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SBCC

Washington State Building Code Council

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Code News

On November 12, 2009 the Council completed adoption of the 2009 International Building, Residential, Mechanical and Fire Codes and the 2009 Uniform Plumbing Code. These codes, with state

? Ask us a question >

Upcoming Meetings

03/11/2010 | MVE Committee
([agenda](#)) | SeaTac City Hall 9 a.m.

03/12/2010 | Council Meeting
([agenda](#)) | SeaTac City Hall 10 a.m.

The State Building Code Council is a state agency created by the legislature to provide independent analysis and objective advice to the legislature and the Governor's Office on state building code issues. The Council establishes the minimum building, mechanical, fire, plumbing and energy code requirements necessary to promote the health, safety and welfare of the people of the state of Washington, by reviewing, developing and adopting the state building code.

2009 Washington State Energy Code: Nonresidential & Multifamily Residential

John Hogan, AIA, PE, LEED® AP – Seattle Department of Planning and Development

Lisa Rosenow, CSBA, LEED® AP – NEEC



New Envelope Requirements

Agenda

- **Changes in Chapter 13, Building Envelope**
- **Changes in Chapter 10, Default Tables**
- **Q&A**

General Comments

- This presentation does not list or reflect all changes in the 2009 WSEC.
- Code sections as presented may have portions excluded for clarity during presentation.
- The code sections presented are intended to highlight select code revisions only.
- It is recommended to go to the State Building Code Council website to download the new code in order to reference the entire detail.
- www.sbcc.wa.gov

General Comments

- “Official” interpretations of Energy Code content are made only by the SBCC in response to questions submitted by building officials.
- Interpretations are available at the SBCC website. Check it out.
- Please download the new code in order to reference all details of each particular section you are interested in.
- www.sbcc.wa.gov

Building Envelope Requirements



Scope: Chapters 1-10 and 11-20

- **101.3 Scope**

- Spaces within the scope of Section R101.2 of the International Residential Code shall comply with Chapters 1 through 10 of this Code. All other spaces, including other Group R Occupancies, shall comply with Chapters 11 through 20 of this Code. Chapter 2, 7 and 10 are applicable to all building types.

- **IRC R101.2:**...“detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress”.

Definition of Residential

- **Single-family:** All spaces within the scope of Section R101.2 of the International Residential Code.
- **Multifamily:**
 - i. All Group R Occupancy not falling under the scope of Section 101.2 of the International Residential Code including, but not limited to, dwelling units, hotel/motel guest rooms, dormitories, fraternity/sorority houses, hostels, prisons, and fire stations;
 - ii. All sleeping areas in Group I Occupancy including, but not limited to, assisted living facilities, nursing homes, patient rooms in hospitals, prisons, and fire stations; and
 - iii. All sleeping areas in other occupancies including, but not limited to, fire stations.

Semi-Heated Spaces

● Section 1310.2

- A space may be considered semi-heated if the installed heating output is:
 - » Climate Zone 1 – Between 3 and 8 Btuh per SF.
 - » Climate Zone 2 – Between 5 and 12 Btuh per SF.
- For semi-heated spaces, the building envelope shall comply with the same requirements as that for conditioned spaces (except wall insulation not required with other fuels); however, semi-heated spaces shall be calculated separately from other conditioned spaces for compliance purposes.

Comment: Threshold is based on heating equipment capacity, NOT temperature setpoint.

Refrigerated Warehouse Insulation

- **1310.3 Cold Storage and Refrigerated Spaces (New)**

- New Table 13-3 with insulation requirements for:
 - » Frozen storage spaces (28 F or below) and
 - » Cold storage spaces (28-45 F).
- Exceptions:
 - » Areas within refrigerated warehouses that are designed solely for the purpose of quick chilling or freezing (design cooling capacities greater than 2 tons / 100 SF).
 - » Controlled atmosphere area exterior floor & partitions.

Refrigerated Warehouse Insulation

- **1310.3 Cold Storage and Refrigerated Spaces**

**TABLE 13.3
REFRIGERATED WAREHOUSE INSULATION**

SPACE	SURFACE	MINIMUM R-VALUE (°F-hr-ft²/Btu)
Frozen Storage Spaces (28°F or below)	Exterior Roof/Ceiling	R-36
	Exterior Wall	R-36
	Exterior Floor	R-36
Cold Storage Spaces (28°F to 45°F)	Interior Partition ¹	R-28
	Exterior Roof/Ceiling	R-28
	Exterior Wall	R-28
	Interior Partition ¹	R-19



Roof / Ceiling Assemblies

- **1311.2 Insulation**

- Where two or more layers of rigid board insulation are used in a roof assembly, the vertical joints between each layer shall be staggered.



