ANSI/ASHRAE/IESNA Addendum *am* to
ANSI/ASHRAE/IESNA Standard 90.1-2001

ASHRAE® STANDARD

Energy Standard for Buildings Except Low-Rise Residential Buildings

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process.)

FOREWORD

This addendum reduces the number of climate zones from 26 to 8. This change should reduce the size of 90.1 and simplify compliance. Also, these changes should increase the consistency in the treatment of climate zones between 90.1 and other standard and code documents.

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

Addendum *am* to 90.1-2001 (I-P and SI editions)

[Delete the existing Table 3.2 and replace it with the following new Table 3.2.]

(I-P edition)

TABLE 3.2
Heated Space Criteria

Heating Output ($Btu/h \cdot ft^2$)	Climate Zone
5	1 and 2
10	3
15	4 and 5
20	6 and 7
25	8

(SI edition)

TABLE 3.2
Heated Space Criteria

Heating Output (W/m^2)	Climate Zone
15	1 and 2
30	3
45	4 and 5
60	6 and 7
75	8

[Revise Sections 5.1.3, 5.1.3.1, and 5.2.3.2 as shown below.]

5.1.3 Climate. ~~The climate shall be determined based on the *cooling degree-days base 50°F, CDD50 (10°C, CDD10),* and *heating degree-days base 65°F, HDD65 (18 °C, HDD18).*~~ Determine the climate zone for the location. For locations in the United States, follow the procedure in 5.1.3.1. For international locations in Canada and other countries, follow the procedure in 5.1.3.2.

5.1.3.1 United States Locations ~~Listed.~~ ~~For those locations listed in Normative Appendix D, use the published climatic data to determine compliance. In the case of cities or urban regions with several climatic data entries, the designer shall select the location within the region or city that best represents the climate of the construction site.~~ Use Figure B-1 or Table B-1 in Appendix B to determine the required climate zone.

5.1.3.2 International Locations ~~Not Listed.~~ ~~For locations not listed in Normative Appendix D, designers shall select the location that best represents the climatic conditions of the construction site being analyzed to determine compliance. If there are recorded historical climatic data available for a construction site, they may be used to determine compliance if approved by the building official.~~. For locations in Canada that are listed in Table B-2 in Appendix B, use this table to determine the required climate zone number and, when a climate zone letter is also required, use Table B-4 and the Major Climate Type Definitions in Appendix B to determine the letter (A, B, or C). For locations in other international countries that are listed in Table B-3, use this table to determine the required climate zone number and, when a climate zone letter is also required, use Table B-4 and the Major Climate Type Definitions in Appendix B to determine the letter (A, B, or C). For all international locations that are not listed either in Table B-2 or B-3, use Table B-4 and the Major Climate Type Definitions in Appendix B to determine both the climate zone letter and number.

[Revise Section 5.1.4 as shown.]

5.1.4 Envelope Requirements Are Specified by Space-Conditioning Categories. Separate *exterior building envelope* requirements are specified for each of two categories of conditioned space:

a. nonresidential conditioned space,
b. residential conditioned space.

Spaces shall be assumed to be *conditioned space* and shall comply with the requirements for *conditioned space* at the time of construction, regardless of whether mechanical or electrical equipment is included in the building permit application or installed at that time.

Exceptions to 5.1.4: For buildings that contain *spaces* that will be only *semi-heated* or *unconditioned*, and if alternative compliance is sought for such spaces, then all *semi-heated* or *unconditioned* spaces shall be clearly indicated on the floor plan as such, and the following *semi-exterior building envelope* requirements apply:

(a) If a *space* will be only *semiheated,* the *space* shall be considered *semiheated*.
(b) If a *space* will remain *unconditioned,* the *space* shall be considered *unconditioned*.

In ~~climates that exceed 1800 *HDD 65 (1000 HDD18)*~~ Climate Zones 3 through 8, a space may be designated as either *semiheated* or *unconditioned* only if approved by the *building official*.

[Revise Tables 5.3.1.1A and 5.3.1.1B as shown below.]

(I-P edition)

TABLE 5.3.1.1A
Single Rafter Roofs

~~HDD65~~ Climate Zone	Minimum Insulation R-Value or Maximum Assembly U-Factor (Wood Rafter Depth, *d (actual)*)		
	d 8 in.	8 < *d* 10 in.	10 < *d* 12 in.
~~0-12,600~~ 1-7	R-19	R-30	R-38
	U-0.055	U-0.036	U-0.028
~~>12,600~~ 8	R-21	R-30	R-38
	U-0.052	U-0.036	U-0.028

(SI edition)

TABLE 5.3.1.1A
Single Rafter Roofs

~~HDD18~~ Climate Zone	Minimum Insulation R-Value or Maximum Assembly U-Factor (Wood Rafter Depth, *d (actual)*)		
	d 200 mm	200 < *d* 250 mm	250 < *d* 300 mm
~~0-7000~~ 1-7	R-3.3	R-5.3	R-6.7
	U-0.31	U-0.0.20	U-0.16
~~>7000~~ 8	R-3.7	R-5.3	R-6.7
	U-0.29	U-0.20	U-0.16

(I-P edition)

TABLE 5.3.1.1B
Roof U-Factor Multipliers for Exception to 5.3.1.1

~~HDD65~~ Climate Zone	Roof U-Factor Multiplier
~~0-900~~ 1	0.77
~~901-1800~~ 2	0.83
~~1801-2700~~ 3	0.85
~~2701-3600~~	~~0.86~~
~~>3600~~ 4 through 8	1.00

TABLE 5.3.1.1B
Roof U-Factor Multipliers for Exception to 5.3.1.1

~~HDD18~~ Climate Zone	Roof U-Factor Multiplier
~~0-500~~ 1	0.77
~~501-1000~~ 2	0.83
~~1001-1500~~ 3	0.85
~~1501-2000~~	~~0.86~~
~~>2000~~ 4 through 8	1.00

[Revise Section 5.3 as follows.]

5.3 Prescriptive Building Envelope Option

For *conditioned space*, the *exterior building envelope* shall comply with either the "nonresidential" or "residential" requirements in Table 5.3 ~~(located in Normative Appendix B)~~ for the appropriate climate.

~~(Table 5.3: When adopted the appropriate tables are to be inserted here by the adopting jurisdiction (state, province, county, city, etc.). Only a limited number of tables in Normative Appendix B are applicable to any one particular jurisdiction. The remainder of Normative Appendix B need not be adopted. See Appendix B for the process to select the applicable tables. Then, select the actual tables from the Normative Appendix B and insert them here: An example table is shown on the next page.)~~

If a building contains any semiheated space or unconditioned space, as noted in the exceptions to 5.1.1, then the *semi-exterior building envelope* shall comply with the requirements for *semiheated space* in Table 5.3 for the appropriate climate. (See Figure 5.3, Exterior and Semi-Exterior Building Envelope.)

[Revise Section 5.3.2.3 as follows.]

5.3.2.3 Fenestration Solar Heat Gain Coefficient (SHGC). *Vertical fenestration* shall have an *SHGC* not greater than that specified for "all" orientations in Table 5.3 for the appropriate total *vertical fenestration area*. *Skylights*, including glass *skylights* with a curb, plastic *skylights* with a curb, and all *skylights* without a curb, shall have an *SHGC* not greater than that specified for "all" orientations in Table 5.3 for the appropriate total *skylight area*. *SHGC* for *fenestration* shall be determined in accordance with 5.2.2. There are no *SHGC* requirements for *semiheated spaces* or for buildings in ~~climates with greater than 10800 HDD65 (6000 HDD18)~~ Climate Zone 8.

[Revise Section 5.3.3.3 as follows.]

5.5.3.3 Loading Dock Weatherseals. In ~~climates that exceed 3600 HDD65 (2000 HDD18)~~ Climate Zones 4

through 8, cargo *doors* and loading dock *doors* shall be equipped with weatherseals to restrict *infiltration* when vehicles are parked in the doorway.

[Revise Section 5.5.3.4 as follows.]

5.5.3.4 Vestibules. A *door* that separates *conditioned space* from the exterior shall be protected with an enclosed vestibule, with all *doors* opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior *doors* to open at the same time. Interior and exterior *doors* shall have a minimum distance between them of not less than 7 ft (21. m) when in the closed position.

Exceptions to 5.5.3.4:

(a) *Doors* in buildings in ~~climates that have less than 1800 HDD65 (1000 HDD18)~~ Climate Zones 1 and 2

(b) *Doors* in buildings less than four stories above grade

(c) *Doors* not intended to be used as a *building entrance door*, such as mechanical or electrical equipment rooms

(d) *Doors* opening directly from a *dwelling unit*

(e) *Doors* that open directly from a space less than 3000 ft^2 (300 m^2) in area

(f) *Doors* in building entrances with revolving *doors*

(g) *Doors* used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

[Move the following tables from Appendix B and insert them here. Change the titles of the tables as follows to create Tables 5.3-1 through 5.3-8. The I-P and SI versions of the tables appear on the following eighteen pages.]

(I-P edition)

TABLE ~~B-2~~5.3-1
Building Envelope Requirements For Climate Zone 1 (A,B) ~~(HDD65: 0-900, CDD50: 9001-10800)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation Min.	Assembly	Insulation Min.	Assembly	Insulation Min.
Opaque Elements	Maximum	R-Value	Maximum	R-Value	Maximum	R-Value
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-1.282	NR
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-1.280	NR
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.614	NR
Walls, Above Grade						
Mass	U-0.580	NR	U-0.151[a]	R-5.7 ci[a]	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.113	R-13.0	U-1.180	NR
Steel Framed	U-0.124	R-13.0	U-0.124	R-13.0	U-0.352	NR
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.292	NR
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
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
Slab-On-Grade Floors						
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.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-1.450		U-1.450	
	Assembly	Assembly Max.	Assembly	Assembly Max.	Assembly	Assembly Max.
	Max. U	SHGC (All	Max. U	SHGC (All	Max. U	SHGC (All
	(Fixed/	Orientations/	(Fixed/	Orientations/	(Fixed/	Orientations/
Fenestration	Operable)	North-Oriented)	Operable)	North-Oriented)	Operable)	North-Oriented)
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.44	U_{oper}-1.27	$SHGC_{north}$-0.44	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-1.22	$SHGC_{all}$-0.19	U_{fixed}-1.22	$SHGC_{all}$-0.19	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.33	U_{oper}-1.27	$SHGC_{north}$-0.33	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-0.16	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.90	$SHGC_{all}$-0.34	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-1.36	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a]Exception to 5.3.1.2a applies.

