

# ANSI/ASHRAE/ICC/USGBC/IES Addendum bk to ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017

# Standard for the Design of High-Performance Green Buildings

## Except Low-Rise Residential Buildings

*The Complete Technical Content of the International Green Construction Code®*

Approved by ASHRAE and the American National Standards Institute on July 6, 2020; by the International Code Council on June 1, 2020; by the U.S. Green Building Council on June 3, 2020; and by the Illuminating Engineering Society on July 1, 2020.

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ISSN 1041-2336



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## **FOREWORD**

*Addendum bk updates the envelope criteria in Informative Appendix E based on changes to fenestration requirements in ANSI/ASHRAE/IES Standard 90.1-2019. For vertical fenestration and skylights, Section 7.4.2.1 of this standard specifies that the requirements in Tables 5.5-0 through 5.5-8 of ANSI/ASHRAE/IES Standard 90.1 be modified by reducing the U-factor by 5%. Additionally, for skylights and east- and west-oriented vertical fenestration, each solar heat gain coefficient (SHGC) in Tables 5.5-0 through 5.5-8 shall be reduced by 5% except where the SHGC requirement is designated as "NR" (no requirement). The tables in Informative Appendix E list the updated calculated values for fenestration under the new criteria. There are no changes to the opaque envelope requirements.*

**Note:** In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strike through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

### **Addendum bk to Standard 189.1-2017**

***Revise Tables E-0 through E-8 as shown. Portions of tables not shown are unchanged.***

[Tables begin on next page.]

**Table E-0 (Supersedes Table 5.5-0 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 0 (A,B)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.039	R-25 c.i.	U-0.032	R-30 c.i.	U-0.218	R-3.8 c.i.			
Metal building <sup>a</sup>	U-0.041	R-10 + R-19 FC	U-0.041	R-10 + R-19 FC	U-0.115	R-10			
Attic and other roofs	U-0.027	R-38	U-0.027	R-38	U-0.081	R-13			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-0.580	NR	U-0.151	R-5.7 c.i.	U-0.580	NR			
Metal building	U-0.094	R-0 + R-9.8 ci	U-0.094	R-0 + R-9.8 ci	U-0.352	NR			
Steel framed	U-0.124	R-13	U-0.124	R-13	U-0.352	NR			
Wood framed and other	U-0.089	R-13	U-0.089	R-13	U-0.292	NR			
<i>Wall, below grade</i>									
Below-grade wall	C-1.140	NR	C-1.140	NR	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.322	NR	U-0.322	NR	U-0.322	NR			
Steel joist	U-0.350	NR	U-0.350	NR	U-0.350	NR			
Wood framed and other	U-0.282	NR	U-0.282	NR	U-0.282	NR			
<i>Slab-on-grade floors</i>									
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR			
Heated	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.			
<i>Opaque doors</i>									
Swinging	U-0.370		U-0.370		U-0.700				
Nonswinging	U-0.310		U-0.310		U-1.450				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-0.30	E&W-0.21, N&S-0.22		U-0.30	E&W-0.21, N&S-0.22		U-0.88		
Metal framing, Fixed	U-0.48	E&W-0.21, N&S-0.22	1.10 (for all types)	U-0.48	E&W-0.21, N&S-0.22	1.10 (for all types)	U-1.14	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.62 U-0.59	E&W-0.19, N&S-0.20		U-0.62 U-0.59	E&W-0.19, N&S-0.20		U-1.14		
Metal framing, Entrance door	U-0.79	E&W-0.19, N&S-0.20		U-0.79	E&W-0.19, N&S-0.20		U-1.05		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.71 U-0.67	0.33 0.29	NR	U-0.71 U-0.67	0.33 0.29	NR	U-1.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-1 (Supersedes Table 5.5-1 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 1 (A,B)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.048	R-20 c.i.	U-0.039	R-25 c.i.	U-0.218	R-3.8 c.i.			
Metal building <sup>a</sup>	U-0.041	R-10 + R-19 FC	U-0.041	R-10 + R-19 FC	U-0.115	R-10			
<i>Attic and other roofs</i>	U-0.027	R-38	U-0.027	R-38	U-0.081	R-13			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-0.580	NR	U-0.151	R-5.7 c.i.	U-0.580	NR			
Metal building	U-0.094	R-0 + R-9.8 c.i.	U-0.094	R-0 + R-9.8 c.i.	U-0.352	NR			
Steel framed	U-0.124	R-13	U-0.124	R-13	U-0.352	NR			
Wood framed and other	U-0.089	R-13	U-0.089	R-13	U-0.292	NR			
<i>Wall, below grade</i>									
Below-grade wall	C-1.140	NR	C-1.140	NR	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.322	NR	U-0.322	NR	U-0.322	NR			
Steel joist	U-0.350	NR	U-0.350	NR	U-0.350	NR			
Wood framed and other	U-0.282	NR	U-0.282	NR	U-0.282	NR			
<i>Slab-on-grade floors</i>									
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR			
Heated	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.			
<i>Opaque doors</i>									
Swinging	U-0.370		U-0.370		U-0.700				
Nonswinging	U-0.310		U-0.310		U-1.450				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-0.48	E&W-0.24, S-0.25, N-0.35,		U-0.48	E&W-0.24, S-0.25, N-0.35,		U-0.88		
Metal framing, Fixed	U-0.54	E&W-0.22, N&S-0.23	1.10 (for all types)	U-0.54	E&W-0.22, N&S-0.23	1.10 (for all types)	U-1.14	NR	NR
Metal framing, Operable	U-0.62	E&W-0.20, N&S-0.21		U-0.62	E&W-0.20, N&S-0.21		U-1.14		
Metal framing, Entrance door	U-1.05	E&W-0.20, N&S-0.21		U-1.05	E&W-0.20, N&S-0.21		U-1.05		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.71	0.33	NR	U-0.71	0.33	NR	U-1.71	NR	NR
	U-0.67	0.29		U-0.67	0.29				