Roof / Ceiling Assemblies

● 1313.2 Moisture Control

- Primary text refers to IBC 1203.2 which requires a minimum of 1 inch of airspace between insulation and the roof sheathing.
- New exception 2 to this requirement allows unvented space provided that the assembly meets certain provisions.
 - » Requirements vary for air permeable and air impermeable insulation.
 - » Air impermeable insulation shall be a vapor retarder, or shall have a vapor retarder coating or covering in direct contact with the underside of the insulation.
 - » Air permeable insulation shall also have rigid board insulation installed above structural roof sheathing.
 - » Many nuances, read carefully.

Air Leakage

- This section of the Code has been substantially changed and expanded.
- Air leakage is a major component in building heat loss, generally neglected by previous code.



Air Leakage

● 1314.1 Building Envelope Sealing

- The following areas of the envelope shall be sealed, caulked, gasketed, or weather-stripped to minimize air leakage:
 - a. Joints around fenestration and door frames;
 - b. Junctions between walls and foundations, between walls at building corners, between walls and structural floors or roofs, and between walls and roof or roof panels;
 - c. Openings at penetrations of utility services through the roofs, walls, and floors;
 - d. Site-built fenestration and doors;
 - e. Building assemblies used as ducts or plenums;
 - f. Joints, seams, and penetrations of vapor retarders;
 - g. All other openings in the building envelope.

Air Leakage

● 1314.2 Glazing and Doors

- Air leakage (rating) for fenestration and doors shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the National Fenestration Rating Council (in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 or ASTM E283), and shall be labeled and certified by the manufacturer.
- Air leakage shall be tested at a pressure of at least 1.57 lbs per SF and shall not exceed:
 - » 1.0 cfm per SF for glazed swinging entrance doors and revolving doors
 - » 0.04 cfm per SF for curtain wall and storefront glazing
 - » 0.2 cfm per SF for all other products, or 0.3 cfm per SF when tested at a pressure of at least 6.24 lbs per SF.

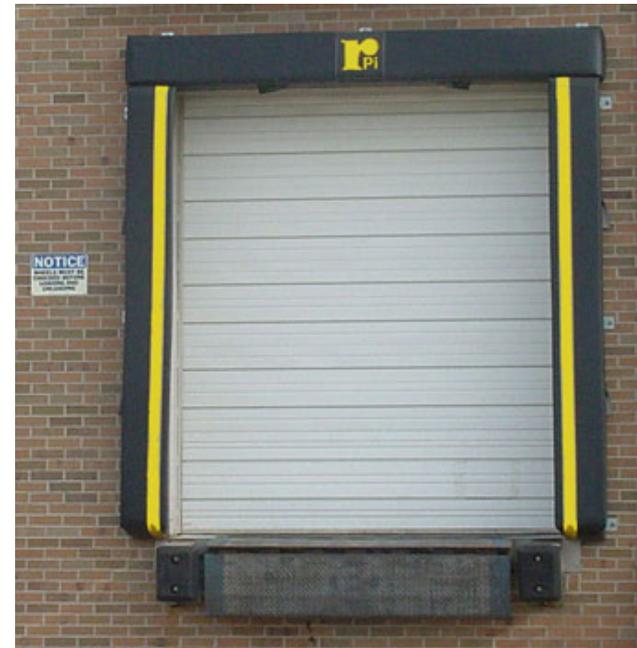
Air Leakage

● 1314.2 Glazing and Doors

- Exceptions to this Section include:
 - » Openings that are required to be fire resistant.
 - » Field fabricated fenestration and doors that are weatherstripped or sealed.
 - » Garage doors tested in accordance with standard ANSI/DASMA 105.
 - » Units without air leakage ratings that are produced by small businesses as long as these units are weatherstripped or sealed per Section 1314.1.

Air Leakage

- **1314.5 Loading Dock Weatherseals**
 - Cargo doors and loading dock doors shall be equipped with weatherseals to restrict infiltration when vehicles are parked in the doorway.



Air Leakage

● 1314.6 Continuous Air Barrier

- For buildings over five stories, the building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of, the conditioned space.
- All air barrier components of each envelope assembly shall be clearly identified on construction documents and the joints, interconnections and penetrations of the air barrier components shall be detailed.

