim/band joists shall be a part of the thermal envelope and have a continuous air barrier.
Floors Including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations and flue shafts opening to exterior or unconditioned space shall be sealed.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.
Shower/tub on exterior walls	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.

Insulation & Installation of Ducts

CHANGE SUMMARY: R-8 insulation required and “ducts inside” with exceptions.

N1105.2 Insulation of ducts. All new duct systems or new portions of duct systems exposed to unconditioned spaces, and buried ductwork within insulation that meets the exception to Section N1105.3, shall be insulated to minimum R-8.

Exceptions:

1. The replacement or addition of a furnace, air conditioner or heat pump shall not require existing ducts to be insulated to current code.
2. Exhaust and intake ductwork.

N1105.3 Installation of ducts. All new duct systems and air handling equipment and appliances shall be located fully within the building thermal envelope.

Exceptions:

1. Ventilation intake ductwork and exhaust ductwork.
2. Up to 5 percent of the length of an HVAC system ductwork shall be permitted to be located outside of the thermal envelope.
3. Ducts deeply buried in insulation in accordance all of the following:
 - 3.1. Insulation shall be installed to fill gaps and voids between the duct and the ceiling, and a minimum of R-19 insulation shall be installed above the duct between the duct and unconditioned attic.
 - 3.2. Insulation depth marker flags shall be installed on the ducts every 10 feet (3048 mm) or as approved by the building official.

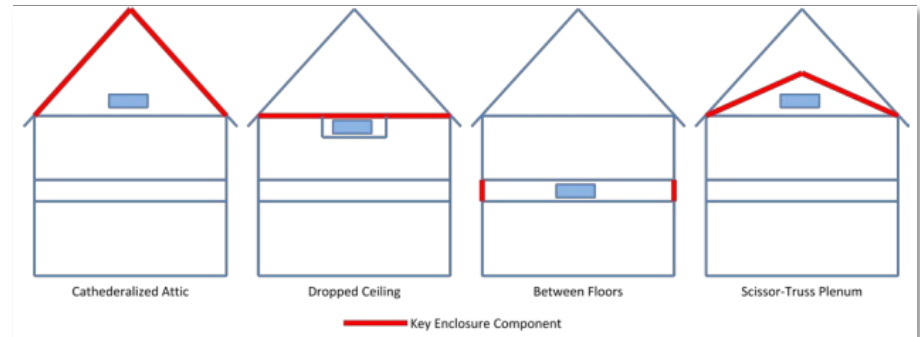


Image courtesy of Home Innovation Research Labs.

Ventilation & Furnace Fan Efficiency

CHANGE SUMMARY: New section specifying the efficiency of exhaust **and** supply ventilation. ECM furnace fan motors are a new federal requirement.



N1105.5 Ventilation Fan Efficiency. Bathroom exhaust fans and outdoor ventilation air supply fans shall be Energy Star certified.

N1105.6 Furnace fan efficiency. New central furnaces shall have electronically commutated fan motors with fan efficiency rating meeting 10 CFR 430.32(y).



Pipe Insulation & Plumbing Efficiency

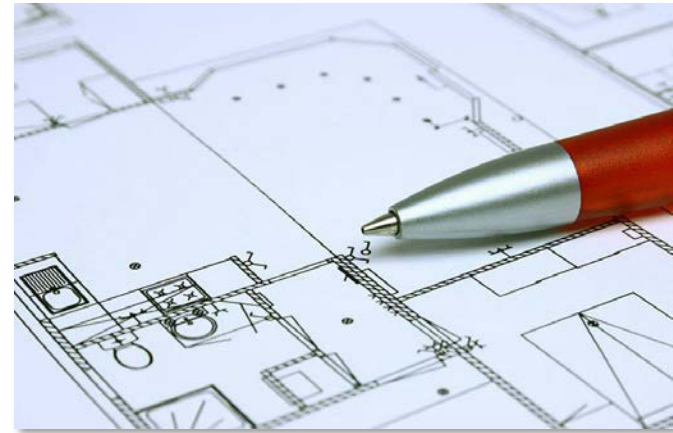
CHANGE SUMMARY: New R-3 requirements and reference to Plumbing Code.