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-2 (Supersedes Table 5.5-2 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 2 (A,B)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	
<i>Roofs</i>									
Insulation entirely above deck	U-0.039	R-25 c.i.	U-0.039	R-25 c.i.	U-0.173	R-5 c.i.			
Metal building <sup>a</sup>	U-0.041	R-10 + R-19 FC	U-0.041	R-10 + R-19 FC	U-0.096	R-16			
<i>Attic and other roofs</i>	U-0.027	R-38	U-0.027	R-38	U-0.053	R-19			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-0.151	R-5.7 c.i.	U-0.123	R-7.6 c.i.	U-0.580	NR			
Metal building	U-0.094	R-0 + R-9.8 c.i.	U-0.094	R-0 + R-9.8 c.i.	U-0.162	R-13			
Steel framed	U-0.084	R-13 + R-3.8 c.i.	U-0.064	R-13 + R-7.5 c.i.	U-0.124	R-13			
Wood framed and other	U-0.089	R-13	U-0.089	R-13	U-0.089	R-13			
<i>Wall, below grade</i>									
Below-grade wall	C-1.140	NR	C-1.140	NR	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.107	R-6.3 c.i.	U-0.087	R-8.3 c.i.	U-0.322	NR			
Steel joist	U-0.038	R-30	U-0.038	R-30	U-0.069	R-13			
Wood framed and other	U-0.033	R-30	U-0.033	R-30	U-0.066	R-13			
<i>Slab-on-grade floors</i>									
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR			
Heated	F-0.900	R-10 for 24 in.	F-0.860	R-15 for 24 in.	F-1.020	R-7.5 for 12 in.			
<i>Opaque doors</i>									
Swinging	U-0.370		U-0.370		U-0.700				
Nonswinging	U-0.310		U-0.310		U-1.450				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
		(for all frame types)			(for all frame types)			(for all frame types)	
Vertical glazing, 0% to 40% of wall									
Nonmetal framing (all)	U-0.35	E&W-0.24, S-0.25, N-0.35		U-0.35	E&W-0.24, S-0.25, N-0.35		U-0.88		
Metal framing, Fixed	U-0.51 U-0.43	E&W-0.24, N&S-0.25	1.10 (for all types)	U-0.51 U-0.43	E&W-0.24, N&S-0.25	1.10 (for all types)	U-1.14 U-0.48	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.62 U-0.57	E&W-0.22, N&S-0.23		U-0.62 U-0.57	E&W-0.22, N&S-0.23		U-1.14 U-0.62		
Metal framing, Entrance door	U-0.79 U-0.73	E&W-0.22, N&S-0.23		U-0.73	E&W-0.22, N&S-0.23		U-0.79 U-0.73		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.62	0.33/0.29	NR	U-0.62	0.33/0.29	NR	U-1.74 U-0.86	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-3 (Supersedes Table 5.5-3 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 3 (A,B,C)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.039	R-25 c.i.	U-0.039	R-25 c.i.	U-0.119	R-7.6 c.i.			
Metal building <sup>a</sup>	U-0.041	R-10 + R-19 FC	U-0.041	R-10 + R-19 FC	U-0.096	R-16			
Attic and other roofs	U-0.027	R-38	U-0.027	R-38	U-0.053	R-19			
<i>Walls, above grade</i>									
Mass	U-0.123	R-7.6 c.i.	U-0.104	R-9.5 c.i.	U-0.580	NR			
Metal building	U-0.094	R-0 + R-9.8 c.i.	U-0.072	R-0 + R-13 c.i.	U-0.162	R-13			
Steel framed	U-0.077	R-13 + R-5 c.i.	U-0.064	R-13 + R-7.5 c.i.	U-0.124	R-13			
Wood framed and other	U-0.089	R-13	U-0.064	R-13 + R-3.8 c.i.	U-0.089	R-13			
<i>Wall, below grade</i>									
Below-grade wall	C-1.140	NR	C-1.140	NR	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.074	R-10 c.i.	U-0.074	R-10 c.i.	U-0.137	R-4.2 c.i.			
Steel joist	U-0.038	R-30	U-0.038	R-30	U-0.052	R-19			
Wood framed and other	U-0.033	R-30	U-0.033	R-30	U-0.051	R-19			
<i>Slab-on-grade floors</i>									
Unheated	F-0.730	NR	F-0.540	R-10 for 24 in.	F-0.730	NR			
Heated	F-0.860	R-15 for 24 in.	F-0.860	R-15 for 24 in.	F-1.020	R-7.5 for 12 in.			
<i>Opaque doors</i>									
Swinging	U-0.370		U-0.370		U-0.370				
Nonswinging	U-0.310		U-0.310		U-0.360				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-0.31	E&W-0.24, S-0.25, N-0.35		U-0.33	E&W-0.24, S-0.25, N-0.35		U-0.83		
Metal framing, Fixed	U-0.43 U-0.40	E&W-0.24, N&S-0.25	1.10 (for all types)	U-0.47 U-0.40	E&W-0.24, N&S-0.25	1.10 (for all types)	U-1.14 U-0.48	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.57 U-0.51	E&W-0.22, N&S-0.23		U-0.57 U-0.51	E&W-0.22, N&S-0.23		U-1.14 U-0.62		
Metal framing, Entrance door	U-0.73 U-0.65	E&W-0.22, N&S-0.23		U-0.65	E&W-0.22, N&S-0.23		U-0.73		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.52	<del>0.33</del> 0.29	NR	U-0.52	<del>0.33</del> 0.29	NR	<del>U-1.62</del> U-0.86	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-4 (Supersedes Table 5.5-4 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 4 (A,B,C)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.030	R-35 c.i.	U-0.030	R-35 c.i.	U-0.088	R-11 c.i.			
Metal building <sup>a</sup>	U-0.035	R-11 + R-19 c.i.	U-0.035	R-11 + R-19 c.i.	U-0.078	R-19 + R-6.5 c.i.			
<i>Attic and other roofs</i>	U-0.020	R-60	U-0.020	R-60	U-0.032	R-38			
<i>Walls, above grade</i>									
Mass	U-0.099	R-11.4 c.i.	U-0.086	R-13.3 c.i.	U-0.580	NR			
Metal building	U-0.057	R-11 + R-13 c.i.	U-0.048	R-11 + R-15.8 c.i.	U-0.154	R-19			
Steel framed	U-0.061	R-13 + R-12.5 c.i.	U-0.061	R-13 + R-12.5 c.i.	U-0.118	R-13 + R-3.8 c.i.			
Wood framed and other	U-0.061	R-13 + R-7.5 c.i.	U-0.061	R-13 + R-7.5 c.i.	U-0.085	R-13 + R-3.8 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.113	R-10.0 c.i.	C-0.087	R-12.5 c.i.	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.054	R-16.7 c.i.	U-0.048	R-18.7 c.i.	U-0.102	R-8.3 c.i.			
Steel joist	U-0.036	R-38	U-0.036	R-38	U-0.049	R-30			
Wood framed and other	U-0.031	R-38	U-0.031	R-38	U-0.048	R-30			
<i>Slab-on-grade floors</i>									
Unheated	F-0.494	R-20 for 48 in.	F-0.494	R-20 for 48 in.	F-0.730	NR			
Heated	F-0.801	R-20 for 48 in.	F-0.654	R-20 full slab	F-0.855	R-20 for 24 in.			
<i>Opaque doors</i>									
Swinging	U-0.352		U-0.352		U-0.352				
Nonswinging	U-0.295		U-0.295		U-0.342				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
		(for all frame types)			(for all frame types)			(for all frame types)	
Vertical glazing, 0% to 40% of wall									
Nonmetal framing (all)	U-0.29	E&W-0.34, S-0.36, N-0.46		U-0.29	E&W-0.34, S-0.36, N-0.46		U-0.48		
Metal framing, Fixed	U-0.36 U-0.34	E&W-0.34 N&S-0.36	1.10 (for all types)	U-0.36 U-0.34	E&W-0.34 N&S-0.36	1.10 (for all types)	U-0.69 U-0.48	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.44 U-0.43	E&W-0.31 N&S-0.33		U-0.44 U-0.43	E&W-0.31 N&S-0.33		U-0.77 U-0.62		
Metal framing, Entrance door	U-0.65 U-0.60	E&W-0.31 N&S-0.33		U-0.65 U-0.60	E&W-0.31 N&S-0.33		U-0.73		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.48	0.38	NR	U-0.48	0.38	NR	U-1.09 U-0.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).