Air Leakage

● 1314.6.1 Characteristics of the Air Barrier

- Each air barrier component shall be joined and sealed in a flexible manner to the air barrier component of adjacent assemblies, allowing for relative movement.
- It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the air barrier without damage or displacement, and shall transfer the load to the structure.
- It shall be installed in accordance with the manufacturer's instructions and in such a manner as to achieve the performance requirements of this Code.

Air Leakage

● 1314.6.2 Compliance

- The continuous air barrier for the opaque building envelope shall be demonstrated by testing the completed building and demonstrating that the air leakage rate of the building envelope does not exceed 0.40 cfm/SF at a pressure differential of 0.3 inch w.g. (1.57 psf).
- Tests shall be accomplished using either pressurization or depressurization or both.
- Whole building testing shall be accomplished in accordance with ASTM E 779 or approved similar test.
- Under ASTM E 779 it is permissible to test using the building HVAC system.

Air Leakage

● 1314.6.2 Compliance

- In lieu of the fan pressurization method described in ASTM E 779, a tracer gas test of the building air change rate in accordance with ASTM E 741 is also allowed. The tracer gas test shall be run with building HVAC fans off.
- The approved compliance test procedure for a multi-zone building is described in the Code.

● 1314.6.3 Certificate of Occupancy

- A final certificate of occupancy shall not be issued for the building, or portion thereof, until such time that the building official determines the building, or portion thereof, has been field tested in accordance with Section 1314.6.2.

Prescriptive Option

● 1322 Opaque Envelope

- Area-weighted averaging of the R-value is not allowed. When showing compliance with R-values, the minimum insulation R-value for all areas of the component shall comply with Table 13-1 or 13-2 (Building Envelope Requirements).
- When calculating compliance using U-factors, area-weighted averaging is allowed.
- Where insulation is tapered (e.g., roofs), separate assembly U-factors shall be calculated for each 4-foot section of tapered insulation.
- The only exception allowed is for opaque smoke vents.

Prescriptive Option

● 1323 Glazing

- All glazing shall be, at a minimum, double glazing. In addition, all glazing assemblies shall have at least one low-emissivity coating unless the assembly has an overall U-factor that complies with the values in Table 13-1 or 13-2.
- Maximum area, U-factor and SHGC in Tables 13-1 or 13-2
- Exceptions include:
 - » Double-glazed vertical glazing (with ½” minimum airspace and low-emissivity coating of e-0.10 maximum) located on the display side of the street level story of a retail occupancy.
 - » Single glazing for security purposes and vestibules and revolving doors. The maximum area allowed for all single glazing is one percent of the gross exterior wall area.

Prescriptive Option

● 1323.3 Solar Heat Gain Coefficient

- New exceptions added to the code:
 - » Glazing separating conditioned space from semi-heated space or unconditioned space.
 - » Vertical glazing which is oriented within 45 degrees of north shall be allowed to have a maximum solar heat gain coefficient SHGC-0.05 above that required in Tables 13-1 and 13-2.
 - » Credit for permanent shading projections allowing the SHGC in the proposed building to be reduced by using values in table of Projection Factor multipliers for each glazing product shaded by permanent projections that will last as long as the building itself.

Projection Factor

Projection Factor	SHGC Multiplier (All Orientations Except North- Oriented)	SHGC Multiplier (North-Oriented)
0 – 0.10	1.00	1.00
<0.10 – 0.20	0.91	0.95
<0.20 – 0.30	0.82	0.91
<0.30 – 0.40	0.74	0.87
<0.40 – 0.50	0.67	0.84
<0.50 – 0.60	0.61	0.81
<0.60 – 0.70	0.56	0.78
<0.70 – 0.80	0.51	0.76
<0.80 – 0.90	0.47	0.75
<0.90 – 1.00	0.44	0.73

