

# OREGON RESIDENTIAL ENERGY CODE WORKSHOP

## Code Change Overview

Effective April 1, 2008

# Residential Energy Code

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## Purpose

The Governor's Advisory Group on Global Warming established a report titled Oregon Strategy for Greenhouse Gas Reduction. With this document, governor Kulongoski's goal was to reduce energy use in new buildings by 15 percent.

This energy conservation updates in residential code are the result of that edict.



# Residential Energy Code

## Applicability

Residential energy code requirements apply to all occupancy group R buildings, 3 stories and less in height, regulated by the Oregon Residential Specialty Code. This includes:

- ◆ Single family, detached
- ◆ Single family, attached
- ◆ Duplexes
- ◆ Apartments – that are regulated by the Residential Structures Board

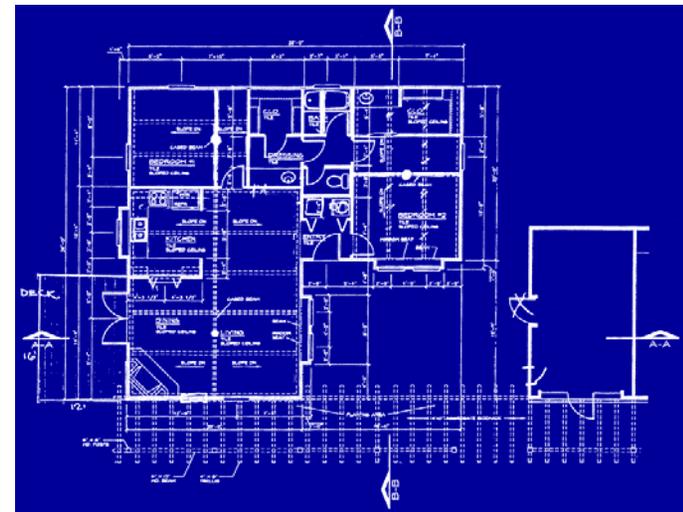


# Residential Energy Code

## Applicability (*continued*)

These new requirements apply to all projects that:

- ◆ Apply for a building permit on or after April 1, 2008
- ◆ Also applicable to additions onto existing residences
- ◆ Energy Star program specifications/requirements will not change through 2008
- ◆ Energy Star translates to hands-on training and incentives for builders



# Residential Energy Code

## Two Parts to New Requirements

### Improved Minimum Building Envelope – Standard Base Case

- ◆ U-0.35 Windows & Sliding Glass Doors
- ◆ R-30 Underfloor Insulation
- ◆ 50% Permanent Fixtures w/Hi-Efficiency Lamps
- ◆ R-10 Underslab-Htd Slabs

### Additional Measure(s) Required

- ◆ Select from a list of 9 Options
- ◆ Option 1 has 3 variations
- ◆ Option 2 has 2 variations
- ◆ Option 4 has 4 distinct options

## Residential Energy Code

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### Table N1101.1(1) – Prescriptive Building Envelope New Standard Base Case

For All Homes (except Log or Solid Timber Homes)

Requirements are performance based – assembly U-factor with R-value for **standard wood-framed** assemblies listed in table

- ◆ Above-grade exterior walls: U-0.060 (R-21)
- ◆ Below-grade walls: F-0.565 (R-15) *Same for interior or exterior application*

## Residential Energy Code

### Table N1101.1(1) – (Continued)

- ◆ Underfloors: U-0.028 (**R-30**) (crawlspace, unheated basement, above garage, & cantilevered 2nd floor) – *R-30 high-density batt is acceptable installed within 4-by-8 post & beam floor system*
- ◆ Slabs: F-0.52 (R-15), **Heated Slabs**: additional **R-10** underneath entire slab *Don't forget slab edge between house and garage, especially in daylight basement*