**Table E-5 (Supersedes Table 5.5-5 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 5 (A,B,C)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.030	R-35 c.i.	U-0.030	R-35 c.i.	U-0.060	R-17 c.i.			
Metal building <sup>a</sup>	U-0.035	R-11 + R-19 c.i.	U-0.035	R-11 + R-19 c.i.	U-0.078	R-19 + R-6.5 c.i.			
<i>Attic and other roofs</i>	U-0.020	R-60	U-0.020	R-60	U-0.032	R-38			
<i>Walls, above grade</i>									
Mass	U-0.086	R-13.3 c.i.	U-0.076	R-15.0 c.i.	U-0.143	R-7.5 c.i.			
Metal building	U-0.048	R-11 + R-15.8 c.i.	U-0.048	R-11 + R-15.8 c.i.	U-0.089	R-11 + R-6.5 c.i.			
Steel framed	U-0.052	R-13 + R-12.5 c.i.	U-0.052	R-13 + R-12.5 c.i.	U-0.080	R-13 + R-5.0 c.i.			
Wood framed and other	U-0.048	R-13 + R-12.5 c.i.	U-0.048	R-13 + R-12.5 c.i.	U-0.085	R-13 + R-3.8 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.113	R-10.0 c.i.	C-0.087	R-12.5 c.i.	C-1.140	NR			
<i>Floors</i>									
Mass	U-0.054	R-16.7 c.i.	U-0.048	R-18.7 c.i.	U-0.102	R-8.3 c.i.			
Steel joist	U-0.036	R-38	U-0.036	R-38	U-0.049	R-30			
Wood framed and other	U-0.031	R-38	U-0.031	R-38	U-0.048	R-30			
<i>Slab-on-grade floors</i>									
Unheated	F-0.494	R-20 for 48 in.	F-0.485	R-20 for 48 in.	F-0.730	NR			
Heated	F-0.654	R-20 full slab	F-0.654	R-20 full slab	F-0.855	R-20 for 24 in.			
<i>Opaque doors</i>									
Swinging	U-0.352		U-0.352		U-0.352				
Nonswinging	U-0.295		U-0.295		U-0.342				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
		(for all frame types)			(for all frame types)			(for all frame types)	
Vertical glazing, 0% to 40% of wall									
Nonmetal framing, all	U-0.29	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-0.29	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-0.43		
Metal framing, Fixed	U-0.36 U-0.34	E&W-0.36, S-0.38, N-0.48		U-0.36 U-0.34	E&W-0.36, S-0.38, N-0.48		U-0.59 U-0.48	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.44 U-0.43	E&W-0.31, S-0.33, N-0.43		U-0.44 U-0.43	E&W-0.31, S-0.33, N-0.43		U-0.67 U-0.62		
Metal framing, Entrance door	U-0.65 U-0.60	E&W-0.31, S-0.33, N-0.43		U-0.65 U-0.60	E&W-0.31, S-0.33, N-0.43		U-0.73		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.48	0.38	NR	U-0.48	0.38	NR	U-0.93 U-0.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-6 (Supersedes Table 5.5-6 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 6 (A,B)\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	
<i>Roofs</i>									
Insulation entirely above deck	U-0.030	R-35 c.i.	U-0.030	R-35 c.i.	U-0.060	R-17 c.i.			
Metal building <sup>a</sup>	U-0.029	R-30 + R-11 <i>Ls</i>	U-0.028	R-10 + R-19 + R-13 c.i.	U-0.057	R-10 + R-10 + R-6.5 c.i.			
<i>Attic and other roofs</i>	U-0.020	R-60	U-0.020	R-60	U-0.032	R-38			
<i>Walls, above grade</i>									
Mass	U-0.076	R-15.0 c.i.	U-0.067	R-17.5 c.i.	U-0.143	R-7.5 c.i.			
Metal building	U-0.048	R-11 + R-15.8 c.i.	U-0.048	R-11 + R-15.8 c.i.	U-0.089	R-11 + R-6.5 c.i.			
Steel framed	U-0.047	R-13 + R-15.6 c.i.	U-0.047	R-13 + R-15.6 c.i.	U-0.080	R-13 + R-5 c.i.			
Wood framed and other	U-0.048	R-13 + R-12.5 c.i.	U-0.048	R-13 + R-12.5 c.i.	U-0.085	R-13 + R-3.8 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.087	R-12.5 c.i.	C-0.060	R-17.5 c.i.	C-0.113	R-10.0 c.i.			
<i>Floors</i>									
Mass	U-0.048	R-18.7 c.i.	U-0.048	R-18.7 c.i.	U-0.083	R-10 c.i.			
Steel joist	U-0.030	R-49.0	U-0.030	R-49	U-0.049	R-30			
Wood framed and other	U-0.026	R-38+ R-7.5 c.i.	U-0.026	R-38 + R-7.5 c.i.	U-0.048	R-30			
<i>Slab-on-grade floors</i>									
Unheated	F-0.485	R-20 for 48 in.	F-0.412	R-15 full slab	F-0.730	NR			
Heated	F-0.654	R-20 full slab	F-0.637	R-20 full slab	F-0.817	R-20 for 48 in.			
<i>Opaque doors</i>									
Swinging	U-0.352		U-0.352		U-0.352				
Nonswinging	U-0.295		U-0.295		U-0.342				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
		(for all frame types)			(for all frame types)			(for all frame types)	
Vertical glazing, 0% to 40% of wall									
Nonmetal framing (all)	U-0.29	E&W-0.38, S-0.40, N-0.50		U-0.29	E&W-0.38, S-0.40, N-0.50		U-0.43		
Metal framing, Fixed	U-0.34 U-0.32	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-0.34 U-0.32	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-0.48 U-0.37	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.43 U-0.40	E&W-0.32, S-0.34, N-0.44		U-0.43 U-0.40	E&W-0.32, S-0.34, N-0.44		U-0.56 U-0.46		
Metal framing, Entrance door	U-0.65 U-0.60	E&W-0.32, S-0.34, N-0.44		U-0.65 U-0.60	E&W-0.32, S-0.34, N-0.44		U-0.73 U-0.65		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.48 U-0.45	0.38	NR	U-0.48	0.38	NR	U-0.81 U-0.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; *Ls* = liner system (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.4); E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-7 (Supersedes Table 5.5-7 in ANSI/ASHRAE/IES Standard 90.1)**  
**Example Building Envelope Requirements- Compliance Values for Climate Zone 7\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	
<i>Roofs</i>									
Insulation entirely above deck	U-0.027	R-40 c.i.	U-0.027	R-40 c.i.	U-0.037	R-26 c.i.			
Metal building <sup>a</sup>	U-0.028	R-10 + R19 + R-13 c.i.	U-0.028	R-10 + R19 + R-13 c.i.	U-0.035	R-11 + R-19 c.i.			
Attic and other roofs	U-0.016	R-71	U-0.016	R-71	U-0.026	R-49			
<i>Walls, above grade</i>									
Mass	U-0.067	R-17.5 c.i.	U-0.067	R-17.5 c.i.	U-0.117	R-9.5 c.i.			
Metal building	U-0.042	R-11 + R-19 c.i.	U-0.042	R-11 + R-19 c.i.	U-0.068	R-11 + R-9.8 c.i.			
Steel framed	U-0.047	R-13 + R-15.6 c.i.	U-0.040	R-13 + R-18.8 c.i.	U-0.061	R-13 + R-12.5 c.i.			
Wood framed and other	U-0.048	R-13 + R-12.5 c.i.	U-0.048	R-13 + R-12.5 c.i.	U-0.061	R-13 + R-7.5 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.060	R-17.5 c.i.	C-0.060	R-17.5 c.i.	C-0.113	R-10.0 c.i.			
<i>Floors</i>									
Mass	U-0.040	R-23 c.i.	U-0.040	R-23 c.i.	U-0.070	R-12.5 c.i.			
Steel joist	U-0.030	R-49	U-0.030	R-49	U-0.049	R-30			
Wood framed and other	U-0.026	R-38+ R-7.5 c.i.	U-0.026	R-38 + R-7.5 c.i.	U-0.048	R-30			
<i>Slab-on-grade floors</i>									
Unheated	F-0.485	R-20 for 48 in.	F-0.412	R-15 full slab	F-0.730	NR			
Heated	F-0.637	R-20 full slab	F-0.637	R-20 full slab	F-0.817	R-20 for 48 in.			
<i>Opaque doors</i>									
Swinging	U-0.352		U-0.352		U-0.352				
Nonswinging	U-0.295		U-0.295		U-0.295				
<b>Fenestration</b>									
	<b>Assembly Max. U</b>	<b>Assembly Max. SHGC</b>	<b>Assembly Min. VT/SHGC</b>	<b>Assembly Max. U</b>	<b>Assembly Max. SHGC</b>	<b>Assembly Min. VT/SHGC</b>	<b>Assembly Max. U</b>	<b>Assembly Max. SHGC</b>	<b>Assembly Min. VT/SHGC</b>
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-0.27	E&W-0.43, S-0.45, N-0.55		U-0.27	E&W-0.43, S-0.45, N-0.55		U-0.30		
Metal framing, Fixed	U-0.31 U-0.28	E&W-0.38, S-0.40, N-0.50	1.10 (for all types)	U-0.31 U-0.28	E&W-0.38, S-0.40, N-0.50	1.10 (for all types)	U-0.36 U-0.34	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.38 U-0.34	E&W-0.34, S-0.36, N-0.46		U-0.38 U-0.34	E&W-0.34, S-0.36, N-0.46		U-0.42		
Metal framing, Entrance door	U-0.65 U-0.60	E&W-0.34, S-0.36, N-0.46		U-0.65 U-0.60	E&W-0.34, S-0.36, N-0.46		U-0.73 U-0.60		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.48 U-0.42	NR	NR	U-0.48 U-0.42	NR	NR	U-0.81 U-0.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-8 (Supersedes Table 5.5-8 in ANSI/ASHRAE/IES Standard 90.1)**  
**Example Building Envelope Requirements- Compliance Values for Climate Zone 8\* (I-P)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.027	R-40 c.i.	U-0.027	R-40 c.i.	U-0.037	R-26 c.i.			
Metal building <sup>a</sup>	U-0.025	R-19 + R-19 + R-25 c.i.	U-0.025	R-19 + R-19 + R-25 c.i.	U-0.035	R-11 + R-19 c.i.			
<i>Attic and other roofs</i>	U-0.016	R-71	U-0.016	R-71	U-0.026	R-49			
<i>Walls, above grade</i>									
Mass	U-0.046	R-21.0 c.i.	U-0.046	R-21.0 c.i.	U-0.099	R-11.4 c.i.			
Metal building	U-0.037	R-11 + R-22.1 c.i.	U-0.037	R-11 + R-22.1 c.i.	U-0.057	R-11 + R-13 c.i.			