(SI edition)

TABLE ~~B-2~~5.3-1
Building Envelope Requirements For Climate Zone 1 (A,B) ~~(HDD18: 0-500, CDD10: 5001-6000)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-7.280	NR
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-7.268	NR
Attic and Other	U-0.192	R-5.3	U-0.153	R-6.7	U-3.483	NR
Walls, Above Grade						
Mass	U-3.293	NR	U-0.857[a]	R-1.0 ci[a]	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.642	R-2.3	U-6.700	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
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-6.473	NR	C-6.473	NR
Floors						
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
Slab-On-Grade Floors						
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
Opaque Doors						
Swinging	U-3.975		U-3.975		U-3.975	
Non-Swinging	U-8.233		U-8.233		U-8.233	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- 0.61	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-7.21	$SHGC_{north}$- 0.44	Uoper-7.21	$SHGC_{north}$- 0.44	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-6.93	$SHGC_{all}$- 0.19	Ufixed-6.93	$SHGC_{all}$- 0.19	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-7.21	$SHGC_{north}$- 0.33	Uoper-7.21	$SHGC_{north}$- 0.33	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-11.24	$SHGC_{all}$- 0.36	Uall-11.24	$SHGC_{all}$- 0.19	Uall-11.24	$SHGC_{all}$- NR
2.1-5.0%	Uall-11.24	$SHGC_{all}$- 0.19	Uall-11.24	$SHGC_{all}$- 0.16	Uall-11.24	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-10.79	$SHGC_{all}$- 0.34	Uall-10.79	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- NR
2.1-5.0%	Uall-10.79	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-7.72	$SHGC_{all}$- 0.36	Uall-7.72	$SHGC_{all}$- 0.19	Uall-7.72	$SHGC_{all}$- NR
2.1-5.0%	Uall-7.72	$SHGC_{all}$- 0.19	Uall-7.72	$SHGC_{all}$- 0.19	Uall-7.72	$SHGC_{all}$- NR

[a] Exception to 5.3.1.2a applies

(I-P edition)

TABLE ~~B-5~~5.3-2
Building Envelope Requirements For Climate Zone 2 (A,B) ~~(HDD65: 901-1800, CDD50: 7201+)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation Min.	Assembly	Insulation Min.	Assembly	Insulation Min.
Opaque Elements	**Maximum**	**R-Value**	**Maximum**	**R-Value**	**Maximum**	**R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.167	R-6.0
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade						
Mass	U-0.580	NR	U-0.151[a]	R-5.7 ci[a]	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.113	R-13.0	U-0.184	R-6.0
Steel Framed	U-0.124	R-13.0	U-0.124	R-13.0	U-0.352	NR
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.292	NR
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
Mass	U-0.137	R-4.2 ci	U-0.107	R-6.3 ci	U-0.322	NR
Steel Joist	U-0.052	R-19.0	U-0.052	R-19.0	U-0.350	NR
Wood Framed and Other	U-0.051	R-19.0	U-0.051	R-19.0	U-0.282	NR
Slab-On-Grade Floors						
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.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-1.450		U-1.450	
	Assembly	**Assembly Max.**	**Assembly**	**Assembly Max.**	**Assembly**	**Assembly Max.**
	Max. U	**SHGC (All**	**Max. U**	**SHGC (All**	**Max. U**	**SHGC (All**
	(Fixed/	**Orientations/**	**(Fixed/**	**Orientations/**	**(Fixed/**	**Orientations/**
Fenestration	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-1.22	$SHGC_{all}$-0.17	U_{fixed}-1.22	$SHGC_{all}$-0.17	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.44	U_{oper}-1.27	$SHGC_{north}$-0.43	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.90	$SHGC_{all}$-0.39	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.90	$SHGC_{all}$-0.34	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-1.36	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a] Exception to 5.3.1.2a applies.

(SI edition)

TABLE ~~B-5~~5.3-2
Building Envelope Requirements For Climate Zone 2 (A,B) ~~(HDD18: 501-1000, CDD10: 4001+)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation	Assembly	Insulation	Assembly	Insulation
Opaque Elements	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-1.240	R-0.7 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.948	R-1.1
Attic and Other	U-0.192	R-5.3	U-0.153	R-6.7	U-0.459	R-2.3
Walls, Above Grade						
Mass	U-3.293	NR	U-0.857[a]	R-1.0 ci[a]	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.642	R-2.3	U-1.045	R-6.0
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
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-6.473	NR	C-6.473	NR
Floors						
Mass	U-0.780	R-0.7 ci	U-0.606	R-1.1 ci	U-1.825	NR
Steel Joist	U-0.296	R-3.3	U-0.296	R-3.3	U-1.986	NR
Wood Framed and Other	U-0.288	R-3.3	U-0.288	R-3.3	U-1.599	NR
Slab-On-Grade Floors						
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
Opaque Doors						
Swinging	U-3.975		U-3.975		U-3.975	
Non-Swinging	U-8.233		U-8.233		U-8.233	

	Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/		Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/		Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/	
Fenestration	**Operable)**	**North-Oriented)**		**Operable)**	**North-Oriented)**		**Operable)**	**North-Oriented)**	
Vertical Glazing, % of Wall									
0-10.0%	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	0.39	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
10.1-20.0%	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
20.1-30.0%	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
30.1-40.0%	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	0.25	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
40.1-50.0%	Ufixed-6.93	$SHGC_{all}$-	0.17	Ufixed-6.93	$SHGC_{all}$-	0.17	Ufixed-5.54	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.44	Uoper-7.21	$SHGC_{north}$-	0.43	Uoper-5.77	$SHGC_{north}$-	NR
Skylight with Curb, Glass, % of Roof									
0-2.0%	Uall-11.24	$SHGC_{all}$-	0.36	Uall-11.24	$SHGC_{all}$-	0.19	Uall-11.24	$SHGC_{all}$-	NR
2.1-5.0%	Uall-11.24	$SHGC_{all}$-	0.19	Uall-11.24	$SHGC_{all}$-	0.19	Uall-11.24	$SHGC_{all}$-	NR
Skylight with Curb, Plastic, % of Roof									
0-2.0%	Uall-10.79	$SHGC_{all}$-	0.39	Uall-10.79	$SHGC_{all}$-	0.27	Uall-10.79	$SHGC_{all}$-	NR
2.1-5.0%	Uall-10.79	$SHGC_{all}$-	0.34	Uall-10.79	$SHGC_{all}$-	0.27	Uall-10.79	$SHGC_{all}$-	NR
Skylight without Curb, All, % of Roof									
0-2.0%	Uall-7.72	$SHGC_{all}$-	0.36	Uall-7.72	$SHGC_{all}$-	0.19	Uall-7.72	$SHGC_{all}$-	NR
2.1-5.0%	Uall-7.72	$SHGC_{all}$-	0.19	Uall-7.72	$SHGC_{all}$-	0.19	Uall-7.72	$SHGC_{all}$-	NR

[a]Exception to 5.3.1.2a applies

(I-P edition)

TABLE ~~B-105~~.3-3
Building Envelope Requirements For Climate Zone 3 (A,B,C) ~~(HDD65: 2701-3600, CDD50: 5401+)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation Min.	Assembly	Insulation Min.	Assembly	Insulation Min.
Opaque Elements	**Maximum**	**R-Value**	**Maximum**	**R-Value**	**Maximum**	**R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.097	R-10.0
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade						
Mass	U-0.151[a,b]	R-5.7 ci[a,b]	U-0.123	R-7.6 ci	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.113	R-13.0	U-0.184	R-6.0
Steel Framed	U-0.124	R-13.0	U-0.084	R-13.0 + R-3.8 ci	U-0.352	NR
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
Mass	U-0.107	R-6.3 ci	U-0.087	R-8.3 ci	U-0.322	NR
Steel Joist	U-0.052	R-19.0	U-0.052	R-19.0	U-0.069	R-13.0
Wood Framed and Other	U-0.051	R-19.0	U-0.033	R-30.0	U-0.282	NR
Slab-On-Grade Floors						
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.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-0.500		U-1.450	
	Assembly	**Assembly Max.**	**Assembly**	**Assembly Max.**	**Assembly**	**Assembly Max.**
	Max. U	**SHGC (All**	**Max. U**	**SHGC (All**	**Max. U**	**SHGC (All**
	(Fixed/	**Orientations/**	**(Fixed/**	**Orientations/**	**(Fixed/**	**Orientations/**
Fenestration (for Zones 3A and 3B; see next page for Zone 3C)	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.25	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.25	U_{fixed}-0.57	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.39	U_{oper}-0.67	$SHGC_{north}$-0.39	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.25	U_{fixed}-0.57	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.39	U_{oper}-0.67	$SHGC_{north}$-0.39	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.19	U_{fixed}-0.46	$SHGC_{all}$-0.19	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.26	U_{oper}-0.47	$SHGC_{north}$-0.26	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-1.17	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.19	U_{all}-1.17	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.30	$SHGC_{all}$-0.65	U_{all}-1.30	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.30	$SHGC_{all}$-0.34	U_{all}-1.30	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-0.69	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.19	U_{all}-0.69	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a] Exception to 5.3.1.2a applies.
[b] Insulation is not required for non-residential mass walls in Climate Zone 3A located below the "Warm-Humid" line, and in Zone 3B.

TABLE ~~B-9~~5.3-3 (continued)
Building Fenestration Requirements For Climate Zone 3C

	Nonresidential		Residential		Semiheated	
Fenestration (for Zone 3C)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-1.22	$SHGC_{all}$-0.61	U_{fixed}-1.22	$SHGC_{all}$-0.61	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.82	U_{oper}-1.27	$SHGC_{north}$-0.82	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-1.22	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-0.61	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-1.22	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-1.22	$SHGC_{all}$-0.34	U_{fixed}-1.22	$SHGC_{all}$-0.34	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-1.22	$SHGC_{all}$-0.20	U_{fixed}-0.73	$SHGC_{all}$-0.25	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-1.27	$SHGC_{north}$-0.30	U_{oper}-0.81	$SHGC_{north}$-0.61	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.98	$SHGC_{all}$-0.61	U_{all}-1.98	$SHGC_{all}$-0.39	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.98	$SHGC_{all}$-0.39	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.90	$SHGC_{all}$-0.65	U_{all}-1.90	$SHGC_{all}$-0.65	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.90	$SHGC_{all}$-0.39	U_{all}-1.90	$SHGC_{all}$-0.34	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-1.36	$SHGC_{all}$-0.61	U_{all}-1.36	$SHGC_{all}$-0.39	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.36	$SHGC_{all}$-0.39	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a]~~Exception to 5.3.1.2a applies.~~

(SI edition)

TABLE ~~B-10~~5.3-3
Building Envelope Requirements For Climate Zone 3 (A,B,C) ~~(HDD18: 1501-2000, CDD10: 3001+)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation	Assembly	Insulation	Assembly	Insulation
Opaque Elements	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-1.240	R-0.7 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.192	R-5.3	U-0.153	R-6.7	U-0.459	R-2.3
Walls, Above Grade						
Mass	U-0.857[a,b]	R-1.0 ci[a,b]	U-0.701	R-1.3 ci	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.642	R-2.3	U-1.045	R-1.1
Steel Framed	U-0.705	R-2.3	U-0.479	R-2.3 + R-0.7 ci	U-1.998	NR
Wood Framed and Other	U-0.504	R-2.3	U-0.504	R-2.3	U-0.504	R-2.3
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-6.473	NR	C-6.473	NR
Floors						
Mass	U-0.606	R-1.1	U-0.496	R-1.5	U-1.825	NR
Steel Joist	U-0.296	R-3.3	U-0.296	R-3.3	U-0.390	R-2.3
Wood Framed and Other	U-0.288	R-3.3	U-0.188	R-5.3	U-1.599	NR
Slab-On-Grade Floors						
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR
Heated	F-1.766	R-1.3 for 300 mm	F-1.644	R-1.3 for 600 mm	F-1.766	R-1.3 for 300 mm
Opaque Doors						
Swinging	U-3.975		U-3.975		U-3.975	
Non-Swinging	U-8.233		U-2.839		U-8.233	
	Assembly	**Assembly**	**Assembly**	**Assembly**	**Assembly**	**Assembly**
	Max. U	**Max. SHGC**	**Max. U**	**Max. SHGC**	**Max. U**	**Max. SHGC**
Fenestration	**(Fixed/**	**(All Orientations/**	**(Fixed/**	**(All Orientations/**	**(Fixed/**	**(All Orientations/**
(for Zones 3A and 3B; see next page for Zone 3C)	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-3.24	$SHGC_{all}$- 0.25	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-3.24	$SHGC_{all}$- 0.25	Ufixed-3.24	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.39	Uoper-3.80	$SHGC_{north}$- 0.39	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-3.24	$SHGC_{all}$- 0.25	Ufixed-3.24	$SHGC_{all}$- 0.25	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.39	Uoper-3.80	$SHGC_{north}$- 0.39	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-2.61	$SHGC_{all}$- 0.19	Ufixed-2.61	$SHGC_{all}$- 0.19	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- 0.26	Uoper-2.67	$SHGC_{north}$- 0.26	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-6.64	$SHGC_{all}$- 0.39	Uall-6.64	$SHGC_{all}$- 0.36	Uall-11.24	$SHGC_{all}$- NR
2.1-5.0%	Uall-6.64	$SHGC_{all}$- 0.19	Uall-6.64	$SHGC_{all}$- 0.19	Uall-11.24	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-7.38	$SHGC_{all}$- 0.65	Uall-7.38	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- NR
2.1-5.0%	Uall-7.38	$SHGC_{all}$- 0.34	Uall-7.38	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-3.92	$SHGC_{all}$- 0.39	Uall-3.92	$SHGC_{all}$- 0.36	Uall-7.72	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.92	$SHGC_{all}$- 0.19	Uall-3.92	$SHGC_{all}$- 0.19	Uall-7.72	$SHGC_{all}$- NR

[a] Exception to 5.3.1.2a applies
[b] Insulation is not required for non-residential mass walls in Climate Zone 3A located below the "Warm-Humid" line, and in Zone 3B.