SECTION N1106 PIPING INSULATION

N1106.1 Mechanical system piping insulation. Mechanical system piping capable of carrying fluids above 105°F (40.5°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

N1106.2 Domestic and service hot water systems. Domestic hot water piping ~~located outside the building thermal envelope~~ shall be insulated to a minimum of R-3 at the following locations:

1. Pipe located outside the building thermal envelope.
2. The first 8 feet (2438 mm) of pipe into and out of a water heater.
3. Recirculating water piping.



SECTION N1108 PLUMBING FIXTURE EFFICIENCY

N1108.1 General. This section shall apply to plumbing fixture efficiency.

N1108.1.1 ~~Water closets.~~ Fixture efficiency. Fixture efficiency shall be per the Plumbing Code. ~~Water closets shall be EPA WaterSense labeled, with an effective flush volume not exceeding 1.28 gallons per flush.~~

N1108.1.2 ~~Shower heads.~~ ~~Shower heads shall be EPA WaterSense labeled, with maximum flow rate not exceeding 2.0 gallons per minute.~~



Lighting Efficiency

CHANGE SUMMARY: Establishes new lumens per watt levels and requires that the two fixture exceptions are on a dimmer or automatic control.

SECTION N1107 LIGHTING

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.

N1107.2 High-efficiency interior lighting—~~efficacy lamps~~. All permanently installed lighting fixtures shall be high efficiency light sources ~~contain high efficacy lamps. Screw-in compact fluorescent and LED lamps comply with this requirement.~~

The building official shall be notified in writing at the final inspection that the permanently installed lighting fixtures have met this requirement.

Exception: Two permanently installed lighting fixtures are not required to ~~have high efficacy lamps.~~ be high-efficiency light sources when controlled by a dimmer or automatic control.

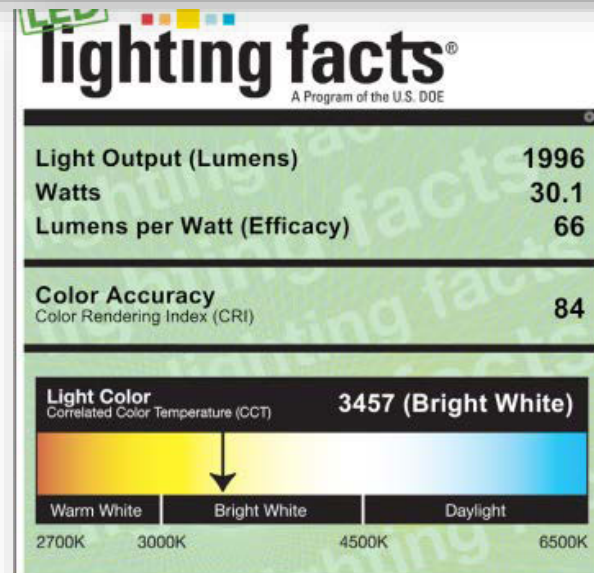
N1107.3 High-~~efficacy~~—efficiency exterior lighting. All exterior lighting fixtures affixed to the exterior of the building shall ~~contain be~~ high-~~efficacy lamps~~—efficiency light sources.

Exception: Two permanently installed lighting fixtures are not required to ~~have high efficacy lamps~~ be high-efficiency light sources when controlled by automatic control.

~~HIGH EFFICACY LAMPS~~ EFFICIENCY LIGHT SOURCE.

Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, LED lamps, fixture-integrated illumination devices, or lamps with an efficacy not less than 65 lumens per watt for each lamp or luminaires with an efficacy not less than 45 lumens per watt per each luminaire.

- ~~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.~~



Solar Ready

CHANGE SUMMARY: New section making all homes “Solar Ready”.

N1107.4 Solar interconnection pathway. A square metal junction box not less than 4 inches by 4 inches (102 mm by 102 mm) with a metal box cover shall be provided within 24 inches (610 mm) horizontally or vertically of the main electrical panel. A minimum 3/4-inch (19 mm) nonflexible metal raceway shall extend from the junction box to a capped roof termination or to an accessible location in the *attic* with a vertical clearance of not less than 36 inches (914 mm).