Steel framed	U-0.035	R-13 + R-21.9 c.i.	U-0.035	R-13 + R-21.9 c.i.	U-0.061	R-13 + R-12.5 c.i.			
Wood framed and other	U-0.030	R-13 + R-21.9 c.i.	U-0.030	R-13 + R-21.9 c.i.	U-0.048	R-13 + R-12.5 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.060	R-17.5 c.i.	C-0.060	R-17.5 c.i.	C-0.113	R-10.0 c.i.			
<i>Floors</i>									
Mass	U-0.036	R-25.1 c.i.	U-0.036	R-25.1 c.i.	U-0.061	R-14.6 c.i.			
Steel joist	U-0.030	R-49	U-0.030	R-49	U-0.049	R-30			
Wood framed and other	U-0.026	R-38+ R-7.5 c.i.	U-0.026	R-38 + R-7.5 c.i.	U-0.031	R-38			
<i>Slab-on-grade floors</i>									
Unheated	F-0.412	R-15 full slab	F-0.403	R-15 full slab	F-0.513	R-20 for 24 in.			
Heated	F-0.637	R-20 full slab	F-0.354	R-25 full slab	F-0.817	R-20 for 48 in.			
<i>Opaque doors</i>									
Swinging	U-0.352		U-0.352		U-0.352				
Nonswinging	U-0.295		U-0.295		U-0.295				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
	(for all frame types)			(for all frame types)			(for all frame types)		
Vertical glazing, 0% to 40% of wall									
Nonmetal framing (all)	U-0.24	E&W-0.43, S-0.45, N-0.55		U-0.24	E&W-0.43, S-0.45, N-0.55		U-0.30		
Metal framing, Fixed	U-0.28 U-0.25	E&W-0.38, S-0.40, N-0.50	1.10 (for all types)	U-0.28 U-0.25	E&W-0.38, S-0.40, N-0.50	1.10 (for all types)	U-0.36 U-0.34	NR (for all types)	NR (for all types)
Metal framing, Operable	U-0.33 U-0.30	E&W-0.34, S-0.36, N-0.46		U-0.33 U-0.30	E&W-0.34, S-0.36, N-0.46		U-0.42		
Metal framing, Entrance door	U-0.65 U-0.60	E&W-0.34, S-0.36, N-0.46		U-0.65 U-0.60	E&W-0.34, S-0.36, N-0.46		U-0.73 U-0.60		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-0.39	NR	NR	U-0.39	NR	NR	U-0.81 U-0.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-0 (Supersedes Table 5.5-0 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 0 (A,B)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.222	R-4.4 c.i.	U-0.184	R-5.3 c.i.	U-1.240	R-0.7 c.i.			
Metal building <sup>a</sup>	U-0.233	R-1.8 + R-3.3 FC	U-0.233	R-1.8 + R-3.3 FC	U-0.653	R-1.8			
<i>Attic and other roofs</i>	U-0.153	R-6.7	U-0.153	R-6.7	U-0.459	R-2.3			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-3.293	NR	U-0.857	R-1.0 c.i.	U-3.293	NR			
Metal building	U-0.533	R-0 + R-1.7 ci	U-0.533	R-0 + R-1.7 ci	U-1.998	NR			
Steel framed	U-0.705	R-2.3	U-0.705	R-2.3	U-1.998	NR			
Wood framed and other	U-0.504	R-2.3	U-0.504	R-2.3	U-1.660	NR			
<i>Wall, below grade</i>									
Below-grade wall	C-6.473	NR	C-6.473	NR	C-6.473	NR			
<i>Floors</i>									
Mass	U-1.825	NR	U-1.825	NR	U-1.825	NR			
Steel joist	U-1.986	NR	U-1.986	NR	U-1.986	NR			
Wood framed and other	U-1.599	NR	U-1.599	NR	U-1.599	NR			
<i>Slab-on-grade floors</i>									
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR			
Heated	F-1.766	R-1.3 for 300 mm	F-1.766	R-1.3 for 300 mm	F-1.766	R-1.3 for 300 mm			
<i>Opaque doors</i>									
Swinging	U-2.101		U-2.101		U-3.975				
Nonswinging	U-1.760		U-1.760		U-8.233				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing, all	U-1.73	E&W-0.21, N&S-0.22		U-1.73	E&W-0.21, N&S-0.22		U-5.02		
Metal framing, Fixed	U-2.70	E&W-0.21, N&S-0.22	1.10 (for all types)	U-2.70	E&W-0.21, N&S-0.22	1.10 (for all types)	U-6.48	NR	NR
Metal framing, Operable	U-3.51 U-3.34	E&W-0.19, N&S-0.20		U-3.51 U-3.34	E&W-0.19, N&S-0.20		U-6.48		
Metal framing, Entrance door	U-4.48	E&W-0.19, N&S-0.20		U-4.48	E&W-0.19, N&S-0.20		U-5.94		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-4.05 U-3.77	0.33 0.29	NR	U-4.05 U-3.77	0.33 0.29	NR	U-9.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-1 (Supersedes Table 5.5-1 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 1 (A,B)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.273	R-3.5 c.i.	U-0.220	R-4.4 c.i.	U-1.240	R-0.7 c.i.			
Metal building <sup>a</sup>	U-0.233	R-1.8 + R-3.3 FC	U-0.233	R-1.8 + R-3.3 FC	U-0.653	R-1.8			
Attic and other roofs	U-0.153	R-6.7	U-0.153	R-6.7	U-0.459	R-2.3			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-3.293	NR	U-0.857	R-1.0 c.i.	U-3.293	NR			
Metal building	U-0.533	R-0 + R-1.7 c.i.	U-0.533	R-0 + R-1.7 c.i.	U-1.998	NR			
Steel framed	U-0.705	R-2.3	U-0.705	R-2.3	U-1.998	NR			
Wood framed and other	U-0.504	R-2.3	U-0.504	R-2.3	U-1.660	NR			
<i>Wall, below grade</i>									
Below-grade wall	C-6.473	NR	C-6.473	NR	C-6.473	NR			
<i>Floors</i>									
Mass	U-1.825	NR	U-1.825	NR	U-1.825	NR			
Steel joist	U-1.986	NR	U-1.986	NR	U-1.986	NR			
Wood framed and other	U-1.599	NR	U-1.599	NR	U-1.599	NR			
<i>Slab-on-grade floors</i>									
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR			
Heated	F-1.766	R-1.3 for 300 mm	F-1.766	R-1.3 for 300 mm	F-1.766	R-1.3 for 300 mm			
<i>Opaque doors</i>									
Swinging	U-2.101		U-2.101		U-3.975				
Nonswinging	U-1.760		U-1.760		U-8.233				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-2.70	E&W-0.24, S-0.25, N-0.35		U-2.70	E&W-0.24, S-0.25, N-0.35		U-5.02		
Metal framing, Fixed	U-3.08 U-2.70	E&W-0.22, N&S-0.23	1.10 (for all types)	U-3.08 U-2.70	E&W-0.22, N&S-0.23	1.10 (for all types)	U-6.48	NR (for all types)	NR (for all types)
Metal framing, Operable	U-3.51 U-3.34	E&W-0.20, N&S-0.21		U-3.51 U-3.34	E&W-0.20, N&S-0.21		U-6.48		
Metal framing, Entrance door	U-5.94 U-4.47	E&W-0.20, N&S-0.21		U-5.94 U-4.47	E&W-0.20, N&S-0.21		U-5.94		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-4.05 U-3.77	0.33 0.29	NR	U-4.05 U-3.77	0.33 0.29	NR	U-9.71	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-2 (Supersedes Table 5.5-2 in ANSI/ASHRAE/IES Standard 90.1)**  
**Building Envelope Requirements for Climate Zone 2 (A,B)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.220	R-4.4 c.i.	U-0.220	R-4.4 c.i.	U-0.982	R-0.9 c.i.			
Metal building <sup>a</sup>	U-0.233	R-1.8 + R-3.3 FC	U-0.233	R-1.8 + R-3.3 FC	U-0.545	R-2.8			
<i>Attic and other roofs</i>	U-0.153	R-6.7	U-0.153	R-6.7	U-0.300	R-3.3			
<i>Walls, above grade</i>									
Mass <sup>b</sup>	U-0.857	R-1.0 c.i.	U-0.701	R-1.3 c.i.	U-3.293	NR			
Metal building	U-0.533	R-0 + R-1.7 c.i.	U-0.533	R-0 + R-1.7 c.i.	U-0.920	R-2.3			
Steel framed	U-0.479	R-2.3 + R-0.7 c.i.	U-0.365	R-2.3 + R-1.3 c.i.	U-0.705	R-2.3			
Wood framed and other	U-0.504	R-2.3	U-0.504	R-2.3	U-0.504	R-2.3			
<i>Wall, below grade</i>									
Below-grade wall	C-6.473	NR	C-6.473	NR	C-6.473	NR			
<i>Floors</i>									
Mass	U-0.606	R-1.1	U-0.496	R-1.5	U-1.825	NR			
Steel joist	U-0.214	R-5.3	U-0.214	R-5.3	U-0.390	R-2.3			
Wood framed and other	U-0.188	R-5.3	U-0.188	R-5.3	U-0.376	R-2.3			
<i>Slab-on-grade floors</i>									
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR			
Heated	F-1.558	R-1.8 for 600 mm	F-1.489	R-2.6 for 600 mm	F-1.766	R-1.3 for 300 mm			
<i>Opaque doors</i>									
Swinging	U-2.101		U-2.101		U-3.975				
Nonswinging	U-1.760		U-1.760		U-8.233				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
<del>Nonmetal framing (all)</del>	<del>U-2.00</del>	<del>E&amp;W-0.24, S-0.25, N-0.35</del>		<del>U-2.00</del>	<del>E&amp;W-0.24, S-0.25, N-0.35</del>		<del>U-5.02</del>		
<del>Metal framing, Fixed</del>	<del>U-2.91</del> <del>U-2.43</del>	<del>E&amp;W-0.24, N&amp;S-0.25</del>	1.10 (for all types)	<del>U-2.91</del> <del>U-2.43</del>	<del>E&amp;W-0.24, N&amp;S-0.25</del>	1.10 (for all types)	<del>U-6.48</del> <del>U-2.70</del>	NR (for all types)	NR (for all types)
<del>Metal framing, Operable</del>	<del>U-3.51</del> <del>U-3.23</del>	<del>E&amp;W-0.22, N&amp;S-0.23</del>		<del>U-3.51</del> <del>U-3.23</del>	<del>E&amp;W-0.22, N&amp;S-0.23</del>		<del>U-6.48</del> <del>U-3.50</del>		
<del>Metal framing, Entrance door</del>	<del>U-4.48</del> <del>U-4.15</del>	<del>E&amp;W-0.22, N&amp;S-0.23</del>		<del>U-4.15</del>	<del>E&amp;W-0.22, N&amp;S-0.23</del>		<del>U-4.48</del> <del>U-4.15</del>		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-3.51	<u>0.33</u> <u>0.29</u>	NR	U-3.51	<u>0.33</u> <u>0.29</u>	NR	<u>U-9.71</u> <u>U-4.85</u>	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