TABLE ~~B-9~~5.3-3 (continued)
Building Envelope Requirements For Climate Zone 3C ~~(HDD18: 1001-1500, CDD10: 0-3000)~~

Fenestration (for Zone 3C)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)		Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)		Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	
Vertical Glazing, % of Wall									
0-10.0%	Ufixed-6.93	$SHGC_{all}$-	0.61	Ufixed-6.93	$SHGC_{all}$-	0.61	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.82	Uoper-7.21	$SHGC_{north}$-	0.82	Uoper-7.21	$SHGC_{north}$-	NR
10.1-20.0%	Ufixed-6.93	$SHGC_{all}$-	0.39	Ufixed-6.93	$SHGC_{all}$-	0.61	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
20.1-30.0%	Ufixed-6.93	$SHGC_{all}$-	0.39	Ufixed-6.93	$SHGC_{all}$-	0.39	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
30.1-40.0%	Ufixed-6.93	$SHGC_{all}$-	0.34	Ufixed-6.93	$SHGC_{all}$-	0.34	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	0.61	Uoper-7.21	$SHGC_{north}$-	NR
40.1-50.0%	Ufixed-6.93	$SHGC_{all}$-	0.20	Ufixed-4.14	$SHGC_{all}$-	0.25	Ufixed-5.54	$SHGC_{all}$-	NR
	Uoper-7.21	$SHGC_{north}$-	0.30	Uoper-4.60	$SHGC_{north}$-	0.61	Uoper-5.77	$SHGC_{north}$-	NR
Skylight with Curb, Glass, % of Roof									
0-2.0%	Uall-11.24	$SHGC_{all}$-	0.61	Uall-11.24	$SHGC_{all}$-	0.39	Uall-11.24	$SHGC_{all}$-	NR
2.1-5.0%	Uall-11.24	$SHGC_{all}$-	0.39	Uall-11.24	$SHGC_{all}$-	0.19	Uall-11.24	$SHGC_{all}$-	NR
Skylight with Curb, Plastic, % of Roof									
0-2.0%	Uall-10.79	$SHGC_{all}$-	0.65	Uall-10.79	$SHGC_{all}$-	0.65	Uall-10.79	$SHGC_{all}$-	NR
2.1-5.0%	Uall-10.79	$SHGC_{all}$-	0.39	Uall-10.79	$SHGC_{all}$-	0.34	Uall-10.79	$SHGC_{all}$-	NR
Skylight without Curb, All, % of Roof									
0-2.0%	Uall-7.72	$SHGC_{all}$-	0.61	Uall-7.72	$SHGC_{all}$-	0.39	Uall-7.72	$SHGC_{all}$-	NR
2.1-5.0%	Uall-7.72	$SHGC_{all}$-	0.39	Uall-7.72	$SHGC_{all}$-	0.19	Uall-7.72	$SHGC_{all}$-	NR

~~* Exception to 5.3.1.2a applies~~

(I-P edition)

TABLE ~~B-13~~5.3-4
Building Envelope Requirements For Climate Zone 4 (A,B,C) ~~(HDD65: 3601-5400, CDD50: 3601+)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.097	R-10.0
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade						
Mass	U-0.151[a]	R-5.7 ci[a]	U-0.104	R-9.5 ci	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.113	R-13.0	U-0.134	R-10.0
Steel Framed	U-0.124	R-13.0	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
Mass	U-0.107	R-6.3 ci	U-0.087	R-8.3 ci	U-0.322	NR
Steel Joist	U-0.052	R-19.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood Framed and Other	U-0.051	R-19.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
Heated	F-0.950	R-7.5 for 24 in.	F-0.840	R-10 for 36 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.25	U_{fixed}-0.46	$SHGC_{all}$-0.25	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.36	U_{oper}-0.47	$SHGC_{north}$-0.36	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-0.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-0.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.30	$SHGC_{all}$-0.65	U_{all}-1.30	$SHGC_{all}$-0.62	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.30	$SHGC_{all}$-0.34	U_{all}-1.30	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.58	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-0.58	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a]Exception to 5.3.1.2a applies.

(SI edition)

TABLE ~~B-13~~5.3-4
Building Envelope Requirements For Climate Zone 4 (A,B,C) ~~(HDD18: 2001-3000, CDD10: 2001+)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-1.240	R-0.7 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.192	R-5.3	U-0.153	R-6.7	U-0.459	R-2.3
Walls, Above Grade						
Mass	U-0.857[a]	R-1.0 ci[a]	U-0.592	R-1.7 ci	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.642	R-2.3	U-0.761	R-1.8
Steel Framed	U-0.705	R-2.3	U-0.365	R-2.3 + R-1.3 ci	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
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-6.473	NR	C-6.473	NR
Floors						
Mass	U-0.606	R-1.1	U-0.496	R-1.5	U-1.825	NR
Steel Joist	U-0.296	R-3.3	U-0.214	R-5.3	U-0.390	R-2.3
Wood Framed and Other	U-0.288	R-3.3	U-0.188	R-5.3	U-0.376	R-2.3
Slab-On-Grade Floors						
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR
Heated	F-1.644	R-1.3 for 600 mm	F-1.454	R-1.8 for 900 mm	F-1.766	R-1.3 for 300 mm
*Opaque Door*s						
Swinging	U-3.975		U-3.975		U-3.975	
Non-Swinging	U-8.233		U-2.839		U-8.233	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-2.61	$SHGC_{all}$- 0.25	Ufixed-2.61	$SHGC_{all}$- 0.25	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- 0.36	Uoper-2.67	$SHGC_{north}$- 0.36	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-6.64	$SHGC_{all}$- 0.49	Uall-5.56	$SHGC_{all}$- 0.36	Uall-11.24	$SHGC_{all}$- NR
2.1-5.0%	Uall-6.64	$SHGC_{all}$- 0.39	Uall-5.56	$SHGC_{all}$- 0.19	Uall-11.24	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-7.38	$SHGC_{all}$- 0.65	Uall-7.38	$SHGC_{all}$- 0.62	Uall-10.79	$SHGC_{all}$- NR
2.1-5.0%	Uall-7.38	$SHGC_{all}$- 0.34	Uall-7.38	$SHGC_{all}$- 0.27	Uall-10.79	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-3.92	$SHGC_{all}$- 0.49	Uall-3.29	$SHGC_{all}$- 0.36	Uall-7.72	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.92	$SHGC_{all}$- 0.39	Uall-3.29	$SHGC_{all}$- 0.19	Uall-7.72	$SHGC_{all}$- NR

[a] Exception to 5.3.1.2a applies

(I-P edition)

TABLE ~~B-175~~.3-5
Building Envelope Requirements For Climate Zone 5 (A,B,C) ~~(HDD65: 5401-7200, CDD50: 1801-3600)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.097	R-10.0
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.123	R-7.6 ci	U-0.090	R-11.4 ci	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.057	R-13.0 + R-13.0	U-0.123	R-11.0
Steel Framed	U-0.084	R-13.0 + R-3.8 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.074	R-10.4 ci	U-0.322	NR
Steel Joist	U-0.052	R-19.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.840	R-10 for 36 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.26	U_{fixed}-0.46	$SHGC_{all}$-0.26	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.36	U_{oper}-0.47	$SHGC_{north}$-0.49	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.10	$SHGC_{all}$-0.77	U_{all}-1.10	$SHGC_{all}$-0.77	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.10	$SHGC_{all}$-0.62	U_{all}-1.10	$SHGC_{all}$-0.62	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-1.36	$SHGC_{all}$-NR

(SI edition)

TABLE ~~B-175~~.3-5
Building Envelope Requirements For Climate Zone 5 (A,B,C) ~~(HDD18: 3001-4000, CDD10: 1001-2000)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation	Assembly	Insulation	Assembly	Insulation
Opaque Elements	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-0.982	R-0.9 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.192	R-5.3	U-0.153	R-6.7	U-0.300	R-3.3
Walls, Above Grade						
Mass	U-0.701	R-1.3 ci	U-0.513	R-2.0 ci	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.324	R-2.3 + R-2.3	U-0.698	R-1.9
Steel Framed	U-0.479	R-2.3 + R-0.7 ci	U-0.365	R-2.3 + R-1.3 ci	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
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-6.473	NR	C-6.473	NR
Floors						
Mass	U-0.496	R-1.5	U-0.420	R-1.8	U-1.825	NR
Steel Joist	U-0.296	R-3.3	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
Slab-On-Grade Floors						
Unheated	F-1.264	NR	F-1.264	NR	F-1.264	NR
Heated	F-1.454	R-1.8 for 900 mm	F-1.454	R-1.8 for 900 mm	F-1.766	R-1.3 for 300 mm
Opaque Doors						
Swinging	U-3.975		U-3.975		U-3.975	
Non-Swinging	U-8.233		U-2.839		U-8.233	
	Assembly Max. U (Fixed/	**Assembly Max. SHGC (All Orientations/**	**Assembly Max. U (Fixed/**	**Assembly Max. SHGC (All Orientations/**	**Assembly Max. U (Fixed/**	**Assembly Max. SHGC (All Orientations/**
Fenestration	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-3.24	$SHGC_{all}$- 0.49	Ufixed-3.24	$SHGC_{all}$- 0.49	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-2.61	$SHGC_{all}$- 0.26	Ufixed-2.61	$SHGC_{all}$- 0.26	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- 0.36	Uoper-2.67	$SHGC_{north}$- 0.49	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-6.64	$SHGC_{all}$- 0.49	Uall-6.64	$SHGC_{all}$- 0.49	Uall-11.24	$SHGC_{all}$- NR
2.1-5.0%	Uall-6.64	$SHGC_{all}$- 0.39	Uall-6.64	$SHGC_{all}$- 0.39	Uall-11.24	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-6.25	$SHGC_{all}$- 0.77	Uall-6.25	$SHGC_{all}$- 0.77	Uall-10.79	$SHGC_{all}$- NR
2.1-5.0%	Uall-6.25	$SHGC_{all}$- 0.62	Uall-6.25	$SHGC_{all}$- 0.62	Uall-10.79	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-3.92	$SHGC_{all}$- 0.49	Uall-3.92	$SHGC_{all}$- 0.49	Uall-7.72	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.92	$SHGC_{all}$- 0.39	Uall-3.92	$SHGC_{all}$- 0.39	Uall-7.72	$SHGC_{all}$- NR

(I-P edition)

TABLE ~~B-195~~.3-6
Building Envelope Requirements For Climate Zone 6 (A,B) ~~(HDD65: 7201-9000, CDD50: 1801+)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.097	R-10.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.104	R-9.5 ci	U-0.090	R-11.4 ci	U-0.580	NR
Metal Building	U-0.113	R-13.0	U-0.057	R-13.0 + R-13.0	U-0.113	R-13.0
Steel Framed	U-0.084	R-13.0 + R-3.8 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.064	R-13.0 + R-3.8 ci	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-0.119	R-7.5 ci	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.064	R-12.5 ci	U-0.322	NR
Steel Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-.0066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.780	R-10 for 48 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.500		U-0.700	
Non-Swinging	U-0.500		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.26	U_{fixed}-0.46	$SHGC_{all}$-0.26	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.49	U_{oper}-0.47	$SHGC_{north}$-0.49	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-0.98	$SHGC_{all}$-0.46	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-0.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-0.87	$SHGC_{all}$-0.71	U_{all}-0.74	$SHGC_{all}$-0.65	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.87	$SHGC_{all}$-0.58	U_{all}-0.74	$SHGC_{all}$-0.55	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.58	$SHGC_{all}$-0.49	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.58	$SHGC_{all}$-0.39	U_{all}-1.36	$SHGC_{all}$-NR

(SI edition)