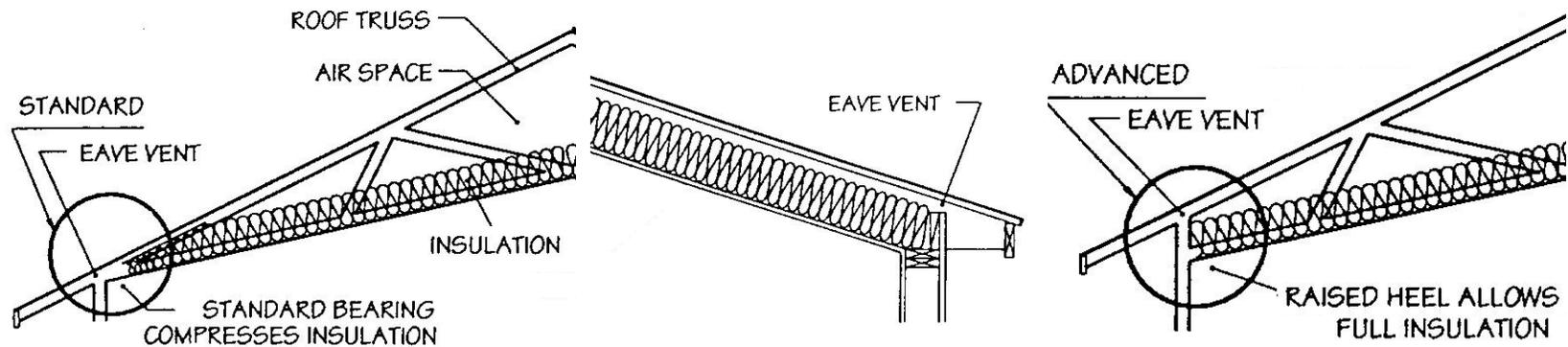


Green Text is an improved value. Blue text/value is a new/revised category or value

# Residential Energy Code

## Table N1101.1(1) – (Continued)

- ◆ Flat ceilings: U-0.031 (R-38), Vaulted ceilings\*: U-0.042\*\* (R-38)



\* Note: Area of vault limited to 50 percent of heated floor area

\*\* Reflects change in base assembly from rafter vault to scissor truss

### Basic Application:

The new vaulted ceiling IS NOT any different from current requirement unless assembly is a standard scissors truss, then it must be insulated to R-38.

# Residential Energy Code

## Table N1101.1(1) – (Continued)

- ◆ Windows & Slid Glass Doors: **U-0.35**
- ◆ Window area limitation: None
- ◆ Doors w/ >2.5ft<sup>2</sup> glazing: **U-0.40**  
**Prescriptive compliance permitted for double-glazed low-e or triple glazed units.**  
(1% exemption can be used for ≤2.5 ft<sup>2</sup> glazing)



**World's Best Window Co.**  
Millennium 2000+ Casement  
Vinyl-Clad Wood Frame  
Double Glaze • Argon Fill • Low E

**CERTIFIED ENERGY Performance**

- Energy savings will depend on your specific climate, house and lifestyle
- For more information, call [manufacturer's phone number] or visit NFCR's web site at [www.nfrc.org](http://www.nfrc.org)

Technical Information				
Res	U-Value	Solar Heat Gain Coefficient	Visible Transmittance	Air Leakage
	<b>.32</b>	<b>.45</b>	<b>.58</b>	<b>.3</b>
Non-Res		<b>.45</b>	<b>.60</b>	<b>.3</b>

Manufacturer stipulates that these ratings conform to applicable NFCR procedures for determining whole product energy performance. NFCR ratings are determined for a fixed set of environmental conditions and specific product sizes.

## Residential Energy Code

### Table N1101.1(1) – (Continued)

- ◆ One Unglazed, Untested, Solid Wood Door: U-0.54
- ◆ All Other Doors: U-0.20
- ◆ Skylights  $\leq 2\%$  Heated Space Floor Area: Wood, vinyl or alum w/thermal brk with double glazed having one pane low-e coated or U-0.75.
- ◆ Skylights  $> 2\%$  Heated Space Floor Area: **U-0.60**



## Residential Energy Code

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### High-Efficiency Lighting

- ◆ 40 lumens per watt or more
- ◆ Compact or linear fluorescent is acceptable
- ◆ **Screw-in** CFL is acceptable to meet code
- ◆ 50% permanently installed fixtures to have high-efficiency lamps. Some options require 75% of fixtures have high-efficiency lamps.



## Residential Energy Code

### HVAC Equipment Efficiency Standards

Code now corresponds with federal EPACK standards

- ◆ Single-phase, air-cooled, split & packaged heat pumps – 7.7 HSPF
- ◆ Single-phase, air-cooled, split & packaged A/C – 13.0 SEER
- ◆ Gas-fired boilers shall have an AFUE not less than 80% and gas-fired steam boilers shall have an AFUE not less than 75%



## Residential Energy Code

### Additional Measures (Options) Required from Table N1101.1(2) Must Select “One” of Following

#### 1. High Efficiency HVAC System

- ◆ Min. 90% AFUE Gas Furnace or Boiler, **or**
- ◆ Min. 8.5 HSPF Heat Pump, **or**
- ◆ Ground Source Heat Pump w/min. 3.0 COP



**OR**



#### 2. High Efficiency Duct Sealing

- ◆ Certified Performance Tested Ducts, **or**
- ◆ All Ducts & Air Handler Interior