Where the raceway terminates in the *attic*, the termination shall be located not less than 6 inches (152 mm) above the insulation. The end of the raceway shall be marked as **“RESERVED FOR SOLAR.”**

Exception: In lieu of 3/4-inch (19 mm) nonflexible metal raceway, a minimum No. 10 copper 3-wire MC cable installed from the junction box to the termination point including 6 inches (152 mm) additional wire is permitted.



2021 ORSC Part V - Mechanical

SUMMARY: ORSC Chapters 12 thru 23. Sections changed and covered in this presentation are in **bold**.

- Chapter 12 – Mechanical Administration
- **Chapter 13 – General Mechanical System Requirements**
- **Chapter 14 – Heating and Cooling Equipment and Appliances**
- **Chapter 15 – Exhaust Systems**
- **Chapter 16 – Duct Systems**
- Chapter 17 – Combustion Air
- Chapter 18 – Chimneys and Vents
- Chapter 19 – Special Appliances, Equipment and Systems
- **Chapter 20 – Boilers and Water Heaters**
- **Chapter 21 – Hydronic Piping**
- Chapter 22 – Special Piping and Storage Systems
- **Chapter 23 – Solar Energy Systems**

Changes to Chapters 13, 15 and 21

CHANGE SUMMARY: Pit locations, domestic cooking exhaust, exhaust discharge, makeup air dampers, and hydronic system changes.

- **Chapter 13** - M1305.1.3.2 Pit locations. Establishes separation distances for appliances installed in pits or excavations. Requires that pits with depth over 12 inches be lined with concrete or masonry.
- **Chapter 15** - M1503.2 Domestic cooking exhaust (New). Shall be compliant with one of the following: UL 507, ANSI Z21.1, UL 858, or UL 923.
- **Chapter 15** - M1503.3 Exhaust discharge. Adds exception for when continuous mechanical exhaust of not less than 20 CFM is provided and where natural ventilation is provided for the kitchen.
- **Chapter 15** - M1503.6.2 Makeup air dampers (New). Dampers shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Gravity or barometric dampers shall not be used in passive makeup air systems except where the dampers are rated to provide the design makeup airflow.
- **Chapter 21** - M2101.10 Tests. Adds exception for PEX systems.
- **Chapter 21** – Adds sections M2103.2.1 Thermal break required and M2103.2.2 Thermal barrier material marking.

Condensate Drain & Insulating Refrig. Pipe

CHANGE SUMMARY: Requires material for condensate gravity drains to be smooth and rigid. Requires refrigerant lines to be insulated to R-4.

M1411.3.2 Drain pipe materials and sizes. Components of the condensate disposal system shall be ABS, cast iron, copper, cross-linked polyethylene, CPVC, galvanized steel, PE-RT, polyethylene, polypropylene or PVC pipe or tubing. Components shall be selected for the pressure and temperature rating of the installation. ~~Joints and connections shall be made in accordance with the applicable provisions of Chapter 30.~~ Material for gravity-drains shall be smooth and rigid to maintain the slope to the discharge point. Condensate waste and drain line size shall be not less than $\frac{3}{4}$ -inch (19 mm) nominal diameter from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an *approved* method.



M1411.6 Insulation of refrigerant piping. Piping and fittings for refrigerant vapor (suction) lines shall be insulated ~~in accordance with Table N1106.1.~~ with insulation having a thermal resistivity of not less than R-4 and having external surface permeance not exceeding 0.05 perm [2.87 ng/(s · m² · Pa)] when tested in accordance with ASTM E96.

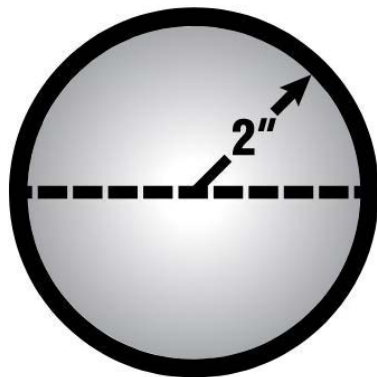


Dryer Duct Installation and Termination

CHANGE SUMMARY: Specifies minimum dryer duct exhaust opening, that they will not be diminished/deformed, and that they shall be sealed with tape only.