TABLE ~~B-195~~.3-6
Building Envelope Requirements For Climate Zone 6 (A,B) ~~(HDD18: 4001-5000, CDD10: 1001+)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-0.982	R-0.9 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.153	R-6.7	U-0.153	R-6.7	U-0.300	R-3.3
Walls, Above Grade						
Mass	U-0.592	R-1.7 ci	U-0.513	R-2.0 ci	U-3.293	NR
Metal Building	U-0.642	R-2.3	U-0.324	R-2.3 + R-2.3	U-0.642	R-2.3
Steel Framed	U-0.479	R-2.3 + R-0.7 ci	U-0.365	R-2.3 + R-1.3 ci	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 ci	U-0.504	R-2.3
Wall, Below Grade						
Below Grade Wall	C-6.473	NR	C-0.678	R-1.3 ci	C-6.473	NR
Floors						
Mass	U-0.496	R-1.5	U-0.363	R-2.2 ci	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
Slab-On-Grade Floors						
Unheated	F-1.264	NR	F-1.260	NR	F-1.264	NR
Heated	F-1.454	R-1.8 for 900 mm	F-1.35	R-1.8 for 1200 mm	F-1.766	R-1.3 for 300 mm
Opaque Doors						
Swinging	U-3.975		U-2.839		U-3.975	
Non-Swinging	U-2.839		U-2.839		U-8.233	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-3.24	$SHGC_{all}$- 0.49	Ufixed-3.24	$SHGC_{all}$- 0.49	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.64	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-3.24	$SHGC_{all}$- 0.39	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-3.80	$SHGC_{north}$- 0.49	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-2.61	$SHGC_{all}$- 0.26	Ufixed-2.61	$SHGC_{all}$- 0.26	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- 0.49	Uoper-2.67	$SHGC_{north}$- 0.49	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-6.64	$SHGC_{all}$- 0.49	Uall-5.56	$SHGC_{all}$- 0.46	Uall-11.24	$SHGC_{all}$- NR
2.1-5.0%	Uall-6.64	$SHGC_{all}$- 0.49	Uall-5.56	$SHGC_{all}$- 0.36	Uall-11.24	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-4.94	$SHGC_{all}$- 0.71	Uall-4.20	$SHGC_{all}$- 0.65	Uall-10.79	$SHGC_{all}$- NR
2.1-5.0%	Uall-4.94	$SHGC_{all}$- 0.58	Uall-4.20	$SHGC_{all}$- 0.55	Uall-10.79	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-3.92	$SHGC_{all}$- 0.49	Uall-3.29	$SHGC_{all}$- 0.49	Uall-7.72	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.92	$SHGC_{all}$- 0.49	Uall-3.29	$SHGC_{all}$- 0.39	Uall-7.72	$SHGC_{all}$- NR

(I-P edition)

TABLE ~~B-225~~.3-7
Building Envelope Requirements For Climate Zone 7~~(HDD65: 9001-10800, CDD50: 0-1800)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building	U-0.065	R-19.0	U-0.065	R-19.0	U-0.097	R-10.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.090	R-11.4 ci	U-0.080	R-13.3 ci	U-0.580	NR
Metal Building	U-0.057	R-13.0 + R-13.0	U-0.057	R-13.0 + R-13.0	U-0.113	R-13.0
Steel Framed	U-0.064	R-13.0 + R-7.5 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.051	R-13.0 + R-7.5 ci	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-0.119	R-7.5 ci	C-0.119	R-7.5 ci	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.064	R-12.5 ci	U-0.137	R-4.2 ci
Steel Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.052	R-19.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.540	R-10 for 24 in.	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.780	R-10 for 48 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.500		U-0.700	
Non-Swinging	U-0.500		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-0.67	$SHGC_{north}$-0.64	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.36	U_{fixed}-0.46	$SHGC_{all}$-0.36	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.64	U_{oper}-0.47	$SHGC_{north}$-0.64	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.68	U_{all}-1.17	$SHGC_{all}$-0.64	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.64	U_{all}-1.17	$SHGC_{all}$-0.64	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-0.87	$SHGC_{all}$-0.77	U_{all}-0.61	$SHGC_{all}$-0.77	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.87	$SHGC_{all}$-0.71	U_{all}-0.61	$SHGC_{all}$-0.77	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.68	U_{all}-0.69	$SHGC_{all}$-0.64	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.64	U_{all}-0.69	$SHGC_{all}$-0.64	U_{all}-1.36	$SHGC_{all}$-NR

(SI edition)

TABLE ~~B 225~~.3-7
Building Envelope Requirements For Climate Zone 7 ~~(HDD18: 5001-6000, CDD10: 0-1000)~~

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation	Assembly	Insulation	Assembly	Insulation
Opaque Elements	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**	**Maximum**	**Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.360	R-2.6 ci	U-0.360	R-2.6 ci	U-0.982	R-0.9 ci
Metal Building	U-0.369	R-3.3	U-0.369	R-3.3	U-0.551	R-1.8
Attic and Other	U-0.153	R-6.7	U-0.153	R-6.7	U-0.300	R-3.3
Walls, Above Grade						
Mass	U-0.513	R-2.0 ci	U-0.453	R-2.3 ci	U-3.293	NR
Metal Building	U-0.324	R-2.3 + R-2.3	U-0.324	R-2.3 + R-2.3	U-0.642	R-2.3
Steel Framed	U-0.365	R-2.3 + R-1.3 ci	U-0.365	R-2.3 + R-1.3 ci	U-0.705	R-2.3
Wood Framed and Other	U-0.504	R-2.3	U-0.291	R-2.3 + R-1.3 ci	U-0.504	R-2.3
Wall, Below Grade						
Below Grade Wall	C-0.678	R-1.3 ci	C-0.678	R-1.3 ci	C-6.473	NR
Floors						
Mass	U-0.496	R-1.5	U-0.363	R-2.2	U-0.780	R-0.7 ci
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-0.376	R-2.3
Slab-On-Grade Floors						
Unheated	F-1.264	NR	F-0.935	R-1.8 for 600 mm	F-1.264	NR
Heated	F-1.454	R-1.8 for 900 mm	F-1.350	R-1.8 for 1200 mm	F-1.766	R-1.3 for 300 mm
Opaque Doors						
Swinging	U-3.975		U-2.839		U-3.975	
Non-Swinging	U-2.839		U-2.839		U-8.233	

	Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/		Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/		Assembly Max. U (Fixed/	Assembly Max. SHGC (All Orientations/	
Fenestration	**Operable)**	**North-Oriented)**		**Operable)**	**North-Oriented)**		**Operable)**	**North-Oriented)**	
Vertical Glazing, % of Wall									
0-10.0%	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-7.21	$SHGC_{north}$-	NR
10.1-20.0%	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-7.21	$SHGC_{north}$-	NR
20.1-30.0%	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-7.21	$SHGC_{north}$-	NR
30.1-40.0%	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-3.24	$SHGC_{all}$-	0.49	Ufixed-6.93	$SHGC_{all}$-	NR
	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-3.80	$SHGC_{north}$-	0.64	Uoper-7.21	$SHGC_{north}$-	NR
40.1-50.0%	Ufixed-2.61	$SHGC_{all}$-	0.36	Ufixed-2.61	$SHGC_{all}$-	0.36	Ufixed-5.54	$SHGC_{all}$-	NR
	Uoper-2.67	$SHGC_{north}$-	0.64	Uoper-2.67	$SHGC_{north}$-	0.64	Uoper-5.77	$SHGC_{north}$-	NR
Skylight with Curb, Glass, % of Roof									
0-2.0%	Uall-6.64	$SHGC_{all}$-	0.68	Uall-6.64	$SHGC_{all}$-	0.64	Uall-11.24	$SHGC_{all}$-	NR
2.1-5.0%	Uall-6.64	$SHGC_{all}$-	0.64	Uall-6.64	$SHGC_{all}$-	0.64	Uall-11.24	$SHGC_{all}$-	NR
Skylight with Curb, Plastic, % of Roof									
0-2.0%	Uall-4.94	$SHGC_{all}$-	0.77	Uall-3.46	$SHGC_{all}$-	0.77	Uall-10.79	$SHGC_{all}$-	NR
2.1-5.0%	Uall-4.94	$SHGC_{all}$-	0.71	Uall-3.46	$SHGC_{all}$-	0.77	Uall-10.79	$SHGC_{all}$-	NR
Skylight without Curb, All, % of Roof									
0-2.0%	Uall-3.92	$SHGC_{all}$-	0.68	Uall-3.92	$SHGC_{all}$-	0.64	Uall-7.72	$SHGC_{all}$-	NR
2.1-5.0%	Uall-3.92	$SHGC_{all}$-	0.64	Uall-3.92	$SHGC_{all}$-	0.64	Uall-7.72	$SHGC_{all}$-	NR

(I-P edition)

TABLE ~~B-245~~.3-8
Building Envelope Requirements For Cimate Zone 8 (~~HDD65: 12601+ -16200, CDD50: 0+~~)

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.048	R-20.0 ci	U-0.048	R-20.0 ci	U-0.093	R-10.0 ci
Metal Building	U-0.049	R-13.0 + R-19.0	U-0.049	R-13.0 + R-19.0	U-0.072	R-16.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.034	R-30.0
Walls, Above Grade						
Mass	U-0.080	R-13.3 ci	U-0.071	R-15.2 ci	U-0.151[a]	R-5.7 ci[a]
Metal Building	U-0.057	R-13.0 + R-13.0	U-0.057	R-13.0 + R-13.0	U-0.113	R-13.0
Steel Framed	U-0.064	R-13.0 + R-7.5 ci	U-0.055	R-13.0 + R-10.0 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.051	R-13.0 + R-7.5 ci	U-0.051	R-13.0 + R-7.5 ci	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-0.119	R-7.5 ci	C-0.119	R-7.5 ci	C-1.140	NR
Floors						
Mass	U-0.064	R-12.5 ci	U-0.057	R-14.6 ci	U-0.137	R-4.2 ci
Steel Joist	U-0.038	R-30.0	U-0.032	R-38.0	U-0.052	R-19.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.051	R-19.0
Slab-On-Grade Floors						
Unheated	F-0.540	R-10 for 24 in.	F-0.520	R-15 for 24 in.	F-0.730	NR
Heated	F-0.780	R-10 for 48 in.	F-0.780	R-10 for 48 in.	F-0.950	R-7.5 for 24 in.
Opaque Doors						
Swinging	U-0.500		U-0.500		U-0.700	
Non-Swinging	U-0.500		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-1.27	$SHGC_{north}$NR
10.1-20.0%	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-1.27	$SHGC_{north}$NR
20.1-30.0%	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-1.27	$SHGC_{north}$NR
30.1-40.0%	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-0.46	$SHGC_{all}$-NR	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-0.47	$SHGC_{north}$-NR	U_{oper}-1.27	$SHGC_{north}$NR
40.1-50.0%	U_{fixed}-0.35	$SHGC_{all}$-NR	U_{fixed}-0.35	$SHGC_{all}$-NR	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.39	$SHGC_{north}$-NR	U_{oper}-0.39	$SHGC_{north}$-NR	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-0.98	$SHGC_{all}$-NR	U_{all}-0.98	$SHGC_{all}$-NR	U_{all}-1.30	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.98	$SHGC_{all}$-NR	U_{all}-0.98	$SHGC_{all}$-NR	U_{all}-1.30	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-0.61	$SHGC_{all}$-NR	U_{all}-0.61	$SHGC_{all}$-NR	U_{all}-1.10	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.61	$SHGC_{all}$-NR	U_{all}-0.61	$SHGC_{all}$-NR	U_{all}-1.10	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.58	$SHGC_{all}$-NR	U_{all}-0.58	$SHGC_{all}$-NR	U_{all}-0.81	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.58	$SHGC_{all}$-NR	U_{all}-0.58	$SHGC_{all}$-NR	U_{all}-0.81	$SHGC_{all}$-NR

[a] Exception to 5.3.1.2a applies

(SI edition)

TABLE ~~B-24~~5.3-8
Building Envelope Requirements For Climate Zone 8 ~~(HDD18: 7001-9000, CDD10: 0+)~~

