



Table 1104.1(1): Residential Thermal Performance Calculations

**TABLE N1104.1(1)
RESIDENTIAL THERMAL PERFORMANCE CALCULATIONS**

BUILDING COMPONENTS ^b	Standard base case ^a			Proposed alternative			
	Areas ^c	U-factor	Areas x U	R-value ^d	Areas ^c	U-factor ^e	Areas x U
Flat ceilings		0.031					
Vaulted ceilings ^f		0.042					
Conventional wood-framed walls		0.060					
Underfloor		0.028					
Slab edge		(perimeter ft. =) F=0.52 ^g					
Windows		0.35					
Skylights <2% ^h		0.75					
Skylights >2% ^h		0.60					
Exterior doors ⁱ		0.20					
Doors with >2.5 ft ² glazing		0.40					
		CODE UA =				Proposed UA ^j =	

^a Base path 1 represents Standard Base Case from Table 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 (2.6 m²) 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 N1104.1(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 Whenever skylight area for Proposed Alternative exceeds 2 percent of the total heated space floor area, enter 2 percent of area under Standard Base Case at U-0.75 then the remaining area under Standard Base Case at U-0.60. For Proposed Alternative skylights, enter the actual skylight area and U-factor of those to be installed in residence.

ⁱ A maximum of 28 square feet (2.6 m²) of exterior door area per dwelling unit can have a U-factor of 0.54 or less. Default U-factor for an unglazed wood door is 0.54.

^j Proposed UA must be less than or equal to Code UA.

TABLE N1104.1(2)— APPROVED DEFAULT U-FACTORS

FLAT CEILINGSA			EXTERIOR WALLSA			
Insulation	Type	U-Factor	Insulation	Insulation Sheathing	Framing	U-Factor
R-38	Conventional framing	0.031	R-15	0	Conventional framing	0.080
R-38	=>8/12 roof pitch	0.028	R-15	0	Intermediate framing ^b	0.075
R-38	Advance framing ^c	0.026				
R-49	Conventional framing	0.025	R-19	0	Conventional framing	0.065
R-49	=>8/12 roof pitch	0.024	R-19	0	Intermediate framing ^b	0.063
R-49	Advance framing ^c	0.020	R-19	0	Advance framing ^d	0.061
VAULTED CEILINGSA						
Insulation	Type	U-Factor	R-21	0	Conventional framing	0.060
R-21	Rafter framings	0.047	R-21	0	Intermediate framing ^b	0.058
R-30	Rafter framing	0.033	R-21	0	Advance framing ^d	0.055
R-38	Rafter framing	0.027				
R-21	Scissors truss	0.055	R-11	3.5 ^e	Conventional framing	0.069
R-30	Scissors truss	0.046	R-11	5 ^e	Conventional framing	0.063
R-38	Scissors truss	0.042	R-11	7 ^e	Conventional framing	0.055
R-49	Scissors truss	0.039	R-11	3.5 ^e	Advance framing ^d	0.067
			R-11	5 ^e	Advance framing ^d	0.061
R-30	Advance scissors truss ^c	0.032	R-11	7 ^e	Advance framing ^d	0.054
R-38	Advance scissors truss ^c	0.026	R-13	3.5 ^e	Conventional framing	0.064
R-49	Advance scissors truss ^c	0.020	R-13	5 ^e	Conventional framing	0.058
EPS FOAM CORE PANEL VAULTED CEILINGSA			R-13	7 ^e	Conventional framing	0.052
Insulation	Type	U-Factor	R-13	3.5 ^e	Advance framing ^d	0.062
R-29	8-1/4" EPS foam core panel	0.037	R-13	5 ^e	Advance framing ^d	0.056
R-37	10-1/4" EPS foam core panel	0.030	R-13	7 ^e	Advance framing ^d	0.050
R-44	12-1/4" EPS foam core panel	0.025				
FLOORSA			R-15	3.5 ^e	Conventional framing	0.060
Insulation	Type	U-Factor	R-15	5 ^e	Conventional framing	0.055
R-21	Underfloor	0.035	R-15	7 ^e	Conventional framing	0.049
R-25	Underfloor	0.032	R-15	3.5 ^e	Advance framing ^d	0.057
R-30	Underfloor	0.028	R-15	5 ^e	Advance framing ^d	0.052
			R-15	7 ^e	Advance framing ^d	0.047
SLAB-ON-GRADE						
Insulation	Type	F-Factor ^f	R-19	3.5 ^e	Conventional framing	0.052
R-10	Slab edge	0.54	R-19	5 ^e	Conventional framing	0.047
R-15	Slab edge	0.52	R-19	7 ^e	Conventional framing	0.043
EPS FOAM CORE PANEL EXTERIOR WALLS			R-19	3.5 ^e	Advance framing ^d	0.049
Insulation	Type	U-Factor	R-19	5 ^e	Advance framing ^d	0.045
R-14.88	4-1/2" EPS foam core panel	0.065	R-19	7 ^e	Advance framing ^d	0.041
R-22.58	6-1/4" EPS foam core panel	0.045				
R-29.31	8-1/4" EPS foam core panel	0.035	R-21	3.5 ^e	Conventional framing	0.048
			R-21	5 ^e	Conventional framing	0.044
			R-21	7 ^e	Conventional framing	0.040
			R-21	3.5 ^e	Advance framing ^d	0.044
			R-21	5 ^e	Advance framing ^d	0.042
			R-21	7 ^e	Advance framing ^d	0.038

^a U-factors are for wood frame construction. U-factors for other assemblies which include steel framing, brick or other masonry, stucco, etc., shall be calculated using standard ASHRAE procedures.

^b Intermediate framing consists of wall studs placed at a minimum 16 inches on-center with insulated headers. Voids in headers shall be insulated with rigid insulation having a minimum R-value of 4 per one-inch (w/m³-k) thickness.

^c Advanced framing construction for ceilings as defined in Section 1104.6

^d Advanced framing construction for walls as defined in Section 1104.5.1

^e Insulation sheathing shall be rigid insulation material, installed continuously over entire exterior or interior of wall (excluding partition walls).

^f F-Factor is heat loss coefficient in Btu/hr/F° per lineal foot of concrete slab perimeter.

Information presented in this publication supports the Oregon Residential Specialty Code. This publication does not include all code requirements. Refer to the code and check with your code official for additional requirements. If information in this publication conflicts with code or your local officials, follow requirements of code and your local officials.

For more information about the residential energy code, call the Building Codes Division at (503) 378-4133 or the Oregon Dept of Energy (503) 378-4040 in Salem or toll-free, 1-800-221-8035.

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