b. Exception applies for mass walls above grade where the requirement is for a maximum assembly U-0.151 (see ANSI/ASHRAE/IES Standard 90.1, Section 5.5.3.2).

**Table E-3 (Supersedes Table 5.5-3 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 3 (A,B,C)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.220	R-4.4 c.i.	U-0.220	R-4.4 c.i.	U-0.677	R-1.3 c.i.			
Metal building <sup>a</sup>	U-0.233	R-1.8 + R-3.3 FC	U-0.233	R-1.8 + R-3.3 FC	U-0.545	R-2.8			
<i>Attic and other roofs</i>	U-0.153	R-6.7	U-0.153	R-6.7	U-0.300	R-3.3			
<i>Walls, above grade</i>									
Mass	U-0.701	R-1.3 c.i.	U-0.592	R-1.7 c.i.	U-3.293	NR			
Metal building	U-0.533	R-0 + R-1.7 c.i.	U-0.409	R-0 + R-2.3 c.i.	U-0.920	R-2.3			
Steel framed	U-0.435	R-2.3 + R-0.9 c.i.	U-0.365	R-2.3 + R-1.3 c.i.	U-0.705	R-2.3			
Wood framed and other	U-0.504	R-2.3	U-0.365	R-2.3 + R-0.7 c.i.	U-0.504	R-2.3			
<i>Wall, below grade</i>									
Below-grade wall	C-6.473	NR	C-6.473	NR	C-6.473	NR			
<i>Floors</i>									
Mass	U-0.420	R-1.8 c.i.	U-0.420	R-1.8 c.i.	U-0.780	R-0.7 c.i.			
Steel joist	U-0.214	R-5.3	U-0.214	R-5.3	U-0.296	R-3.3			
Wood framed and other	U-0.188	R-5.3	U-0.188	R-5.3	U-0.288	R-3.3			
<i>Slab-on-grade floors</i>									
Unheated	F-1.264	NR	F-0.935	R-1.8 for 600 mm	F-1.264	NR			
Heated	F-1.489	R-2.6 for 600 mm	F-1.489	R-2.6 for 600 mm	F-1.766	R-1.3 for 300 mm			
<i>Opaque doors</i>									
Swinging	U-2.101		U-2.101		U-2.101				
Nonswinging	U-1.760		U-1.760		U-2.044				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing, all	U-1.78	E&W-0.24, S-0.25, N-0.35		U-1.89	E&W-0.24, S-0.25, N-0.35		U-4.69		
Metal framing, Fixed	U-2.43 U-2.26	E&W-0.24, N&S-0.25	1.10 (for all types)	U-2.64 U-2.26	E&W-0.24, N&S-0.25	1.10 (for all types)	U-6.48 U-2.70	NR (for all types)	NR (for all types)
Metal framing, Operable	U-3.24 U-2.91	E&W-0.22, N&S-0.23		U-3.24 U-2.91	E&W-0.22, N&S-0.23		U-6.48 U-3.50		
Metal framing, Entrance door	U-4.15 U-3.67	E&W-0.22, N&S-0.23		U-3.67	E&W-0.22, N&S-0.23		U-4.15		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.97	0.33 0.29	NR	U-2.97	0.33 0.29	NR	U-9.17 U-4.85	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; FC = filled cavity (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.5); E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).