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.273	R-3.5 ci	U-0.273	R-3.5 ci	U-0.527	R-1.8 ci
Metal Building	U-0.278	R-2.3 + R-3.3	U-0.278	R-2.3 + R-3.3	U-0.409	R-2.8
Attic and Other	U-0.153	R-6.7	U-0.153	R-6.7	U-0.192	R-5.3
Walls, Above Grade						
Mass	U-0.453	R-2.3 ci	U-0.404	R-2.7 ci	U-0.857[a]	R-1.0 ci[a]
Metal Building	U-0.324	R-2.3 + R-2.3	U-0.324	R-2.3 + R-2.3	U-0.642	R-2.3
Steel Framed	U-0.365	R-2.3 + R-1.3 ci	U-0.315	R-2.3 + R-1.8 ci	U-0.705	R-2.3
Wood Framed and Other	U-0.291	R-2.3 + R-1.3 ci	U-0.291	R-2.3 + R-1.3 ci	U-0.504	R-2.3
Wall, Below Grade						
Below Grade Wall	C-0.678	R-1.3 ci	C-0.678	R-1.3 ci	C-6.473	NR
Floors						
Mass	U-0.363	R-2.2 ci	U-0.321	R-2.6 ci	U-0.780	R-0.7 ci
Steel Joist	U-0.214	R-5.3	U-0.183	R-6.7	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
Slab-On-Grade Floors						
Unheated	F-0.935	R-1.8 for 600 mm	F-0.900	R-2.6 for 600 mm	F-1.264	NR
Heated	F-1.350	R-1.8 for 1200 mm	F-1.350	R-1.8 for 1200 mm	F-1.644	R-1.3 for 600 mm
Opaque Doors						
Swinging	U-2.839		U-2.839		U-3.975	
Non-Swinging	U-2.839		U-2.839		U-8.233	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing, % of Wall						
0-10.0%	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- NR	Uoper-2.67	$SHGC_{north}$- NR	Uoper-7.21	$SHGC_{north}$- NR
10.1-20.0%	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- NR	Uoper-2.67	$SHGC_{north}$- NR	Uoper-7.21	$SHGC_{north}$- NR
20.1-30.0%	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- NR	Uoper-2.67	$SHGC_{north}$- NR	Uoper-7.21	$SHGC_{north}$- NR
30.1-40.0%	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-2.61	$SHGC_{all}$- NR	Ufixed-6.93	$SHGC_{all}$- NR
	Uoper-2.67	$SHGC_{north}$- NR	Uoper-2.67	$SHGC_{north}$- NR	Uoper-7.21	$SHGC_{north}$- NR
40.1-50.0%	Ufixed-1.99	$SHGC_{all}$- NR	Ufixed-1.99	$SHGC_{all}$- NR	Ufixed-5.54	$SHGC_{all}$- NR
	Uoper-2.21	$SHGC_{north}$- NR	Uoper-2.21	$SHGC_{north}$- NR	Uoper-5.77	$SHGC_{north}$- NR
Skylight with Curb, Glass, % of Roof						
0-2.0%	Uall-5.56	$SHGC_{all}$- NR	Uall-5.56	$SHGC_{all}$- NR	Uall-7.38	$SHGC_{all}$- NR
2.1-5.0%	Uall-5.56	$SHGC_{all}$- NR	Uall-5.56	$SHGC_{all}$- NR	Uall-7.38	$SHGC_{all}$- NR
Skylight with Curb, Plastic, % of Roof						
0-2.0%	Uall-3.46	$SHGC_{all}$- NR	Uall-3.46	$SHGC_{all}$- NR	Uall-6.25	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.46	$SHGC_{all}$- NR	Uall-3.46	$SHGC_{all}$- NR	Uall-6.25	$SHGC_{all}$- NR
Skylight without Curb, All, % of Roof						
0-2.0%	Uall-3.29	$SHGC_{all}$- NR	Uall-3.29	$SHGC_{all}$- NR	Uall-4.60	$SHGC_{all}$- NR
2.1-5.0%	Uall-3.29	$SHGC_{all}$- NR	Uall-3.29	$SHGC_{all}$- NR	Uall-4.60	$SHGC_{all}$- NR

[a] Exception to 5.3.1.2a applies

[In Section 6, revise Table 6.1.3 as shown below.]

(I-P Units)

TABLE 6.1.3
Eliminate Required Economizer by Increasing Cooling Efficiency

Unitary Systems with Heat Pump Heating

System Size	Mandatory	~~Cooling Degree-Days (CDD50)~~Climate Zones					
(kBtu/h)	Minimum EER	~~0 – 3600~~ 5 to 8	~~3601 – 5400~~ 4	~~5401 – 7200~~ 3	~~7201 – 9000~~ 2	~~9001 – 0800~~	
		Minimum Cooling Efficiency Required (EER)[a]					Test Procedure[c]
≥65 and <135	10.1	N/A[b]	12.1	11.6	11.1	~~10.7~~	ARI 210/240
≥135 and ≤240	9.3	N/A[b]	11.3	10.8	10.4	~~9.9~~	ARI 340/360
>240 and <760	9.0	N/A[b]	10.9	10.5	10.0	~~9.6~~	

Other Unitary Systems

System Size	Mandatory	~~Cooling Degree-Days (CDD50)~~Climate Zones					
(kBtu/h)	Minimum EER	~~0 – 3600~~ 5 to 8	~~3601 – 5400~~ 4	~~5401 – 7200~~ 3	~~7201 – 9000~~ 2	9001 - 10800	
		Minimum Cooling Efficiency Required (EER)[a]					Test Procedure[c]
≥65 and <135	10.3	N/A[b]	12.5	12.0	11.5	~~11.0~~	ARI 210/240
≥135 and ≤240	9.7	N/A[b]	11.5	11.1	10.6	~~10.1~~	ARI 340/360
>240 and <760	9.5	N/A[b]	11.2	10.7	10.3	~~9.9~~	

[a] Each EER shown below should be reduced by 0.2 for units with a heating section other than electric resistance heat.

[b] Elimination of required economizer is not allowed.

[c] Section 12 contains complete specification of the referenced test procedure, including the referenced year version of the test procedure.

(SI Units)

TABLE 6.1.3
Eliminate Required Economizer by Increasing Cooling Efficiency

Unitary Systems with Heat Pump Heating

System Size	Mandatory	~~Cooling Degree-Days (CDD10)~~Climate Zones					
(kW)	Minimum COP_c	~~0-3600~~ 5-8	~~3601-5400~~ 4	~~5401-7200~~ 3	~~7201-9000~~ 2	9001-10800	
		Minimum Cooling Efficiency Required (COP_c)[a]					Test Procedure[c]
≥19 and <40	2.96	N/A[b]	3.55	3.40	3.25	~~2.84~~	ARI 210/240
≥40 and ≤70	2.72	N/A[b]	3.31	3.16	3.05	~~2.90~~	ARI 340/360
>70 and <223	2.64	N/A[b]	3.19	3.08	2.93	~~2.81~~	

Other Unitary Systems

System Size	Mandatory	~~Cooling Degree-Days (CDD10)~~Climate Zones					
(kW)	Minimum COP_c	~~0-3600~~ 5-8	~~3601-5400~~ 4	~~5401-7200~~ 3	~~7201-9000~~ 2	9001-10800	
		Minimum Cooling Efficiency Required (COP_c)[a]					Test Procedure[c]
≥19 and <40	3.02	N/A[b]	3.66	3.52	3.37	~~3.22~~	ARI 210/240
≥40 and ≤70	2.84	N/A[b]	3.37	3.24	3.11	~~2.96~~	ARI 340/360
>70 and <223	2.78	N/A[b]	3.28	3.14	3.02	~~2.87~~	

[a] Each EER shown below should be reduced by 0.2 for units with a heating section other than electric resistance heat.

[b] Elimination of required economizer is not allowed.

[c] Section 12 contains complete specification of the referenced test procedure, including the referenced year version of the test procedure

[Revise Section 6.2.3.2.2 as follows.]

6.2.3.2.2 Setback Controls. Heating systems located ~~where the *heating design temperature* is 40°F (4ºC) or less~~ in climate zones 2-8 shall be equipped with controls that have the capability to automatically restart and temporarily operate the system as required to maintain *zone* temperatures above a heating setpoint adjustable down to 55°F (13ºC) or lower. (See Appendix D for *heating design temperatures*.)

Cooling systems located ~~where the *cooling design temperature* is greater than 100°F (38ºC)~~ in climate zones 1b, 2b, and 3b shall be equipped with controls that have the capability to automatically restart and temporarily operate the system as required to maintain *zone* temperatures below a cooling setpoint adjustable up to 90°F (32ºC) or higher or to prevent high space humidity levels. (See Appendix D for *cooling design temperatures*.)

Exception to 6.2.3.2.2: Radiant floor and ceiling heating *systems.*

[Revise the exceptions to Sections 6.2.3.3.2 and 6.2.3.3.3 as follows.]

6.2.3.3.2 6.2.3.3.2 Gravity Hoods, Vents, and Ventilators. All outdoor air supply and exhaust hoods, vents, and ventilators shall be equipped with motorized dampers that will automatically shut when the spaces served are not in use.

Exceptions to 6.2.3.3.1 and 6.2.3.3.2:

(a) Gravity (nonmotorized) dampers are acceptable in buildings less than three stories in height above grade and for buildings of any height located in ~~climates with less than 2700 HDD65 (1500 HDD18)~~ Climate Zones 1,2 and 3.

(b) Ventilation systems serving unconditioned spaces.

6.2.3.3.3 Shutoff Damper Controls. Both outdoor air supply and exhaust systems shall be equipped with motorized dampers that will automatically shut when the systems or spaces served are not in use. Ventilation outside air dampers shall be capable of automatically shutting off during preoccupancy building warmup, cooldown, and *setback,* except when *ventilation* reduces energy costs (e.g., night purge) or when ventilation must be supplied to meet code requirements.

Exceptions to 6.2.3.3.3:

(a) Gravity (nonmotorized) dampers are acceptable in buildings less than three stories in height and for buildings of any height located in ~~climates with less than 2700 HDD65 (1500 HDD18)~~ Climate Zones 1,2 and 3.

(b) Gravity (nonmotorized) dampers are acceptable in systems with a design outside air intake or exhaust capacity of 300 cfm (140 L/s) or less.

[Delete Table 6.2.3.3.4 as shown below and replace it with the following new version of the table. For the deleted table, only the I-P version is shown. The replacement table shows both I-P and SI versions.]

~~**TABLE 6.2.3.3.4**~~
~~**Maximum Damper Leakage**~~

~~Climate~~	~~Maximum Damper Leakage at 1.0 in w.g.cfm per ft^2 of damper area~~	
	~~Motorized~~	~~Non-motorized~~
~~HDD65>7200 or CDD50>7200~~	~~4~~	~~Not allowed~~
~~HDD65<2701 and CDD50<3601~~	~~20~~	~~20[a]~~
~~All others~~	~~10~~	~~20[a]~~

~~Notes:~~

~~[a] Dampers smaller than 24 in. in either dimension may have leakage of 40 cfm/ft^2.~~

(I-P edition)

TABLE 6.2.3.3.4
Maximum Damper Leakage

Climate Zones	Maximum Damper Leakage at 1.0 in. w.g. cfm/ft^2 of damper area	
	Motorized	Non-Motorized
1, 2, 6, 7, 8	4	Not Allowed
All other climates	10	20[a]

Notes:

[a] Dampers smaller than 24 in. in either dimension may have leakage of 40 cfm/ft^2.

(SI edition)

TABLE 6.2.3.3.4
Maximum Damper Leakage

Climate Zones	Maximum Damper Leakage at 250 Pa (l/s per m^2 of damper area	
	Motorized	Non-Motorized
1, 2, 6, 7, 8	20	Not Allowed
All other climates	50	100[a]

Notes:

[a] Dampers smaller than 0.6 m in either dimension may have leakage of 200L/s per m^2.

[Delete the I-P and SI versions of Table 6.2.4.2A and B and replace them with the new I-P and SI versions that follow each deleted table. The order of the deleted and replacement tables is as follows on this page and the next seven pages: deleted Table 6.2.4.2A (I-P version), new Table 6.2.4.2A (I-P version), deleted Table 6.2.4.2B (I-P version), new Table 6.2.4.2B (I-P version), deleted Table 6.2.4.2A (SI version), new Table 6.2.4.2A (SI version), deleted Table 6.2.4.2B (SI version), new Table 6.2.4.2B (SI version).