M1502.3 Duct termination. 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 (914 mm) in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.

M1502.3.1 Exhaust termination outlet and passageway size. The passageway of dryer exhaust duct terminals shall be undiminished in size and shall provide an open area of not less than 12.5 square inches (8065 mm²).



Area = 3.14159 X Radius Squared
12.57 = 3.14159 X 4



M1502.4 Dryer exhaust ducts. Dryer exhaust ducts shall conform to the requirements of Sections M1502.4.1 through M1502.4.7.

M1502.4.1 Material and size. Exhaust ducts shall have a smooth interior finish and shall be constructed of metal not less than 0.0157 inch (0.3950 mm) in thickness (No. 28 gage). The duct shall be 4 inches (102 mm) nominal in diameter.

M1502.4.2 Duct installation. Exhaust ducts shall be supported at intervals not to exceed ~~12 feet (3658 mm)~~ 4 feet (1219 mm) and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed with listed tape in accordance with Section M1601.4.1 and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude ~~more than 1/8 inch (3.2 mm)~~ into the inside of the duct. Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.

Ventilation for Rooms with Water Closets

CHANGE SUMMARY: Rooms with water closets, bathing facilities or spa facilities must be provided with mechanical ventilation controlled by automatic means.

R303.3 Toilet and bathing facilities ventilation.

R303.3.1 Rooms with bathing or spa facilities. Any room with a bathtub, shower or spa facility shall be provided with mechanical ventilation designed and installed in accordance with Section M1505.5.

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

Exception: The glazed areas shall not be required where artificial light and a mechanical ventilation system are provided. The minimum ventilation rates shall be in accordance with Table M1505.5.

M1505.6 Rooms with water closets, bathing facilities or spa facilities. Rooms containing water closets, bathing facilities or spa facilities shall be provided with a mechanical ventilation system controlled by a dehumidistat, timer or similar means of automatic control.



Ventilation Rates

CHANGE SUMMARY: New ventilation rates per Table M1505.5. Fans must be ENERGY STAR certified.

M1505.5 Exhaust ventilation rate. Ventilation systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with Table M1505.5. Exhaust flow ratings shall be source specific ventilation systems shall be in accordance with the Home Ventilating Institute (HVI) or Air Movement and Control Association (AMCA) residential ventilation standards. Fans shall be **Energy Star certified** in accordance with Section N1105.5.



**TABLE M1505.5
EXHAUST RATES FOR RESIDENTIAL DWELLINGS**

DOMESTIC KITCHENS	
Range hoods/downdraft exhaust.	Min. 150 cfm intermittent
BATHROOMS/TOILET ROOMS	
Rooms containing bathing and spa facilities. (Static pressure shall be rated @ 0.10-inch water gauge for intermittent fans.)	Min. 80 cfm intermittent or 20 cfm continuous
Toilet rooms without bathing or spa facilities, when not provided with natural ventilation in accordance with Section R303.3.2.	Min. 50 cfm

~~M1505.4.4 Local exhaust rates.~~ ~~Local exhaust systems shall be designed to have the capacity to exhaust the minimum airflow rate determined in accordance with Table M1505.4.4.~~

**TABLE M1505.4.4
MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS**

AREA TO BE EXHAUSTED	EXHAUST RATES
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms-Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

Mechanical Ventilation

CHANGE SUMMARY: Adds range hoods and rooms with bathing facilities to the recirculation requirement. Requires that whole house ventilation be balanced.

SECTION M1505 MECHANICAL VENTILATION

M1505.1 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 this section. Where local exhaust or whole-house mechanical ventilation is provided, the equipment shall be designed in accordance with this section and the applicable provisions of Chapter 11.