# Residential Energy Code

## Additional Measures (Options) Cont.

### 3. High Efficiency Building Envelope

- ◆ U-0.047 (R-19+R-5 cont.) Exterior Walls, **and**  
R-30A/U-0.033 Vaulted Ceilings, **and**  
R-49/U-0.025 Flat Ceilings, **and**  
U-0.32 Windows



OR

### 4. Zonal Electric, Ductless Furnace, Ductless Heat Pump

- ◆ 75% Permanent Lighting Fixtures are Energy Efficient, **or**



- ◆ U-0.32 Windows, **or**
- ◆ R-49/U-0.025 Flat Ceilings, **or**
- ◆ R-24/U-0.047 Exterior Walls

## Residential Energy Code

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### **Additional Measures (Options) *Cont.***

#### **5. High Efficiency Ceiling, Windows & Lighting**

- ◆ R-30A/U-0.033 Vaulted Ceilings, **and** R-49/U-0.025 Flat Ceilings, **and** U-0.32 Windows , **and** 75% Permanent Fixtures are Energy Efficient

**OR**

#### **6. High Efficiency Ceiling, Windows & Water Heating**

- ◆ R-30A/U-0.033 Vaulted Ceilings, **and** R-49/U-0.025 Flat Ceilings, **and** U-0.32 Windows, **and** 0.80 EF min. Gas or Propane Demand Water Heating

## Residential Energy Code

### Additional Measures (Options) *Cont.*

#### 7. High Efficiency Water Heating & Lighting

- ◆ 0.80 EF min. Gas or Propane Demand Water Heating, **and** 75% Permanent Fixtures are Energy Efficient

**OR**

#### 8. Solar Photovoltaic

- ◆ Min. of 1w/ft<sup>2</sup> of conditioned space floor area

**OR**

#### 9. Solar Water Heating

- ◆ 40 ft<sup>2</sup> min. of gross collector area





# Residential Energy Code

## Details of Demonstrating Compliance

The following outlines the various options and the specific requirements. This information is contained on the Additional Measure Packages Checklist.

- ◆ The 9 Additional Measures translate to 13 actual Options
- ◆ Applicant circles the number of Additional Measure for project
- ◆ Make sure each of the Required Measures are identified on all copies of plans & specifications



# Residential Energy Code

## Summary of Additional Measures

Additional Measure Path	
1	High efficiency HVAC
2a	High efficiency ducts – certified-sealed
2b	High efficiency ducts --all interior <sup>R</sup>
3	High efficiency building envelope
4a	Zonal electric, ductless furn or ht pump-hi eff ltg
4b	Zonal electric, ductless furn or ht pump-U-032 window & sl glass doors
4c	Zonal electric, ductless furn or ht pump-improved ceilings
4d	Zonal electric, ductless furn or ht pump-R24 wall
5	High efficiency windows/ceilings/lighting
6	High efficiency windows/ceilings/water htg
7	High efficiency water heating/lighting
8	Solar photovoltaic
9	Solar water heating

*Additional Measure 1 will be used as an example to demonstrate compliance*

## Residential Energy Code

### Additional Measures – How to Document & Verify



#### ***Applicant Selects a Measure***

Builder/Applicant must circle the Additional Measure being used to demonstrate compliance

For our example, applicant has selected Additional Measure Path 1. Applicant must submit all pertinent “Measure” information directly on plans

# Residential Energy Code

## Required Measures Verification

Floors		
Underfloor R-30	Slab edge perimeter R-15	Heated slab, interior R-10
X	-	-

### Floors

◆ This project has a crawlspace with standard wood framed construction and underfloor insulation was indicated as R-30 on plans.

Joists/beams are specified as nominal 8 inches or deeper – or special insulation support system is specified

◆ Project does not have a slab floor



# Residential Energy Code

## Required Measures Verification

Fenestration			
Windows & sliding glass doors U-0.35	Windows & sliding glass doors U-0.32	Skylights ≤ 2% htd space flr area <sup>A</sup>	Skylights > 2% htd space flr area U-0.60
X		X	-

### Fenestration

- ◆ All windows and sliding glass doors are specified as having a U-factor of 0.35 or less
- ◆ The “grayed-out” squares on form are not required for the selected
- ◆ Skylight area does not exceed 2% of heated space floor area and is specified as either having a wood, vinyl, or aluminum w/thermal brk frame and low-e coated glazing or an NFRC-certified U-0.75
- ◆ The >2% does not apply

# Residential Energy Code

## Required Measures Verification

Fenestration				
		Exterior doors $\leq 28 \text{ ft}^2$ U-0.54	Exterior doors $> 28 \text{ ft}^2$ U-0.20	Doors w/ $>2.5 \text{ ft}^2$ glazing U-0.40 <sup>B</sup>
		X	X	X