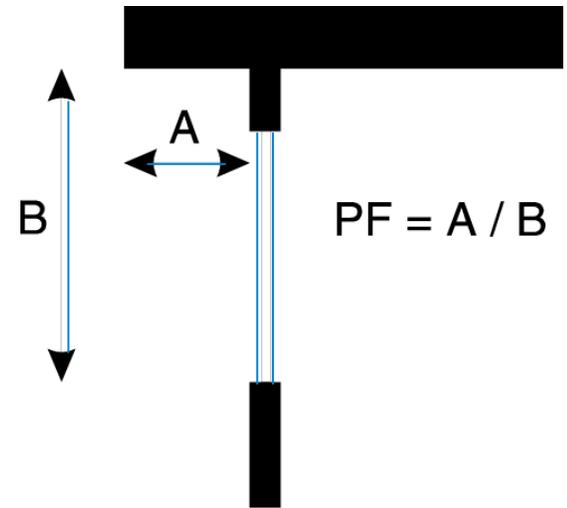
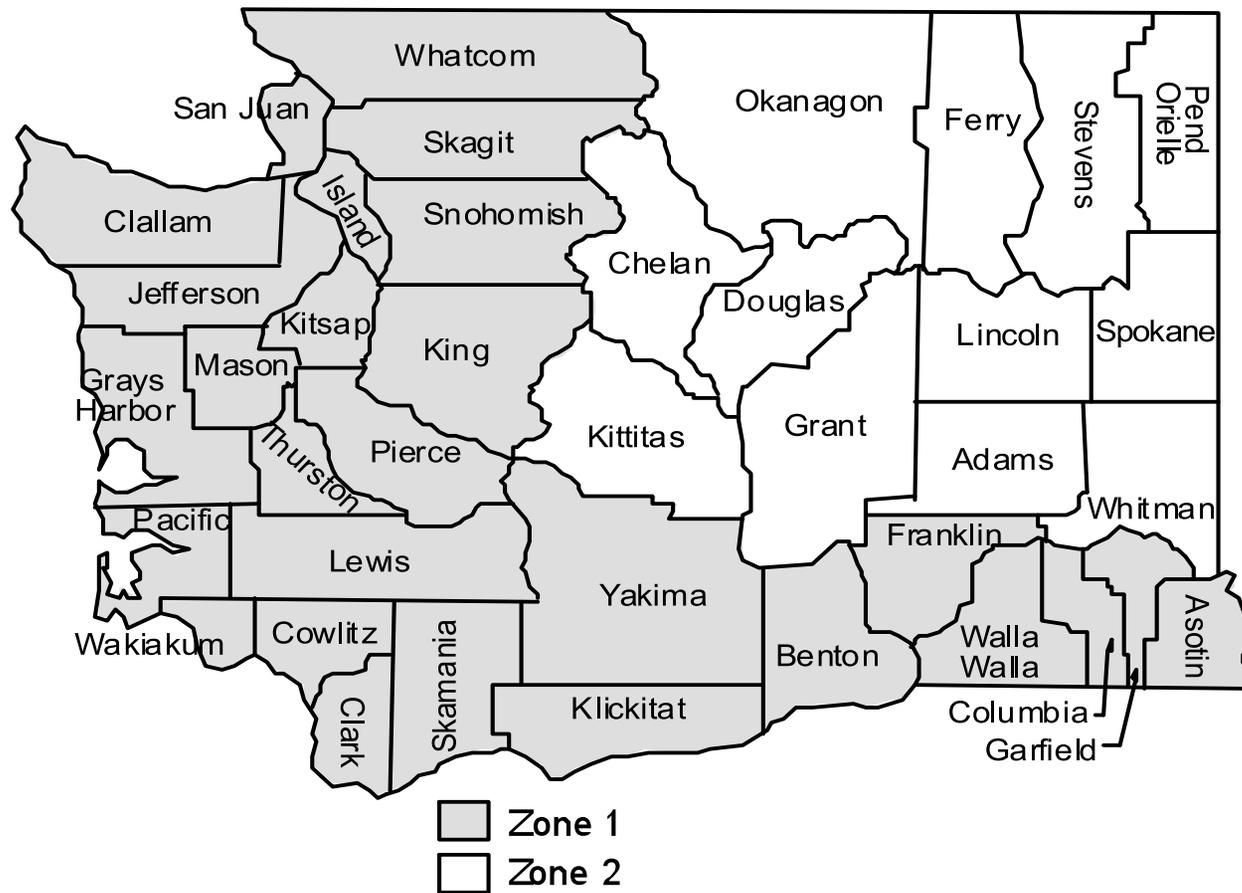


FIGURE 13B

Climate Zones



Building Envelope Requirements

- Building envelope requirements are specified separately for two space types:
 - *Nonresidential*
 - *Residential, other than Single Family*
- Opaque criteria are specified for:
 - *Roof (4 types), above-grade wall (4 types), below-grade wall (1 type), floors over unconditioned space (3 types), slab on grade floors (2 types), opaque doors (2 types)*
- Fenestration (windows, skylights, doors) criteria are specified for:
 - *Vertical fenestration (3 types), skylights (2 types)*