(I-P edition)

~~TABLE 6.2.4.2A~~

~~Minimum Duct Insulation R-Value,[a] Cooling and Heating Only, Supply Ducts and Return Ducts~~

~~Climate Zone~~			~~Duct Location~~						
~~Envelope Criteria Table~~	~~HDD65~~	~~CDD50~~	~~Exterior~~	~~Ventilated Attic~~	~~Unvented Attic with Backloaded Ceiling~~	~~Unvented Attic with Roof Insulation~~	~~Unconditioned Space[b]~~	~~Indirectly Conditioned Space[c]~~	~~Buried~~
				~~Heating Ducts Only~~					
~~B-1 to B-7~~	~~0-1800~~	~~all~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~
~~B-8 to B-12~~	~~1801-3600~~	~~all~~	~~R-3.5~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~
~~B-13 to B-15~~	~~3601-5400~~	~~all~~	~~R-3.5~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~	~~none~~
~~B-16 to B-18~~	~~5401-7200~~	~~all~~	~~R-6~~	~~R-3.5~~	~~none~~	~~none~~	~~none~~	~~none~~	~~R-3.5~~
~~B-19 to B-20~~	~~7201-9000~~	~~all~~	~~R-6~~	~~R-6~~	~~R-3.5~~	~~none~~	~~none~~	~~none~~	~~R-3.5~~
~~B-21 to B-22~~	~~9001-10800~~	~~all~~	~~R-8~~	~~R-6~~	~~R-6~~	~~none~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-23~~	~~10801-12600~~	~~all~~	~~R-8~~	~~R-6~~	~~R-6~~	~~none~~	~~R-6~~	~~none~~	~~R-6~~
~~B-24~~	~~12601-16200~~	~~all~~	~~R-8~~	~~R-8~~	~~R-6~~	~~none~~	~~R-6~~	~~none~~	~~R-6~~
~~B-25~~	~~16201-19800~~	~~all~~	~~R-10~~	~~R-8~~	~~R-8~~	~~none~~	~~R-6~~	~~none~~	~~R-6~~
~~B-26~~	~~19801+~~	~~all~~	~~R-10~~	~~R-10~~	~~R-8~~	~~none~~	~~R-8~~	~~none~~	~~R-6~~
				~~Cooling Only Ducts~~					
~~B-15, 18, 20, 22 to 26~~	~~all~~	~~0-1800~~	~~R-1.9~~	~~R-1.9~~	~~R-1.9~~	~~R-1.9~~	~~R-1.9~~	~~none~~	~~none~~
~~B-12, 14, 17, 19, 21~~	~~all~~	~~1801-3600~~	~~R-3.5~~	~~R-1.9~~	~~R-3.5~~	~~R-1.9~~	~~R-1.9~~	~~none~~	~~none~~
~~B-7, 9, 11, 13, 16~~	~~all~~	~~3601-5400~~	~~R-3.5~~	~~R-3.5~~	~~R-6~~	~~R-1.9~~	~~R-1.9~~	~~none~~	~~none~~
~~B-4, 6, 8, 10~~	~~all~~	~~5401-7200~~	~~R-6~~	~~R-6~~	~~R-6~~	~~R-3.5~~	~~R-1.9~~	~~none~~	~~none~~
~~B-3, B-5~~	~~all~~	~~7201-9000~~	~~R-6~~	~~R-6~~	~~R-6~~	~~R-3.5~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-2~~	~~all~~	~~9001-10800~~	~~R-6~~	~~R-6~~	~~R-8~~	~~R-3.5~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-1~~	~~all~~	~~10801+~~	~~R-8~~	~~R-8~~	~~R-8~~	~~R-3.5~~	~~R-3.5~~	~~none~~	~~R-3.5~~
				~~Return Ducts~~					
~~B-1 to B-26~~	~~all climates~~		~~R-3.5~~	~~R-3.5~~	~~R-3.5~~	~~none~~	~~none~~	~~none~~	~~none~~

~~[a]Insulation R-values, measured in (h·ft²·°F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.~~

~~[b]Includes crawl spaces, both ventilated and unventilated.~~

~~[c]Includes return air plenums with or without exposed roofs above.~~

(I-P edition)

TABLE 6.2.4.2A

Minimum Duct Insulation R-Value,[a] Cooling and Heating Only, Supply Ducts and Return Ducts

Climate Zone	Duct Location						
	Exterior	Ventilated Attic	Unvented Attic with Backloaded Ceiling	Unvented Attic with Roof Insulation	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
Heating Ducts Only							
1, 2	None	none	none	none	none	none	none
3	R-3.5	none	none	none	none	none	none
4	R-3.5	none	none	none	none	none	none
5	R-6	R-3.5	none	none	none	none	R-3.5
6	R-6	R-6	R-3.5	none	none	none	R-3.5
7	R-8	R-6	R-6	none	R-3.5	none	R-3.5
8	R-8	R-8	R-6	none	R-6	none	R-6
Cooling Only Ducts							
7, 8	R-1.9	R-1.9	R-1.9	R-1.9	R-1.9	none	none
5, 6	R-3.5	R-1.9	R-3.5	R-1.9	R-1.9	none	none
4	R-3.5	R-3.5	R-6	R-1.9	R-1.9	none	none
3	R-6	R-6	R-6	R-3.5	R-1.9	none	none
2	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
1	R-6	R-6	R-8	R-3.5	R-3.5	none	R-3.5
Return Ducts							
1 to 8	R-3.5	R-3.5	R-3.5	none	none	none	none

[a] Insulation R-values, measured in $(h \cdot ft^2 \cdot °F)/Btu$, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.

[b] Includes crawl spaces, both ventilated and unventilated.

[c] Includes return air plenums with or without exposed roofs above.

(I-P edition)

TABLE 6.2.4.2B

Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Ducts

Climate Zone			Duct Location						
Envelope Criteria			Ventilated Attic	Unvented Attic w/ Backloaded Ceiling	Unvented Attic w/ Roof Insulation[a]	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
Table	HDD65	CDD50	Exterior					
B-1	0-900	10801+	R-8	R-6	R-8	R-3.5	R-3.5	none	R-3.5
B-2	0-900	9001-10800	R-6	R-6	R-8	R-3.5	R-3.5	none	R-3.5
B-3	0-900	7201-9000	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-4	0-900	0-7200	R-6	R-3.5	R-6	R-3.5	R-1.9	none	R-3.5
B-5	901-1800	7201+	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-6	901-1800	5401-7200	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-7	901-1800	0-5400	R-3.5	R-3.5	R-6	R-1.9	R-1.9	none	R-1.9
B-8	1801-2700	5401+	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-9	1801-2700	0-5400	R-6	R-3.5	R-6	R-1.9	R-1.9	none	R-1.9
B-10	2701-3600	5401+	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-11	2701-3600	3601-5400	R-6	R-6	R-6	R-3.5	R-3.5	none	R-1.9
B-12	2701-3600	0-3600	R-3.5	R-3.5	R-3.5	R-1.9	R-1.9	none	R-1.9
B-13	3601-5400	3601+	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-14	3601-5400	1801-3600	R-6	R-3.5	R-6	R-1.9	R-3.5	none	R-1.9
B-15	3601-5400	0-1800	R-3.5	R-3.5	R-3.5	R-1.9	R-1.9	none	R-1.9
B-16	5401-7200	3601+	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
B-17	5401-7200	1801-3600	R-6	R-6	R-6	R-1.9	R-3.5	none	R-3.5
B-18	5401-7200	0-1800	R-6	R-3.5	R-3.5	R-1.9	R-3.5	none	R-3.5

~~**TABLE 6.2.4.2B** *(Continued)*~~

~~**Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Ducts**~~

~~B-19~~	~~7201-9000~~	~~1801+~~	~~R-8~~	~~R-6~~	~~R-6~~	~~R-1.9~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-20~~	~~7201-9000~~	~~0-1800~~	~~R-6~~	~~R-6~~	~~R-6~~	~~R-1.9~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-21~~	~~9001-10800~~	~~1801+~~	~~R-8~~	~~R-6~~	~~R-6~~	~~R-1.9~~	~~R-6~~	~~none~~	~~R-3.5~~
~~B-22~~	~~9001-10800~~	~~0-1800~~	~~R-8~~	~~R-6~~	~~R-6~~	~~R-1.9~~	~~R-3.5~~	~~none~~	~~R-3.5~~
~~B-23~~	~~10801-12600~~	~~all~~	~~R-8~~	~~R-6~~	~~R-6~~	~~R-1.9~~	~~R-6~~	~~none~~	~~R-6~~
~~B-24~~	~~12601-16200~~	~~all~~	~~R-8~~	~~R-8~~	~~R-8~~	~~R-1.9~~	~~R-6~~	~~none~~	~~R-6~~
~~B-25~~	~~16201-19800~~	~~all~~	~~R-10~~	~~R-8~~	~~R-8~~	~~R-3.5~~	~~R-6~~	~~none~~	~~R-6~~
~~B-26~~	~~19801+~~	~~all~~	~~R-10~~	~~R-10~~	~~R-8~~	~~R-3.5~~	~~R-8~~	~~R-3.5~~	~~R-6~~

~~a Insulation R-values, measured in (h·ft^2·°F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.~~

~~b Includes crawl spaces, both ventilated and non-ventilated.~~

~~c Includes return air plenums with or without exposed roofs above.~~

(I-P edition)

TABLE 6.2.4.2B
Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Ducts

Climate Zone	Duct Location						
Climate Zone	Exterior	Ventilated Attic	Unvented Attic w/ Backloaded Ceiling	Unvented Attic w/ Roof Insulation[a]	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
1	R-6	R-6	R-8	R-3.5	R-3.5	none	R-3.5
2	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
3	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
4	R-6	R-6	R-6	R-3.5	R-3.5	none	R-3.5
5	R-6	R-6	R-6	R-1.9	R-3.5	none	R-3.5
6	R-8	R-6	R-6	R-1.9	R-3.5	none	R-3.5
7	R-8	R-6	R-6	R-1.9	R-3.5	none	R-3.5
8	R-8	R-8	R-8	R-1.9	R-6	none	R-6

a Insulation R-values, measured in (h·ft^2·°F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 75°F at the installed thickness.

b Includes crawl spaces, both ventilated and unventilated.

C Includes return air plenums with or without exposed roofs above.

(SI edition)

TABLE 6.2.4.2A

Minimum Duct Insulation R-Value,[a] Cooling and Heating Only Supply Ducts and Return Ducts

Climate Zone			Duct Location						
Envelope Criteria Table	HDD18	CDD10	Exterior	Ventilated Attic	Unvented Attic with Backloaded Ceiling	Unvented Attic with Roof Insulation	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
Heating Ducts Only									
B-1 to B-7	0-1000	all	none	none	none	none	none	none	none
B-8 to B-12	1001-2000	all	R-0.62	none	none	none	none	none	none
B-13 to B-15	2001-3000	all	R-0.62	none	none	none	none	none	none
B-16 to B-18	3001-4000	all	R-1.06	R-0.62	none	none	none	none	R-0.62
B-19 to B-20	4001-5000	all	R-1.06	R-1.06	R-0.62	none	none	none	R-0.62
B-21 to B-22	5001-6000	all	R-1.41	R-1.06	R-1.06	none	R-0.62	none	R-0.62
B-23	6001-7000	all	R-1.41	R-1.06	R-1.06	none	R-1.06	none	R-1.06
B-24	7001-9000	all	R-1.41	R-1.41	R-1.06	none	R-1.06	none	R-1.06
B-25	9001-11000	all	R-1.76	R-1.41	R-1.41	none	R-1.06	none	R-1.06
B-26	11001+	all	R-1.76	R-1.76	R-1.41	none	R-1.41	none	R-1.06
Cooling Only Ducts									
B-15, 18, 20, 22 to 26	all	0-1000	R-0.34	R-0.34	R-0.34	R-0.34	R-0.34	none	none
B-12, 14, 17, 19, 21	all	1001-2000	R-0.62	R-0.34	R-0.62	R-0.34	R-0.34	none	none
B-7, 9, 11, 13, 16	all	2001-3000	R-0.62	R-0.62	R-1.06	R-0.34	R-0.34	none	none
B-4, 6, 8, 10	all	3001-4000	R-1.06	R-1.06	R-1.06	R-0.62	R-0.34	none	none
B-3, B-5	all	4001-5000	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-2	all	5001-6000	R-1.06	R-1.06	R-1.41	R-0.62	R-0.62	none	R-0.62
B-1	all	6001+	R-1.41	R-1.41	R-1.41	R-0.62	R-0.62	none	R-0.62
Return Ducts									
B-1 to B-26	all climates		R-3.5	R-3.5	R-3.5	none	none	none	none

[a] Insulation R-values, measured in $(m^2 \cdot k)/W$, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 23.9°C at the installed thickness.

[b] Includes crawl spaces, both ventilated and nonventilated.

[c] Includes return air plenums with or without exposed roofs above.