### Fenestration (*cont.*)

- ◆ The door between the family & garage is specified as a solid wood door – U-0.54
- ◆ All other doors are specified as U-0.20
- ◆ The front door (as shown below) has  $>2.5 \text{ ft}^2$  glazing & is specified as triple-pane glazing



# Residential Energy Code

## Required Measures Verification

Walls		
Above grade wall insulation R-21	Above grade wall U-0.047°	Below grade wall insulation R-15
X		1

### Above-Grade Walls

- ◆ All above-grade walls are standard wood framed construction and specified as having R-21 insulation

### Below-Grade Walls

- ◆ Project does not contain below-grade walls



# Residential Energy Code

## Required Measures Verification

Ceilings	
Flat ceilings R-38	X
Flat ceilings R-49	
(1) Vaulted cell. ≤50% htd flr area U-0.042 <sup>0</sup>	X
(1) Vaulted ceilings ~50% htd flr area <sup>F</sup>	-
(2) Vaulted ceilings ≤50% htd flr area R-30A	
(2) Vaulted ceilings >50% htd flr area <sup>F</sup>	

### Flat Ceilings

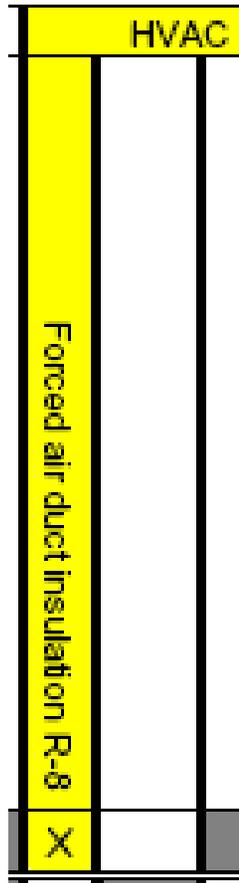
- ◆ All flat ceilings are standard wood framed construction and specified as R-38

### Vaulted Ceilings

- ◆ Vaulted ceiling areas do not exceed 50% of heated space floor area, are standard wood framed construction. Since project utilizes 2x10 wood rafters, high density R-30 batt is specied and complies with vaulted ceiling U- requirement
- ◆ The >50% vaulted ceiling area does not apply

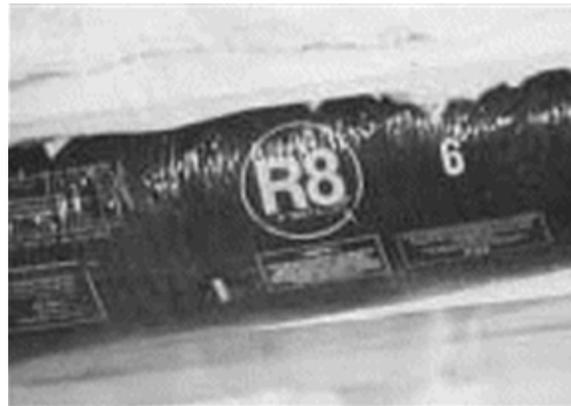
# Residential Energy Code

## Required Measures Verification



### Forced Air Ducts

- ◆ R-8 insulation is specified for all heating and cooling, supply and return air ducts that are located in unconditioned spaces



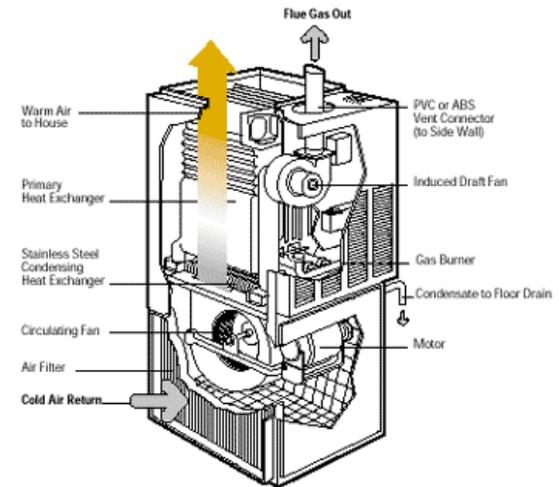
# Residential Energy Code

## Required Measures Verification

HVAC
90% AFUE furnace, 8.5HSPF heat pump, 3.0COP ground source heat pump
X

The Additional Measure circled (selected) was high efficiency HVAC system.