M1505.2 Recirculation of air. Exhaust air from range hoods, bathrooms, and toilet rooms and rooms with bathing or spa facilities shall not be recirculated within a residence or circulated to another *dwelling unit* and shall be exhausted directly to the outdoors. Exhaust air from bathrooms, toilet rooms and kitchens shall not discharge into an *attic*, crawl space or other areas inside the building. This section shall not prohibit the installation of ductless range hoods in accordance with the exception to Section M1503.3.

M1505.3 Exhaust equipment. Exhaust equipment serving single dwelling units shall be listed and labeled as providing the minimum required airflow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51.

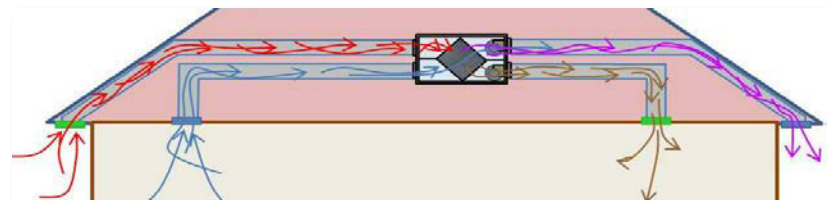
M1505.4.1 System design. The *whole-house mechanical ventilation system* shall provide balanced ventilation ~~consist of one or more supply or exhaust fans, or a combination of such, and associated ducts and controls.~~ Local exhaust or supply fans are permitted to serve as part of such a system. Outdoor air ~~ducts connected~~ ventilation provided by a supply fan ducted to the return side of an air handler shall be considered as providing supply ventilation for the balanced system.

M1505.4.2 System controls. The *whole-house mechanical ventilation system* shall be provided with controls that enable manual override.

M1505.4.3 Mechanical ventilation rate. The whole-house mechanical ventilation system shall provide outdoor air at a continuous rate as determined in accordance with Table M1505.4.3(1) or Equation 15-1.

Ventilation rate in cubic feet per minute = (0.01 × total square foot area of house) + [7.5 × (number of bedrooms + 1)]

Equation 15-1



Duct System Insulation and Installation

CHANGE SUMMARY: Removes allowance of gypsum products for return ducts in new buildings and additions. Refers insulation/installation back to Section N1105.

M1601.1.1 Above-ground duct systems. Above-ground duct systems shall conform to the following:

- ~~5. The use of gypsum products to construct return air ducts or plenums is permitted, provided that the air temperature does not exceed 125°F (52°C) and exposed surfaces are not subject to condensation.~~
7. Volume dampers, equipment and other means of supply, return and exhaust air adjustment used in system balancing shall be provided with access.

M1601.4.6 Duct insulation. Duct insulation shall be installed in accordance with the following requirements:

- ~~1. A vapor retarder having a permeance of not greater than 0.05 perm [2.87 ng/(s · m² · Pa)] in accordance with ASTM E96, or aluminum foil with a thickness of not less than 2 mils (0.05 mm), shall be installed on the exterior of insulation on cooling supply ducts that pass through unconditioned spaces conducive to condensation except where the insulation is spray polyurethane foam with a water vapor permeance of not greater than 3 perms per inch [1722 ng/(s · m² · Pa)] at the installed thickness. Ductwork insulation shall be installed in accordance with Section N1105.2.~~

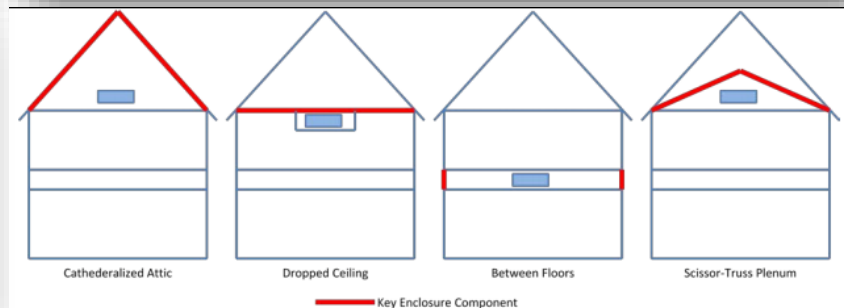
M1601.4.8 Duct separation. Ducts shall be installed with not less than 4 inches (102 mm) separation from earth except where they meet the requirements of Section M1601.1.2.