**Table E-4 (Supersedes Table 5.5-4 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 4 (A,B,C)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.173	R-6.2 c.i.	U-0.173	R-6.2 c.i.	U-0.502	R-1.9 c.i.			
Metal building <sup>a</sup>	U-0.200	R-1.9 + R-3.3 c.i.	U-0.200	R-1.9 + R-3.3 c.i.	U-0.442	R-3.3 + R-1.1 c.i.			
<i>Attic and other roofs</i>	U-0.113	R-10.6	U-0.113	R-10.6	U-0.183	R-6.7			
<i>Walls, above grade</i>									
Mass	U-0.561	R-2.0 c.i.	U-0.486	R-2.3 c.i.	U-3.294	NR			
Metal building	U-0.324	R-1.9 + R-2.3 c.i.	U-0.270	R-1.9 + R-2.8 c.i.	U-0.874	R-3.3			
Steel framed	U-0.345	R-2.3 + R-2.2 c.i.	U-0.345	R-2.3 + R-2.2 c.i.	U-0.669	R-2.3+ R-0.7 c.i.			
Wood framed and other	U-0.345	R-2.3 + R-1.3 c.i.	U-0.345	R-2.3 + R-1.3 c.i.	U-0.480	R-2.3+ R-0.7 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.642	R-1.8 c.i.	C-0.496	R-2.2 c.i.	C-6.475	NR			
<i>Floors</i>									
Mass	U-0.308	R-2.9 c.i.	U-0.275	R-3.3 c.i.	U-0.577	R-1.5 c.i.			
Steel joist	U-0.205	R-6.7	U-0.205	R-6.7	U-0.281	R-5.3			
Wood framed and other	U-0.178	R-6.7	U-0.178	R-6.7	U-0.275	R-5.3			
<i>Slab-on-grade floors</i>									
Unheated	F-0.855	R-3.5 for 1200 mm	F-0.855	R-3.5 for 1200 mm	F-1.264	NR			
Heated	F-1.386	R-3.5 for 1200 mm	F-1.131	R-3.5 full slab	F-1.480	R-3.5 for 600 mm			
<i>Opaque doors</i>									
Swinging	U-1.997		U-1.997		U-1.997				
Nonswinging	U-1.673		U-1.673		U-1.943				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
		(for all frame types)			(for all frame types)			(for all frame types)	
Vertical glazing, 0% to 40% of wall									
Nonmetal framing, all	U-1.67	E&W-0.34, S-0.36, N-0.46		U-1.67	E&W-0.34, S-0.36, N-0.46		U-2.75		
Metal framing, Fixed	U-2.05 U-1.94	E&W-0.34, N&S-0.36	1.10 (for all types)	U-2.05 U-1.94	E&W-0.34, N&S-0.36	1.10 (for all types)	U-3.94 U-2.70	NR (for all types)	NR (for all types)
Metal framing, Operable	U-2.48 U-2.43	E&W-0.31, N&S-0.33		U-2.48 U-2.43	E&W-0.31, N&S-0.33		U-4.37 U-3.50		
Metal framing, Entrance door	U-3.67 U-3.40	E&W-0.31, N&S-0.33		U-3.67 U-3.40	E&W-0.31, N&S-0.33		U-4.15		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.70	0.38	NR	U-2.70	0.38	NR	U-6.21 U-4.04	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, N&S = north and south oriented (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-5 (Supersedes Table 5.5-5 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements—Compliance Values for Climate Zone 5 (A, B, C)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.173	R-6.2 c.i.	U-0.173	R-6.2 c.i.	U-0.340	R-3.0 c.i.			
Metal building <sup>a</sup>	U-0.200	R-1.9 + R-3.3 c.i.	U-0.200	R-1.9 + R-3.3 c.i.	U-0.442	R-3.3 + R-1.1 c.i.			
<i>Attic and other roofs</i>	U-0.113	R-10.6	U-0.113	R-10.6	U-0.183	R-6.7			
<i>Walls, above grade</i>									
Mass	U-0.486	R-2.3 c.i.	U-0.432	R-2.6 c.i.	U-0.815	R-1.3 c.i.			
Metal building	U-0.270	R-1.9 + R-2.8 c.i.	U-0.270	R-1.9 + R-2.8 c.i.	U-0.507	R-1.9 + R-1.1 c.i.			
Steel framed	U-0.297	R-2.3 + R-2.2 c.i.	U-0.297	R-2.3 + R-2.2 c.i.	U-0.453	R-2.3 + R-0.9 c.i.			
Wood framed and other	U-0.275	R-2.3 + R-2.2 c.i.	U-0.275	R-2.3 + R-2.2 c.i.	U-0.480	R-2.3 + R-0.7 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.642	R-1.8 c.i.	C-0.496	R-2.2 c.i.	C-6.475	NR			
<i>Floors</i>									
Mass	U-0.308	R-2.9 c.i.	U-0.275	R-3.3 c.i.	U-0.577	R-1.5 c.i.			
Steel joist	U-0.205	R-6.7	U-0.205	R-6.7	U-0.281	R-5.3			
Wood framed and other	U-0.178	R-6.7	U-0.178	R-6.7	U-0.275	R-5.3			
<i>Slab-on-grade floors</i>									
Unheated	F-0.855	R-3.5 for 1200 mm	F-0.839	R-3.5 for 1200 mm	F-1.264	NR			
Heated	F-1.131	R-3.5 full slab	F-1.131	R-3.5 full slab	F-1.480	R-3.5 for 600 mm			
<i>Opaque doors</i>									
Swinging	U-1.997		U-1.997		U-1.997				
Nonswinging	U-1.673		U-1.673		U-1.943				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-1.67	E&W-0.36, S-0.38, N-0.48		U-1.67	E&W-0.36, S-0.38, N-0.48		U-2.43		
Metal framing, fixed	U-2.05 U-1.94	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-2.05 U-1.94	E&W-0.36, S-0.38, N-0.48	1.10 (for all types)	U-3.35 U-2.70	NR (for all types)	NR (for all types)
Metal framing, operable	U-2.48 U-2.43	E&W-0.31, S-0.33, N-0.43		U-2.48 U-2.43	E&W-0.31, S-0.33, N-0.43		U-3.78 U-3.50		
Metal framing, entrance door	U-3.67 U-3.40	E&W-0.31, S-0.33, N-0.43		U-3.67 U-3.40	E&W-0.31, S-0.33, N-0.43		U-4.15		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.70	0.38	NR	U-2.70	0.38	NR	U-5.29 U-4.04	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-6 (Supersedes Table 5.5-6 in ANSI/ASHRAE/IES Standard 90.1)**