- ◆ This project is utilizing a 90% AFUE natural gas-fired furnace and plans must specify a min 90% AFUE furnace
- ◆ If project was utilizing a heat pump, plans must specify a min. 8.5 HSPF
- ◆ If project was utilizing a ground source heat pump, plans must specify a min. 3.0 COP



# Residential Energy Code

## Required Measures Verification

HVAC	
Performance tested ducts	All interior ducts <sup>E</sup>

### High Efficiency Duct Sealing

- ◆ Since this project has selected High Efficiency HVAC System, these measures are not applicable

If applicable, provide the Oregon Dept of Energy Performance Tested Ducts documentation after testing is completed

**Note:** All supply and return ducts and penetrations must be sealed per code



# Residential Energy Code

## Required Measures Verification

Ltg.
50% fixtures – high efficiency
75% fixtures – high efficiency
X

**High Efficiency Lighting** – includes all interior and attached on exterior of building

- ◆ Plans either specify 50% of all permanently installed interior and exterior fixtures are high efficiency lighting; or have a label attached that specifies this information. See *Lighting Labels for plans on next slide*
- ◆ The 75% fixtures does not apply to this project



## Residential Energy Code

### Required Measures Verification

50 percent of all permanently installed interior and exterior lighting fixtures on the building contain high efficiency lamps (minimum 40 lumens per watt)

50 percent of all permanently installed interior and exterior lighting fixtures on the building contain high efficiency lamps (minimum 40 lumens per watt)

### High Efficiency Lighting

- ◆ To aid in transition to this requirement, ODOE will be providing jurisdictions with peel-n-stick labels to be inserted on each set of plans.
- ◆ A template of these labels will be available to download at the ODOE website – to be copied onto blank label stock. This information can also simply be inserted into the plans.

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Misc.
On-demand water heating
Solar photovoltaic
Solar water heating

## Required Measures Verification

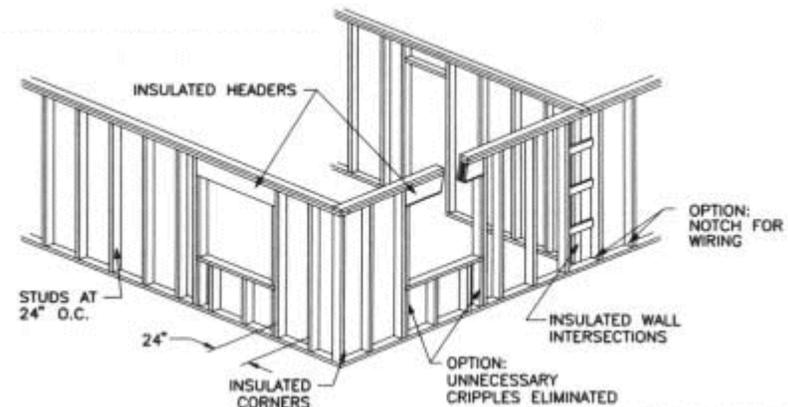
### Miscellaneous Additional Measures

- ◆ If project was utilizing on demand water heater(s), plans must specify a min. 0.80 EF
- ◆ If project was utilizing solar photovoltaic, documentation must be provided that demonstrates Total Solar Resource Fraction is no less than 75%. System must be rated to provide 1 watt per square feet of conditioned floor area.
- ◆ If project was utilizing a solar water heating, plans must specify a min. 40 ft<sup>2</sup> of collector area and that it meets Standard OG-300

# Residential Energy Code

## Application to Additions – *new floor space*

- ◆ The “addition” must comply with code – both Tables N1101.1(1) and N1101.1(2)
- ◆ Addition needs to comply only with Table N1101.1(1) when it is <30% of the house (heated floor area) or 400 ft<sup>2</sup>, whichever is less.



## Residential Energy Code

### Application to Remodels/Existing Buildings

“Remodel” to an existing envelope

- ◆ “Improvement” must comply with building envelope to the maximum extent practical

Change of “use”

- ◆ Changing from unconditioned to conditioned space must comply with building envelope to the maximum extent practical

Change of “occupancy”

- ◆ Work involved with changing from non-residential (such as a church or warehouse) must comply with code – exception: may disregard minimum component requirements of Table N1104.1, footnote d.

## Residential Energy Code

### Systems Analysis Alternative

The baseline design, conforming to requirements specified in this chapter and the proposed design shall be analyzed using the same procedures. These analyses shall use equal floor area and equal environmental conditions. The comparison shall be expressed in Btu input per gross building square foot of conditioned space per year .

- ◆ Software must have ability to model 8760 hours of operation per year
- ◆ Credit can only be taken for “code regulated” measures
- ◆ Code does not regulate or specify ACH as a measure