**Table 13-1 Building Envelope Requirements
for *Climate Zone 1***

	Nonresidential		Residential, Other than Single-Family	
Opaque Elements	Assembly Max.	Insulation Min. R-Value	Assembly Max.	Insulation Min. R-Value
<i>Roofs</i>				
Insulation Entirely above Deck	U-0.034	R-30 c.i.	U-0.031	R-38 c.i.
Metal Building	U-0.031	R-25 + R-11 Ls	U-0.031	R-25 + R-11 Ls
Single-Rafter	U-0.027	R-38	U-0.027	R-38
Attic and Other	U-0.027	R-38 adv or R-49	U-0.027	R-38 adv or R-49
<i>Walls, Above-grade</i>				
Mass ¹	U-0.150	R-5.7 c.i.	U-0.090	R-11.4 c.i.
Metal Building	U-0.064	R-13 + R-7.5 c.i.	U-0.057	R-19 + R-8.5 c.i.
Steel Framed	U-0.064	R-13 + R-7.5c.i.	U-0.057	R-19 + R-8.5 c.i.
Wood Framed and Other	U-0.057	R-21	U-0.057	R-13 + R- 6 c.i.
<i>Wall, Below Grade</i>				
Below Grade Wall		Same as above grade		Same as above grade

**Table 13-1 Building Envelope Requirements
for *Climate Zone 1***

	Nonresidential		Residential, Other than Single-Family	
Opaque Elements	Assembly Max.	Insulation Min. R-Value	Assembly Max.	Insulation Min. R-Value
<i>Floors</i>				
Mass	U-0.029	R-30 c.i.	U-0.029	R-30 c.i.
Steel Joist	U-0.029	R-38 + R-4 c.i.	U-0.029	R-38 + R-4 c.i.
Wood Framed and Other	U-0.029	R-30	U-0.029	R-30
<i>Slab-On-Grade Floors</i>				
Unheated	F-0.540	R-10 for 24 in. (with thermal break)	F-0.540	R-10 for 24 in. (with thermal break)
Heated	F-0.360	R-10 c.i. (with thermal break)	F-0.360	R-10 c.i. (with thermal break)
<i>Opaque Doors</i>				
Swinging	U-0.600		U-0.400	
Non-Swinging	U-0.600		U-0.400	

**Table 13-1 Building Envelope Requirements
for *Climate Zone 1***

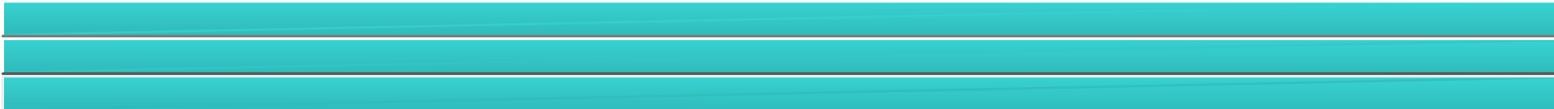
	Nonresidential		Residential, Other than Single-Family	
<i>Fenestration 0-40% of Wall</i>	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration</i>				
Nonmetal framing: all	U-0.32	SHGC-0.40 all, OR SHGC-0.45 all PLUS permanent PF > 0.50 on west, south, and east	U-0.32	
Metal framing: fixed/operable	U-0.40		U-0.40	
Entrance doors	U-0.60		U-0.60	
<i>Skylights</i>				
Without curb (i.e. sloped glazing)	U-0.50	SHGC-0.35 all	U-0.50	SHGC-0.35 all
With curb (i.e. individual unit skylights)	U-0.60		U-0.60	

**Table 13-2 Building Envelope Requirements
for *Climate Zone 2***

	Nonresidential		Residential, Other than Single-Family	
Opaque Elements	Assembly Max.	Insulation Min. R-Value	Assembly Max.	Insulation Min. R-Value
<i>Roofs</i>				
Insulation Entirely above Deck	U-0.034	R-30 c.i.	U-0.031	R-38 c.i.
Metal Building	U-0.031	R-25 + R-11 Ls	U-0.031	R-25 + R-11 Ls
Single-Rafter	U-0.027	R-38	U-0.027	R-38
Attic and Other	U-0.027	R-38 adv or R-49	U-0.027	R-38 adv or R-49
<i>Walls, Above-grade</i>				
Mass	U-0.123	R-7.6 c.i.	U-0.080	R-13.3 c.i.
Metal Building	U-0.064	R-13 + R-7.5 c.i.	U-0.044	R-19 + R-16 c.i.
Steel Framed	U-0.064	R-13 + R-7.5 c.i.	U-0.044	R-19 + R-14 c.i.
Wood Framed and Other	U-0.051	R-13 + R-7.5 c.i., or R-21 + R-2.5 c.i.	U-0.044	R-21 + R-5 c.i.
<i>Wall, Below Grade</i>				
Below Grade Wall		Same as above grade		Same as above grade