**Example Building Envelope Requirements- Compliance Values for Climate Zone 6 (A,B)\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.173	R-6.2 c.i.	U-0.173	R-6.2 c.i.	U-0.340	R-3.0 c.i.			
Metal building <sup>a</sup>	U-0.167	R-5.3 + R-1.9 <i>Ls</i>	U-0.156	R-1.8 + R-3.3 + R-2.3 c.i.	U-0.324	R-1.8 + R-1.8 + R-1.1 c.i.			
<i>Attic and other roofs</i>	U-0.113	R-10.6	U-0.113	R-10.6	U-0.183	R-6.7			
<i>Walls, above grade</i>									
Mass	U-0.432	R-2.6 c.i.	U-0.383	R-3.1 c.i.	U-0.815	R-1.3 c.i.			
Metal building	U-0.270	R-1.9 + R-2.8 c.i.	U-0.270	R-1.9 + R-2.8 c.i.	U-0.507	R-1.9 + R-1.1 c.i.			
Steel framed	U-0.264	R-2.3 + R-2.7 c.i.	U-0.264	R-2.3 + R-2.7 c.i.	U-0.453	R-2.3+ R-0.9 c.i.			
Wood framed and other	U-0.275	R-2.3 + R-2.2 c.i.	U-0.275	R-2.3 + R-2.2 c.i.	U-0.480	R-2.3+ R-0.7 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.496	R-2.2 c.i.	C-0.340	R-3.1 c.i.	C-0.642	R-1.8 c.i.			
<i>Floors</i>									
Mass	U-0.275	R-3.3 c.i.	U-0.275	R-3.3 c.i.	U-0.469	R-1.8 c.i.			
Steel joist	U-0.173	R-8.6	U-0.173	R-8.6	U-0.281	R-5.3			
Wood framed and other	U-0.146	R-6.7+ R-1.3 c.i.	U-0.146	R-6.7 + R-1.3 c.i.	U-0.275	R-5.3			
<i>Slab-on-grade floors</i>									
Unheated	F-0.839	R-3.5 for 1200 mm	F-0.714	R-2.6 full slab	F-1.264	NR			
Heated	F-1.131	R-3.5 full slab	F-1.103	R-3.5 full slab	F-1.414	R-3.5 for 1200 mm			
<i>Opaque doors</i>									
Swinging	U-1.997		U-1.997		U-1.997				
Nonswinging	U-1.673		U-1.673		U-1.943				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-1.62	E&W-0.38; S-0.40; N-0.50		U-1.62	E&W-0.38; S-0.40; N-0.50		U-2.43		
Metal framing, fixed	U-1.94 U-1.83	E&W-0.36; S-0.38; N-0.48	1.10 (for all types)	U-1.94 U-1.83	E&W-0.36; S-0.38; N-0.48	1.10 (for all types)	U-2.75 U-2.10	NR (for all types)	NR (for all types)
Metal framing, operable	U-2.43 U-2.26	E&W-0.32; S-0.34; N-0.44		U-2.43 U-2.26	E&W-0.32; S-0.34; N-0.44		U-3.18 U-2.59		
Metal framing, entrance door	U-3.67 U-3.40	E&W-0.32; S-0.34; N-0.44		U-3.67 U-3.40	E&W-0.32; S-0.34; N-0.44		U-4.15 U-3.67		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.70 U-2.53	0.38	NR	U-2.70	0.38	NR	U-4.59 U-4.04	NR	NR