Exception: When approved ground-cover is placed between earth and the duct a minimum of 1 inch (25.4 mm) separation from the earth shall be allowed.

M1601.4.9 Ducts located in garages. Ducts in garages shall comply with the requirements of Section R302.5.2.

M1601.4.10 Flood hazard areas. In flood hazard areas as established by the flood plain administrator ~~Table R301.2(1)~~, duct systems shall be located or installed in accordance with Section R322.1.6.

M1601.4.11 Ductwork installation location. All supply and return ductwork shall be installed within the building thermal envelope in accordance with Section N1105.3.



Pool Heaters

CHANGE SUMMARY: New UL/CSA reference for pool and spa “heat pump” water heaters. Removes UL/CSA reference for portable spa exception.

SECTION M2006 POOL HEATERS

M2006.1 General. Pool and spa heaters shall be installed in accordance with the manufacturer’s installation instructions. Oil-fired pool heaters shall comply with UL 726. Electric pool and spa heaters shall comply with UL 1261. Pool and spa heat pump water heaters shall comply with UL 1995 or CSA C22.2 No. 236.

Exception: Portable residential spas and portable residential exercise spas shall comply with UL 1563 or CSA C22.2 No. 218.1.



UL 1995

STANDARD FOR SAFETY

Heating and Cooling Equipment



C22.2 No. 236-15

Heating and cooling equipment



Solar Thermal Energy System

CHANGE SUMMARY: Requires that access be provided and that there is no obstruction with roof-mounted equipment. Adds freeze protection language.

SECTION M2301 SOLAR THERMAL ENERGY SYSTEMS

M2301.1 General. This section provides for the design, construction, installation, *alteration* and repair of *equipment* and systems using solar ~~thermal energy to provide non-potable~~ space heating or cooling, hot water heating and swimming pool heating.

M2301.2 ~~Design and i~~ Installation. The ~~design and~~ installation of solar thermal energy systems shall comply with Sections M2301.2.1 through M2301.2.13.

M2301.2.1 Access. Access shall be provided to solar energy equipment for maintenance. Solar systems and appurtenances shall not obstruct or interfere with the operation of any doors, windows or other building components requiring operation or access. Roof-mounted solar thermal equipment shall not obstruct or interfere with the operation of roof-mounted equipment, appliances, chimneys, plumbing vents, roof hatches, smoke vents, skylights and other roof penetrations and openings.



M2301.2.6 Protection from freezing. System components shall be protected from damage resulting from freezing of heat-transfer liquids at the winter design temperature provided in Table R301.2(1). Freeze protection shall be provided in accordance with ICC 900/SRCC 300. Drain-back systems shall be installed in compliance with Section M2301.2.6.1. Systems utilizing freeze-protection valves shall comply with Section M2301.2.6.2.

~~Exception: Where the 97.5 percent winter design temperature is greater than or equal to 48°F (9°C).~~

M2301.2.6.1 Drain-back systems. Drain-back systems shall be designed and installed to allow for manual gravity draining of fluids from areas subject to freezing to locations not subject to freezing, and air filling of the components and piping. Such piping and components shall maintain a horizontal slope in the direction of flow of not less than one-fourth unit vertical in 12 units horizontal (2-percent slope). Piping and components subject to manual gravity draining shall permit subsequent air filling upon drainage and air venting upon refilling.

M2301.2.6.2 Freeze-protection valves. Freeze-protection valves shall discharge in a manner that does not create a hazard or structural damage.

2021 ORSC Part VI – Fuel Gas

CHANGE SUMMARY: Changes to Sections 2406, 2413, and 2414.