**Table 13-2 Building Envelope Requirements
for *Climate Zone 2***

	Nonresidential		Residential, Other than Single-Family	
Opaque Elements	Assembly Max.	Insulation Min. R-Value	Assembly Max.	Insulation Min. R-Value
<i>Floors</i>				
Mass	U-0.029	R-30 c.i.	U-0.029	R-30 c.i.
Steel Joist	U-0.029	R-38 + R-4 c.i.	U-0.029	R-38.0 + R-4 c.i.
Wood Framed and Other	U-0.029	R-30	U-0.029	R-30
<i>Slab-On-Grade Floors</i>				
Unheated	F-0.540	R-10 for 24 in. (with thermal break).	F-0.540	R-10 for 24 in. (with thermal break)
Heated	F-0.360	R-10 c.i. (with thermal break)	F-0.360	R-10 c.i. (with thermal break)
<i>Opaque Doors</i>				
Swinging	U-0.600		U-0.400	
Non-Swinging	U-0.600		U-0.400	



**Table 13-2 Building Envelope Requirements
for *Climate Zone 2***

	Nonresidential		Residential, Other than Single-Family	
Fenestration 0-40% of Wall	Assembly Max. U	Assembly Max. SHGC	Assembly Max. U	Assembly Max. SHGC
<i>Vertical Fenestration</i>				
Nonmetal framing: all	U-0.32	SHGC-0.40 all, OR SHGC-0.45 all PLUS permanent PF > 0.50 on west, south, and east	U-0.32	
Metal framing: fixed/operable	U-0.40		U-0.40	
Metal framing, entrance door	U-0.60		U-0.60	
<i>Skylights</i>				
Without curb (i.e. sloped glazing)	U-0.50	SHGC-0.35 all	U-0.50	SHGC-0.35 all
With curb (i.e. individual unit skylights)	U-0.60		U-0.60	

Table 10-A R-Value of Fiberglass Batts Compressed Within Various Depth Cavities

Rated R-Value		82	71	60	49	38	30	22	21	19	15	13	11
Standard Thickness, Inches		26.0	22.5	19.0	15.5	12"	9.5	6.5	5.5	6	3.5	3.5	3.5
Nominal Lumber Sizes, Inches	Actual Depth of Cavity, Inches	Insulation R-Values When Installed in a Confined Cavity											
		Truss	26.0	82	—	—	—	—	—	—	—	—	—
Truss	22.5	—	71	—	—	—	—	—	—	—	—	—	—
Truss	19.0	—	—	60	—	—	—	—	—	—	—	—	—
Truss	15.5	—	—	—	49	—	—	—	—	—	—	—	—
Truss	12.0	—	—	—	—	38	—	—	—	—	—	—	—
2x12	11.25	—	—	—	—	37	—	—	—	—	—	—	—
2x10	9.25	—	—	—	—	32	30	—	—	—	—	—	—
2x8	7.25	—	—	—	—	27	26	22	21	19	—	—	—
2x6	5.5	—	—	—	—	—	21	20	21	18	—	—	—
2x4	3.5	—	—	—	—	—	—	14	—	13	15	13	11
	2.5	—	—	—	—	—	—	—	—	—	—	9.8	—
	1.5	—	—	—	—	—	—	—	—	—	—	6.3	6.0