\* The following definitions apply: c.i. = continuous insulation (ANSI/ASHRAE/IES Standard 90.1, see Section 3.2); NR = no (insulation) requirement; *Ls* = liner system (see ANSI/ASHRAE/IES Standard 90.1, Section A2.3.2.4) E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-7 (Supersedes Table 5.5-7 in ANSI/ASHRAE/IES Standard 90.1)**  
**Example Building Envelope Requirements—Compliance Values for Climate Zone 7\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.151	R-7.0 c.i.	U-0.151	R-7.0 c.i.	U-0.210	R-4.6 c.i.			
Metal building <sup>a</sup>	U-0.156	R-1.8 + R-3.3 + R-2.3 c.i.	U-0.156	R-1.8 + R-3.3 + R-2.3 c.i.	U-0.200	R-1.9 + R-3.3 c.i.			
Attic and other roofs	U-0.092	R-12.5	U-0.092	R-12.5	U-0.146	R-8.6			
<i>Walls, above grade</i>									
Mass	U-0.383	R-3.1 c.i.	U-0.383	R-3.1 c.i.	U-0.664	R-1.7 c.i.			
Metal building	U-0.237	R-1.9 + R-3.3 c.i.	U-0.237	R-1.9 + R-3.3 c.i.	U-0.389	R-1.9 + R-1.7 c.i.			
Steel framed	U-0.264	R-2.3 + R-2.7 c.i.	U-0.227	R-2.3 + R-3.3 c.i.	U-0.345	R-2.3 + R-2.2 c.i.			
Wood framed and other	U-0.275	R-2.3 + R-2.2 c.i.	U-0.275	R-2.3 + R-2.2 c.i.	U-0.345	R-2.3 + R-1.3 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.340	R-3.1 c.i.	C-0.340	R-3.1 c.i.	C-0.642	R-1.8 c.i.			
<i>Floors</i>									
Mass	U-0.227	R-4.1 c.i.	U-0.227	R-4.1 c.i.	U-0.399	R-2.2 c.i.			
Steel joist	U-0.173	R-8.6	U-0.173	R-8.6	U-0.281	R-5.3			
Wood framed and other	U-0.146	R-6.7 + R-1.3 c.i.	U-0.146	R-6.7 + R-1.3 c.i.	U-0.275	R-5.3			
<i>Slab-on-grade floors</i>									
Unheated	F-0.839	R-3.5 for 1200 mm	F-0.714	R-2.6 full slab	F-1.264	NR			
Heated	F-1.103	R-3.5 full slab	F-1.103	R-3.5 full slab	F-1.414	R-3.5 for 1200 mm			
<i>Opaque doors</i>									
Swinging	U-1.997		U-1.997		U-1.997				
Nonswinging	U-1.673		U-1.673		U-1.673				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-1.51	E&W 0.43, S 0.45, N 0.55		U-1.51	E&W 0.43, S 0.45, N 0.55		U-1.73		
Metal framing, Fixed	U-1.78 U-1.56	E&W 0.38, S 0.40, N 0.50	1.10 (for all types)	U-1.78 U-1.40	E&W 0.38, S 0.40, N 0.50	1.10 (for all types)	U-2.05 U-1.94	NR (for all types)	NR (for all types)
Metal framing, Operable	U-2.16 U-1.94	E&W 0.34, S 0.36, N 0.46		U-2.16 U-1.73	E&W 0.34, S 0.36, N 0.46		U-2.37		
Metal framing, Entrance door	U-3.67 U-3.40	E&W 0.34, S 0.36, N 0.46		U-3.67 U-3.40	E&W 0.34, S 0.36, N 0.46		U-4.15 U-3.40		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.70 U-2.37	NR	NR	U-2.70 U-2.37	NR	NR	U-4.59 U-4.04	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**Table E-8 (Supersedes Table 5.5-8 in ANSI/ASHRAE/IES Standard 90.1)**  
**Example Building Envelope Requirements—Compliance Values for Climate Zone 8\* (SI)**

Opaque Elements	Nonresidential		Residential		Semiheated				
	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**	Assembly Maximum	Insulation Min. R-Value**			
<i>Roofs</i>									
Insulation entirely above deck	U-0.151	R-7.0 c.i.	U-0.151	R-7.0 c.i.	U-0.210	R-4.6 c.i.			
Metal building <sup>a</sup>	U-0.140	R-3.3 + R-3.3 + R-4.4 c.i.	U-0.140	R-3.3 + R-3.3 + R-4.4 c.i.	U-0.200	R-1.9 + R-3.3 c.i.			
Attic and other roofs	U-0.092	R-12.5	U-0.092	R-12.5	U-0.146	R-8.6			
<i>Walls, above grade</i>									
Mass	U-0.259	R-3.7 c.i.	U-0.259	R-3.7 c.i.	U-0.561	R-2.0 c.i.			
Metal building	U-0.210	R-1.9 + R-3.9 c.i.	U-0.210	R-1.9 + R-3.9 c.i.	U-0.324	R-1.9 + R-2.3 c.i.			
Steel framed	U-0.200	R-2.3 + R-3.9 c.i.	U-0.200	R-2.3 + R-3.9 c.i.	U-0.345	R-2.3 + R-2.2 c.i.			
Wood framed and other	U-0.173	R-2.3 + R-3.9 c.i.	U-0.173	R-2.3 + R-3.9 c.i.	U-0.275	R-2.3 + R-2.2 c.i.			
<i>Wall, below grade</i>									
Below-grade wall	C-0.340	R-3.1 c.i.	C-0.340	R-3.1 c.i.	C-0.642	R-1.8 c.i.			
<i>Floors</i>									
Mass	U-0.205	R-4.4 c.i.	U-0.205	R-4.4 c.i.	U-0.345	R-2.6 c.i.			
Steel joist	U-0.173	R-8.6	U-0.173	R-8.6	U-0.281	R-5.3			
Wood framed and other	U-0.146	R-6.7 + R-1.3 c.i.	U-0.146	R-6.7 + R-1.3 c.i.	U-0.178	R-6.7			
<i>Slab-on-grade floors</i>									
Unheated	F-0.714	R-2.6 full slab	F-0.697	R-2.6 full slab	F-0.888	R-3.5 for 600 mm			
Heated	F-1.103	R-3.5 full slab	F-0.613	R-4.4 full slab	F-1.414	R-3.5 for 1200 mm			
<i>Opaque doors</i>									
Swinging	U-1.997		U-1.997		U-1.997				
Nonswinging	U-1.673		U-1.673		U-1.673				
Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical glazing, 0% to 40% of wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing (all)	U-1.35	E&W 0.43, S 0.45, N 0.55		U-1.35	E&W 0.43, S 0.45, N 0.55		U-1.73		
Metal framing, fixed	U-1.56 U-1.40	E&W 0.38, S 0.40, N 0.50	1.10 (for all types)	U-1.56 U-1.40	E&W 0.38, S 0.40, N 0.50	1.10 (for all types)	U-2.05 U-1.94	NR (for all types)	NR (for all types)
Metal framing, operable	U-1.89 U-1.73	E&W 0.34, S 0.36, N 0.46		U-1.89 U-1.73	E&W 0.34, S 0.36, N 0.46		U-2.37		
Metal framing, entrance door	U-3.67 U-3.40	E&W 0.34, S 0.36, N 0.46		U-3.67 U-3.40	E&W 0.34, S 0.36, N 0.46		U-4.15 U-3.40		
<i>Skylight, 0% to 3% of roof</i>									
All types	U-2.21	NR	NR	U-2.21	NR	NR	U-4.59 U-4.04	NR	NR

\* The following definitions apply: c.i. = continuous insulation (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2); NR = no (insulation) requirement; NR = no (insulation) requirement; E&W = east and west oriented, S = south oriented, N = within 22.5 degrees of north in the Northern Hemisphere (see Sections 7.4.2.1 and 7.4.2.7).

\*\* The insulation minimum R-value criteria in this table meet the criteria in Section 7.4.2.1 but it is possible that some assemblies with slightly less insulation minimum R-value will also meet the criteria of Section 7.4.2.1.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see ANSI/ASHRAE/IES Standard 90.1, Section 3.2).

**POLICY STATEMENT DEFINING ASHRAE'S CONCERN  
FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES**

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

### **Standard 189.1 and the International Green Construction Code**

Standard 189.1 serves as the complete technical content of the International Green Construction Code<sup>®</sup> (IgCC). The IgCC creates a regulatory framework for new and existing buildings, establishing minimum green requirements for buildings and complementing voluntary rating systems. For more information, visit [www.iccsafe.org](http://www.iccsafe.org).

### **About ASHRAE**

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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