- **Section G2406.2** - Prohibited locations. New exception for a clothes dryer installed in a residential bathroom or toilet room having a permanent opening with an area of not less than 100 square inches that communicates with a space outside of a sleeping room, bathroom, toilet room or storage closet.
- **Section G2413.5** - Noncorrugated stainless steel tubing. Shall be sized in accordance with Equations 24-3 and 24-4 of Section 2413.4.
- **Section G2413.7** - Maximum operating pressure. Added exception when the piping joints are flanged and pipe-to-flange connections are made by welding or brazing.
- **Section G2414.4.2** - Steel. Steel, stainless steel and wrought-iron pipe shall not be lighter than Schedule 10 and shall comply with the dimensional standards of ASME B36.10, 10M and one of the current ASTM standards.

2021 ORSC Part VI – Fuel Gas

CHANGE SUMMARY: Changes to Sections 2414.

- **Section G2414.5.2** - Stainless steel. Stainless steel tubing shall comply with ASTM A268 or ASTM A269.
- **Section G2414.10.1** - Pipe joints. Schedule 40 and heavier pipe joints shall be threaded, flanged, brazed, welded or assembled with press-connect fittings listed in accordance with ANSI LC4/CSA 6.32. Pipe lighter than Schedule 40 shall be connected using press-connect fittings, flanges, brazing or welding.
- **Section G2414.10.3** - Stainless steel tubing joints. Stainless steel tubing joints shall be welded, assembled with approved tubing fittings, brazed with a material having a melting point in excess of 1,000°F, or assembled with press-connect fittings listed in accordance with ANSI LC4/CSA 6.32.
- **Section G2414.10.5** - Metallic fittings. Fittings used with steel, stainless steel or wrought-iron pipe shall be steel, stainless steel, copper alloy, malleable iron or cast iron.

2021 ORSC Part VI – Fuel Gas

CHANGE SUMMARY: Changes to Sections 2415, 2418, 2420, and 2447.

- **Section G2415.14** - Piping underground beneath buildings. Allows piping or encasement system listed for installation beneath buildings to be used.
- **Section G2415.17.3** – Tracer. Allows products specifically designed for the purpose of tracer wire to be utilized.
- **Section G2418.2** - Design and installation of pipe support. Piping shall be supported with **metal** pipe hooks, **metal** pipe straps, **metal** bands, **metal** brackets, **metal** hangers or building structural components suitable for the size of piping.
- **Section G2420.6** - Shutoff valves in tubing systems. Shutoff valves installed in tubing systems shall be rigidly and securely supported independently of the tubing.
- **Section G2447.2** - Prohibited locations of cooking appliances. New exception which allows the installation of commercial appliances if designed by a licensed Professional Engineer, and in compliance with the manufacturer's installation instructions.

Installation of Insulation Shield

CHANGE SUMMARY: Adds that insulation shields are required for factory built chimneys. Matches language for vents.

G2427.5.10 (503.5.11) Insulation shield. Where a factory-built chimney passes through insulated assemblies, an insulation shield constructed of steel having a thickness of not less than 0.0187 inch (0.475 mm) (nominal 26 gage) shall be installed to provide clearance between the chimney and the insulation material. The clearance shall be not less than the clearance to combustibles specified by the chimney manufacturer's installation instructions. Where chimneys pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the installation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a listed chimney system shall be installed in accordance with the manufacturer's installation instructions.



G2426.4-(502.4) Insulation shield. Where vents pass through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 26 gage) shall be installed to provide clearance between the vent and the insulation material. The clearance shall be not less than the clearance to combustibles specified by the vent manufacturer's installation instructions. Where vents pass through attic space, the shield shall terminate not less than 2 inches (51 mm) above the insulation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a listed vent system shall be installed in accordance with the manufacturer's instructions.





THANK YOU FOR WATCHING

Additional Resources:

Division website - [Oregon.gov/bcd](https://oregon.gov/bcd)

Technical questions - BCD.PTSPtech@oregon.gov

Program contacts - [Oregon.gov/bcd/Pages/contact-us.aspx](https://oregon.gov/bcd/Pages/contact-us.aspx)

Residential Structures Program - [Oregon.gov/bcd/codes-stand/Pages/residential-structures.aspx](https://oregon.gov/bcd/codes-stand/Pages/residential-structures.aspx)