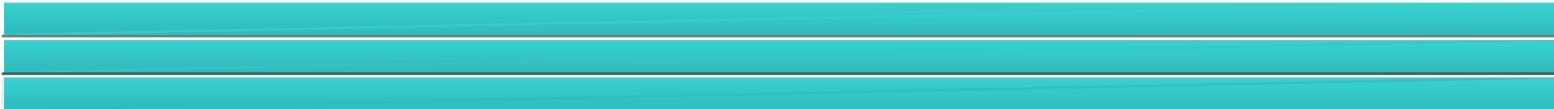


Table 10-5A(1) Overall Assembly U-factors for Metal Stud Walls

Metal Framing	R-Value of Continuous Foam Board Insulation	Cavity Insulation					
		R-0	R-11	R-13	R-15	R-19	R-21
16" o.c.	R-0 (none)	0.352	0.132	0.124	0.118	0.109	0.106
	R-1	0.260	0.117	0.111	0.106	0.099	0.096
	R-2	0.207	0.105	0.100	0.096	0.090	0.087
	R-3	0.171	0.095	0.091	0.087	0.082	0.080
	R-4	0.146	0.087	0.083	0.080	0.076	0.074
	R-5	0.128	0.080	0.077	0.074	0.071	0.069
	R-6	0.113	0.074	0.071	0.069	0.066	0.065
	R-7	0.102	0.069	0.066	0.065	0.062	0.061
	R-8	0.092	0.064	0.062	0.061	0.058	0.057
	R-9	0.084	0.060	0.059	0.057	0.055	0.054
	R-10	0.078	0.057	0.055	0.054	0.052	0.051
	R-11	0.072	0.054	0.052	0.051	0.050	0.049
	R-12	0.067	0.051	0.050	0.049	0.047	0.047
	R-13	0.063	0.049	0.048	0.047	0.045	0.045
	R-14	0.059	0.046	0.045	0.045	0.043	0.043
	R-15	0.056	0.044	0.043	0.043	0.041	0.041
R-20	0.044	0.036	0.036	0.035	0.034	0.034	



Table 10-5A(3) Default Metal Building Wall U-factors

Insulation System	Rated R-Value of Insulation	Overall U-Factor for Entire Base Wall Assembly	Overall U-Factor for Assembly of Base Wall Plus Continuous Insulation (Uninterrupted by Framing)					
			R-6.5	R-13	R-19.5	R-26	R-32.5	R-39
Single Layer of Mineral Fiber								
	None	1.180	0.136	0.072	0.049	0.037	0.030	0.025
	R-10	0.186	0.084	0.054	0.040	0.032	0.026	0.023
	R-11	0.185	0.084	0.054	0.040	0.032	0.026	0.023
	R-13	0.162	0.079	0.052	0.039	0.031	0.026	0.022
	R-16	0.155	0.077	0.051	0.039	0.031	0.026	0.022
	R-19	0.147	0.075	0.050	0.038	0.030	0.025	0.022



Table 10-5B(2) Peripheral Edges of Intermediate Concrete Floors

Slab Edge Treatment	Average Thickness of Wall Above and Below			
	6 inches	8 inches	10 inches	12 inches
Exposed Concrete	0.816	0.741	0.678	0.625
R-5 Exterior Insulation	0.161	0.157	0.154	0.152
R-6 Exterior Insulation	0.138	0.136	0.134	0.132
R-7 Exterior Insulation	0.122	0.120	0.118	0.116
R-8 Exterior Insulation	0.108	0.107	0.106	0.104
R-9 Exterior Insulation	0.098	0.097	0.095	0.094
R-10 Exterior Insulation	0.089	0.088	0.087	0.086
R-11 Exterior Insulation	0.082	0.081	0.080	0.079
R-12 Exterior Insulation	0.076	0.075	0.074	0.074
R-13 Exterior Insulation	0.070	0.070	0.069	0.068
R-14 Exterior Insulation	0.066	0.065	0.065	0.064
R-15 Exterior Insulation	0.062	0.061	0.061	0.060



Table 10-6 Default U-factors for Vertical Glazing, Overhead Glazing and Opaque Doors

VERTICAL GLAZING

	Any Frame	U-Factor Aluminum w/Thermal Break	Wood/ Vinyl/ Fiberglass Frame
Single	1.45	1.45	1.45
Double	0.90	0.85	0.75
1/2 Inch Air, Fixed/Operable	0.75/0.90	0.70/0.84	0.60/0.72
1/2 Inch Air, Low-e ^(0.40) , Fixed/Operable	0.70/0.84	0.60/0.72	0.50/0.60
1/2 Inch Air, Low-e ^(0.10) , Fixed/Operable	0.65/0.78	0.44/0.66	0.45/0.54
1/2 Inch Argon, Low-e ^(0.10) , Fixed/Operable	0.60/0.72	0.50/0.60	0.40/0.48
Triple	0.75	0.55	0.50
1/2 Inch Air, Fixed/Operable	0.55/0.66	0.50/0.60	0.45/0.54
1/2 Inch Air, Low-e ^(0.20) , Fixed/Operable	0.50/0.60	0.45/0.54	0.40/0.48
1/2 Inch Air, 2 Low-e ^(0.10) , Fixed/Operable	0.45/0.54	0.35/0.42	0.30/0.36
1/2 Inch Argon, Low-e ^(0.10) , Fixed/Operable	0.40/0.48	0.30/0.36	0.25/0.30