(SI edition)

TABLE 6.2.4.2A
Minimum Duct Insulation R-Value,[a] Cooling and Heating Only Supply Ducts and Return Ducts

Climate Zone	Duct Location						
	Exterior	Ventilated Attic	Unvented Attic with Backloaded Ceiling	Unvented Attic with Roof Insulation	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
Heating Ducts Only							
1, 2	None	none	none	none	none	none	none
3	R-0.62	none	none	none	none	none	none
4	R-0.62	none	none	none	none	none	none
5	R-1.06	R-0.62	none	none	none	none	R-0.62
6	R-1.06	R-1.06	R-0.62	none	none	none	R-0.62
7	R-1.41	R-1.06	R-1.06	none	R-0.62	none	R-0.62
8	R-1.41	R-1.41	R-1.06	none	R-1.06	none	R-1.06
Cooling Only Ducts							
7, 8	R-0.34	R-0.34	R-0.34	R-0.34	R-0.34	none	none
5, 6	R-0.62	R-0.34	R-0.62	R-0.34	R-0.34	none	none
4	R-0.62	R-0.62	R-1.06	R-0.34	R-0.34	none	none
3	R-1.06	R-1.06	R-1.06	R-0.62	R-0.34	none	none
2	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
1	R-1.06	R-1.06	R-1.41	R-0.62	R-0.62	none	R-0.62
Return Ducts							
1 to 8	R-0.62	R-0.62	R-0.62	none	none	none	none

[a] Insulation R-values, measured in (m^2·K)/W, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 23.9°C at the installed thickness.

[b] Includes crawl spaces, both ventilated and unventilated.

[c] Includes return air plenums with or without exposed roofs above.

(SI edition)

TABLE 6.2.4.2B
Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Ducts

Climate Zone			Duct Location					
Envelope Criteria				Ventilated Attic	Unvented Attic w/ Backloaded Ceiling	Unvented Attic w/ Roof Insulation[a]	Unconditioned Space[b]	Indirectly Conditioned Space[c]	Buried
Table	HDD18	CDD10	Exterior						
B-1	0-500	6001+	R-1.41	R-1.06	R-1.41	R-0.62	R-0.62	none	R-0.62
B-2	0-500	5001-6000	R-1.06	R-1.06	R-1.41	R-0.62	R-0.62	none	R-0.62
B-3	0-500	4001-5000	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-4	0-500	0-4000	R-1.06	R-0.62	R-1.06	R-0.62	R-0.34	none	R-0.62
B-5	501-1000	4001+	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-6	501-1000	3001-4000	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-7	501-1000	0-3000	R-0.62	R-0.62	R-1.06	R-0.34	R-0.34	none	R-0.34
B-8	1001-1500	3001+	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-9	1001-1500	0-3000	R-1.06	R-0.62	R-1.06	R-0.34	R-0.34	none	R-0.34
B-10	1501-2000	3001+	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-11	1501-2000	2001-3000	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.34
B-12	1501-2000	0-2000	R-0.62	R-0.62	R-0.62	R-0.34	R-0.34	none	R-0.34
B-13	2001-3000	2001+	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-14	2001-3000	1001-2000	R-1.06	R-0.62	R-1.06	R-0.34	R-0.62	none	R-0.34
B-15	2001-3000	0-1000	R-0.62	R-0.62	R-0.62	R-0.34	R-0.34	none	R-0.34
B-16	3001-4000	2001+	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
B-17	3001-4000	1001-2000	R-1.06	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
B-18	3001-4000	0-1000	R-1.06	R-0.62	R-0.62	R-0.34	R-0.62	none	R-0.62
B-19	4001-5000	1001+	R-1.41	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
B-20	4001-5000	0-1000	R-1.06	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
B-21	5001-6000	1001+	R-1.41	R-1.06	R-1.06	R-0.34	R-1.06	none	R-0.62
B-22	5001-6000	0-1000	R-1.41	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
B-23	6001-7000	all	R-1.41	R-1.06	R-1.06	R-0.34	R-1.06	none	R-1.06
B-24	7001-9000	all	R-1.41	R-1.41	R-1.41	R-0.34	R-1.06	none	R-1.06
B-25	9001-11000	all	R-1.76	R-1.41	R-1.41	R-0.62	R-1.06	none	R-1.06
B-26	11001+	all	R-1.76	R-1.76	R-1.41	R-0.62	R-1.41	R-0.62	R-1.06

[a]Insulation R-values, measured in $(m^2 \cdot k)/W$, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 23.9ºC at the installed thickness.

[b]Includes crawl spaces, both ventilated and non-ventilated.

[c]Includes return air plenums with or without exposed roofs above.

(SI edition)

TABLE 6.2.4.2B
Minimum Duct Insulation R-Value,[a] Combined Heating and Cooling Ducts

Climate Zone	Duct Location						
Climate Zone	Exterior	Ventilated Attic	Unvented Attic w/ Backloaded Ceiling	Unvented Attic w/ Roof Insulation[a]	Uncon-ditioned Space[b]	Indirectly Condi-tioned Space[c]	Buried
1	R-1.06	R-1.06	R-1.41	R-0.62	R-0.62	none	R-0.62
2	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
3	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
4	R-1.06	R-1.06	R-1.06	R-0.62	R-0.62	none	R-0.62
5	R-1.06	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
6	R-1.41	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
7	R-1.41	R-1.06	R-1.06	R-0.34	R-0.62	none	R-0.62
8	R-1.41	R-1.41	R-1.41	R-0.34	R-1.06	none	R-1.06

[a] Insulation R-values, measured in $(m^2 \cdot K)/W$, are for the insulation as installed and do not include film resistance. The required minimum thicknesses do not consider water vapor transmission and possible surface condensation. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of 6.2.4.2 or Section 5. Insulation resistance measured on a horizontal plane in accordance with ASTM C518 at a mean temperature of 23.9°C at the installed thickness.

[b] Includes crawl spaces, both ventilated and unventilated.

[c] Includes return air plenums with or without exposed roofs above.

[Revise Exception "c" to Section 6.3.1.3 as shown below.]

6.3.1.3 Integrated Economizer Control. Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load.

Exceptions to 6.3.1.3:

(a) Direct expansion systems that include controls that reduce the quantity of outdoor air required to prevent coil frosting at the lowest step of compressor unloading, provided this lowest step is no greater than 25% of the total system capacity.

(b) Individual direct expansion units that have a rated cooling capacity less than 65,000 Btu/h (19kW) and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.

(c) Systems in ~~locations having less than 800 average hours per year between 8 a.m. and 4 p.m. when the ambient dry bulb temperatures are between 55°F (13°C) and 69°F (21°C) inclusive. (See Appendix D for climatic data.)~~Climate Zones 1, 2, 3a, 4a, 5a, 5b, 6, 7, 8.

[Delete Table 6.3.1 as shown below and replace it with the following new version of the table. For the deleted table, only the I-P version is shown.]

(I-P edition)

TABLE 6.3.1
Minimum System Size for Which an Economizer is Required

		1% Cooling Design Wet-Bulb Temperature	
	$T_{wb} < 69°F$	$69°F \le T_{wb} \le 73°F$	$T_{wb} > 73°F$
No. of Hours Between 8 a.m. and 4 p.m. with $55°F < T_{db} < 69°F$	Minimum System Size (Btu/h)	Minimum System Size (Btu/h)	Minimum System Size (Btu/h)
0-199	N.R.[a]	N.R.	N.R.
200-399	135,000	N.R.	N.R.
400-599	135,000	N.R.	N.R.
600-799	65,000	135,000	N.R.
800-999	65,000	135,000	135,000
1000-1199	65,000	65,000	135,000
>1199	65,000	65,000	65,000

[a]N.R. means that there is no system size for which an economizer is a requirement in this climate.

(I-P edition)

TABLE 6.3.1
Minimum System Size for Which an Economizer is Required

Climate Zones	Cooling Capacity for Which an Economizer is Required
1a, 1b, 2a, 3a, 4a	No Economizer Requirement
2b, 5a, 6a, 7, 8	≥135,000 Btu/h
3b, 3c, 4b, 4c, 5b, 5c, 6b	≥65,000 Btu/h

(SI edition)

TABLE 6.3.1
Minimum System Size for Which an Economizer is Required

Climate Zones	Cooling Capacity for Which an Economizer is Required
1a, 1b, 2a, 3a, 4a	No Economizer Requirement
2b, 5a, 6a, 7, 8	≥40kW
3b, 3c, 4b, 4c, 5b, 5c, 6b	≥19kW

[Revise Tables 6.3.1.1.3 A and B as shown below.]

(I-P edition)

TABLE 6.3.1.1.3A
High Limit Shutoff Control Options for Air Economizers

Climate Zones	Allowed Control Types	Prohibited Control Types
~~Dry~~ ~~T_{wb} < 69°F~~ ~~or~~ ~~(T_{wb} < 75°F~~ ~~and T_{db} ≥ 100°F)~~[a] 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7, 8	Fixed Dry Bulb Differential Dry Bulb Electronic Enthalpy[b] Differential Enthalpy	Fixed Enthalpy
~~Intermediate~~ ~~69°F ≤ T_{wb} ≤ 73°F~~ ~~T_{db} < 100°F~~ All Other Climates	Fixed Dry Bulb Differential Dry Bulb Fixed Enthalpy Electronic Enthalpy[~~b~~a] Differential Enthalpy	
~~Humid~~ ~~T_{wb} > 73°F~~ 1a, 2a, 3a, 4a	Fixed Dry Bulb Fixed Enthalpy Electronic Enthalpy[~~b~~a] Differential Enthalpy	Differential Dry Bulb
[~~a~~] ~~T_{wb} is the 1% *cooling design* wet-bulb temperature. T_{db} is the 1% *cooling design* dry-bulb temperature.~~ [a~~b~~]-Electronic enthalpy controllers are devices that use a combination of humidity and dry-bulb temperature in their switching algorithm		

(SI edition)

TABLE 6.3.1.1.3A
High Limit Shutoff Control Options for Air Economizers

Climate Zones	Allowed Control Types	Prohibited Control Types
~~Dry~~ ~~T_{wb} < 21°C~~ ~~or~~ ~~(T_{wb} < 24°C~~ ~~and T_{db} ≥ 38°C)~~[a] 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7, 8	Fixed Dry Bulb Differential Dry Bulb Electronic Enthalpy[b] Differential Enthalpy	Fixed Enthalpy
~~Intermediate~~ ~~21°C ≤ T_{wb} ≤ 23°C~~ ~~T_{db} < 38°C~~ All Other Climates	Fixed Dry Bulb Differential Dry Bulb Fixed Enthalpy Electronic Enthalpy[~~b~~a] Differential Enthalpy	
~~Humid~~ ~~T_{wb} > 23°C~~ 1a, 2a, 3a, 4a	Fixed Dry Bulb Fixed Enthalpy Electronic Enthalpy[~~b~~a] Differential Enthalpy	Differential Dry Bulb
[~~a~~] ~~T_{wb} is the 1% *cooling design* wet-bulb temperature. T_{db} is the 1% *cooling design* dry-bulb temperature.~~ [a~~b~~]-Electronic enthalpy controllers are devices that use a combination of humidity and dry-bulb temperature in their switching algorithm		

(I-P edition)

TABLE 6.3.1.1.3B
High Limit Shutoff Control Settings for Air Economizers

Device Type	Climate Zones	Required High Limit (Economizer Off When):	
		Equation	Description
Fixed Dry Bulb	~~Dry~~ 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7, 8	$T_{OA} > 75°F$	Outside air temperature exceeds 75°F
	~~Intermediate~~ 5a, 6a, 7a	$T_{OA} > 70°F$	Outside air temperature exceeds 70°F
	~~Humid~~ All Other Zones	$T_{OA} > 65°F$	Outside air temperature exceeds 65°F
Differential Dry Bulb	~~All~~ 1b, 2b, 3b, 3c, 4b, 4c, 5a, 5b, 5c, 6a, 6b, 7, 8	$T_{OA} > T_{RA}$	Outside air temperature exceeds return air temperature
Fixed Enthalpy	All	$h_{OA} > 28$ Btu/lb [b]	Outside air enthalpy exceeds 28 Btu/lb of dry air[b]
Electronic Enthalpy	All	$(T_{OA}, RH_{OA}) > A$	Outside air temperature/RH exceeds the "A" setpoint curve[a]
Differential Enthalpy	All	$h_{OA} > h_{RA}$	Outside air enthalpy exceeds return air enthalpy

[a] Setpoint "A" corresponds to a curve on the psychometric chart that goes through a point at approximately 75°F and 40% relative humidity and is nearly parallel to dry-bulb lines at low humidity levels and nearly parallel to enthalpy lines at high humidity levels.