Table 10-6C Revolving Doors, Double-Skin Steel Emergency Exit Doors

Revolving Doors	
Size (W x H)	U-Factor
3-wing	
8 ft x 7 ft	0.79
10 ft x 8 ft	0.80
4-wing	
7 ft x 6.5 ft	0.63
7 ft x 7.5 ft	0.64
Open	
82 in x 84 in	1.32

Double-Skin Steel Emergency Exit Doors		
Core Insulation	3 ft x 6 ft 8 in	6 ft x 6 ft 8 in
1-3/8 in. thickness		
Honeycomb kraft paper	0.57	0.52
Mineral wool, steel ribs	0.44	0.36
Polyurethane foam	0.34	0.28
1-3/4 in. thickness		
Honeycomb kraft paper	0.57	0.54
Mineral wool, steel ribs	0.41	0.33
Polyurethane foam	0.31	0.26
1-3/8 in. thickness		
Honeycomb kraft paper	0.60	0.55
Mineral wool, steel ribs	0.47	0.39
Polyurethane foam	0.37	0.31
1-3/4 in. thickness		
Honeycomb kraft paper	0.60	0.57
Mineral wool, steel ribs	0.44	0.37
Polyurethane foam	0.34	0.30

Table 10-7F Default U-factors for Metal Building Roofs

Insulation System	Rated R-Value of Insulation	Overall U-Factor for Entire Base Roof Assembly	Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (uninterrupted by framing) Rated R-Value of Continuous Insulation					
			R-6.5	R-13	R-19.5	R-26	R-32.5	R-39
Standing Seam Roofs with Thermal Spacer Blocks^{a,b}								
Single Layer	None	1.280	0.137	0.073	0.049	0.037	0.030	0.025
	R-10	0.115	0.066	0.046	0.035	0.029	0.024	0.021
	R-11	0.107	0.063	0.045	0.035	0.028	0.024	0.021
	R-13	0.101	0.061	0.044	0.034	0.028	0.024	0.020
	R-16	0.096	0.059	0.043	0.033	0.027	0.023	0.020
	R-19	0.082	0.053	0.040	0.031	0.026	0.022	0.020
	R-10 + R-10	0.088	0.056	0.041	0.032	0.027	0.023	0.020
	R-10 + R-11	0.086	0.055	0.041	0.032	0.027	0.023	0.020
	R-11 + R-11	0.085	0.055	0.040	0.032	0.026	0.023	0.020
	R-10 + R-13	0.084	0.054	0.040	0.032	0.026	0.023	0.020
Double Layer	R-11 + R-13	0.082	0.053	0.040	0.032	0.026	0.022	0.020
	R-13 + R-13	0.075	0.050	0.038	0.030	0.025	0.022	0.019
	R-10 + R-19	0.074	0.050	0.038	0.030	0.025	0.022	0.019
	R-11 + R-19	0.072	0.049	0.037	0.030	0.025	0.022	0.019
	R-13 + R-19	0.068	0.047	0.036	0.029	0.025	0.021	0.019
	R-16 + R-19	0.065	0.046	0.035	0.029	0.024	0.021	0.018
	R-19 + R-19	0.060	0.043	0.034	0.028	0.023	0.020	0.018
	R-19 + R-11	0.035						

2009 Washington State Nonresidential Energy Code Compliance Forms

- ***Envelope UA Calculations (ENV-UA)***
 - ***Includes compliance forms for:***
 - » ***Zone 1 Non-Residential***
 - » ***Zone 1 Residential***
 - » ***Zone 2 Non-Residential***
 - » ***Zone 2 Residential***
 - » ***Cold and Refrigerated Storage***
- ***SHGC Calculations (ENV-SHGC)***
- ***Target Area Adjustment Calculations***

Question & Answer

- NREC compliance forms will be available for free download from www.neec.net in June 2010.
- Technical Assistance
 - Stan Price & Lisa Rosenow at NEEC
 - » Stan@putnamprice.com
 - » Lisa@putnamprice.com