[b] At altitudes substantially different than sea level, the fixed enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at approximately 6000 ft elevation the fixed enthalpy limit is approximately 30.7 Btu/lb.

(SI edition)

TABLE 6.3.1.1.3B
High Limit Shutoff Control Settings for Air Economizers

Device Type	Climate Zones	Required High Limit (Economizer Off When):	
		Equation	Description
Fixed Dry Bulb	~~Dry~~ 1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7, 8	$T_{OA} > 24°C$	Outside air temperature exceeds 24°C
	~~Intermediate~~ 5a, 6a, 7a	$T_{OA} > 21°C$	Outside air temperature exceeds 21°C
	~~Humid~~ All Other Zones	$T_{OA} > 18°C$	Outside air temperature exceeds 18°C
Differential Dry Bulb	~~All~~ 1b, 2b, 3b, 3c, 4b, 4c, 5a, 5b, 5c, 6a, 6b, 7, 8	$T_{OA} > T_{RA}$	Outside air temperature exceeds return air temperature
Fixed Enthalpy	All	$h_{OA} > 47$ kJ/kg [b]	Outside air enthalpy exceeds 47 kJ/kg of dry air[b]
Electronic Enthalpy	All	$(T_{OA}, RH_{OA}) > A$	Outside air temperature/RH exceeds the "A" set-point curve[a]
Differential Enthalpy	All	$h_{OA} > h_{RA}$	Outside air enthalpy exceeds return air enthalpy

[a] Setpoint "A" corresponds to a curve on the psychometric chart that goes through a point at approximately 24°C and 40% relative humidity and is nearly parallel to dry-bulb lines at low humidity levels and nearly parallel to enthalpy lines at high humidity levels.

[b] At altitudes substantially different from sea level, the fixed enthalpy limit value shall be set to the enthalpy value at 24°C and 50% relative humidity. As an example, at approximately 1830 m elevation the fixed enthalpy limit is approximately 53.5 kJ/kg.

[Revise Section 6.3.2.2.3 as shown below.]

6.3.2.2.3 Hydronic (Water Loop) Heat Pump Systems. Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g., cooling tower) and heat addition (e.g., boiler) shall have the following:

a. Controls that are capable of providing a heat pump water supply temperature deadband of at least 20°F (12°C) between initiation of heat rejection and heat addition by the central devices (e.g., tower and boiler).

b. For ~~climates with greater than 1800 HDD65 (1000 HDD18)~~Climate Zones 3 through 8, if a closed-circuit tower (fluid cooler) is used, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower (for freeze protection) or low-leakage positive closure dampers shall be provided. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower. If an open-circuit tower is used in conjunction with a separate heat exchanger to isolate the tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

Exception to 6.3.2.2.3: Where a system loop temperature optimization controller is used to determine the most efficient operating temperature based on real-time conditions of demand and capacity, dead bands of less than 20°F (12°C) shall be allowed.

[Revise Section 6.3.5.2 as shown below.]

6.3.5.2 Fan Speed Control. Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two-thirds of full speed or less and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device.

Exceptions to 6.3.5.2:

(a) Condenser fans serving multiple refrigerant circuits.

(b) Condenser fans serving flooded condensers.

(c) Installations located in ~~climates with greater than 7200 CDD50 (4000 CDD10).~~Climate Zones 1 and 2.

(d) Up to one-third of the fans on a condenser or tower with multiple fans, where the lead fans comply with the speed control requirement

[Revise the exceptions to Section 6.3.6.1 as follows.]

6.3.6 Energy Recovery

6.3.6.1 Exhaust Air Energy Recovery. Individual fan systems that have both a design supply air capacity of 5000 cfm (2400 L/s) or greater and have a minimum outside air supply of 70% or greater of the design supply air quantity shall have an energy recovery system with at least 50% recovery effectiveness. Fifty percent energy recovery effectiveness shall mean a change in the enthalpy of the outdoor air supply equal to 50% of the difference between the outdoor air and return air at design conditions. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by 6.3.1.1.

Exceptions to 6.3.6.1:

(a) (a) Laboratory systems meeting 6.3.7.2.

(b) Systems serving spaces that are not cooled and that are heated to less than 60°F (16°C).

(c) Systems exhausting toxic, flammable, paint or corrosive fumes or dust.

(d) Commercial kitchen hoods (grease) classified as Type 1 by *NFPA 96*.

(e) Where more than 60% of the outdoor air heating energy is provided from site-recovered or site solar energy.

(f) Heating systems in ~~climates with less than 3600 HDD65 (2000 HDD18).~~Climate Zones 1 through 3.

(g) Cooling systems ~~in climates with a 1% cooling design wet bulb temperature less than 65°F (18°C).~~in Climate Zones 3c, 4c, 5b, 5c, 6b, 7 and 8.

(h) Where the largest exhaust source is less than 75% of the design outdoor airflow.

(i) Systems requiring dehumidification that employ series-style energy recovery coils wrapped around the cooling coil.

[Delete the entire existing Appendix B and replace it with the following new version of Appendix B.]

(This is a normative appendix and is part of this standard.)

NORMATIVE APPENDIX B

BUILDING ENVELOPE CLIMATE CRITERIA

B1 General. This normative appendix provides the information to determine both United States and International climate zones. For U.S locations, use either Figure B-1 or Table B-1 to determine the climate zone number and letter that is required for determining compliance regarding various sections and tables in this standard. Figure B-1 contains the county-by-county climate zone map for the United States. Table B-1 lists each state and major counties within the state and shows the climate number and letter for each county listed.

Table B-2 shows the climate zone number for a wide variety of Canadian locations. When the climate zone letter is required to determine compliance with this standard, refer to Table B-4 and the "Major Climate Type Definitions" in Section B2 to determine the letter (A, B, or C).

Table B-3 shows the climate zone number for a wide variety of other international locations besides Canada. When the climate zone letter is required to determine compliance with this standard, refer to Table B-4 and the "Major Climate Type Definitions" in Section B2 to determine the letter (A, B, or C).

For all international locations that are not listed either in Table B-2 or B-3, use Table B-4 and the "Major Climate Type Definitions" in Section B2 to determine both the climate zone letter and number.

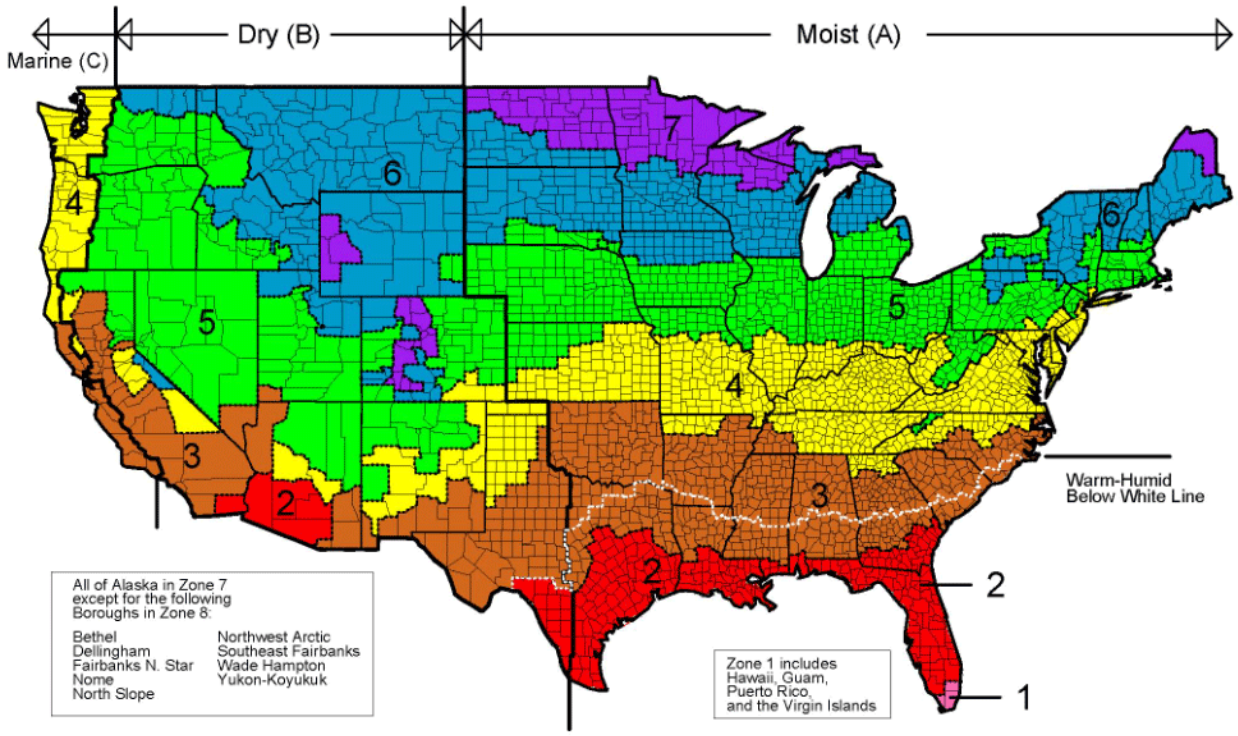

Figure B-1 Climate zones for United States locations.

(I-P edition)

Note: CDD50 and HDD65 values may be found in Normative Appendix D.

(SI edition)

Note: CDD10 and HDD18 values may be found in Normative Appendix D.

TABLE B-1
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Alabama (AL)		Searcy	4A	Colorado (CO)		Zone 2A Except	
Zone 3A Except		Stone	4A	Zone 5B Except		Broward	1A
Baldwin	2A	Washington	4A	Baca	4B	Miami-Dade	1A
Mobile	2A	California (CA)		Las Animas	4B	Monroe	1A
Alaska (AK)		Zone 3B Except		Otero	4B	Georgia (GA)	
Zone 7 Except		Imperial	2B	Alamosa	6B	Zone 3A Except	
Bethel (CA)	8	Alameda	3C	Archuleta	6B	Appling	2A
Dillingham (CA)	8	Marin	3C	Chaffee	6B	Atkinson	2A
Fairbanks North Star	8	Mendocino	3C	Conejos	6B	Bacon	2A
Nome (CA)	8	Monterey	3C	Costilla	6B	Baker	2A
North Slope	8	Napa	3C	Custer	6B	Berrien	2A
Northwest Arctic	8	San Benito	3C	Dolores	6B	Brantley	2A
Southeast Fairbanks (CA)	8	San Francisco	3C	Eagle	6B	Brooks	2A
Wade Hampton (CA)	8	San Luis Obispo	3C	Moffat	6B	Bryan	2A
Yukon-Koyukuk (CA)	8	San Mateo	3C	Ouray	6B	Camden	2A
Arizona (AZ)		Santa Barabara	3C	Rio Blanco	6B	Charlton	2A
Zone 3B Except		Santa Clara	3C	Saguache	6B	Chatham	2A
La Paz	2B	Santa Cruz	3C	San Miguel	6B	Clinch	2A
Maricopa	2B	Sonoma	3C	Clear Creek	7	Colquitt	2A
Pima	2B	Ventura	3C	Grand	7	Cook	2A
Pinal	2B	Amador	4B	Gunnison	7	Decatur	2A
Yuma	2B	Calaveras	4B	Hinsdale	7	Echols	2A
Gila	4B	Del Norte	4B	Jackson	7	Effingham	2A
Yavapai	4B	El Dorado	4B	Lake	7	Evans	2A
Apache	5B	Humboldt	4C	Mineral	7	Glynn	2A
Coconino	5B	Inyo	4B	Park	7	Grady	2A
Navajo	5B	Lake	4B	Pitkin	7	Jeff Davis	2A
Arkansas (AR)		Mariposa	4B	Rio Grande	7	Lanier	2A
Zone 3A Except		Trinity	4B	Routt	7	Liberty	2A
Baxter	4A	Tuolumne	4B	San Juan	7	Long	2A
Benton	4A	Lassen	5B	Summit	7	Lowndes	2A
Boone	4A	Modoc	5B	Connecticut (CT)		McIntosh	2A
Carroll	4A	Nevada	5B	Zone 5A		Miller	2A
Fulton	4A	Plumas	5B	Delaware (DE)		Mitchell	2A
Izard	4A	Sierra	5B	Zone 4A		Pierce	2A
Madison	4A	Siskiyou	5B	District of Columbia (DC)		Seminole	2A
Marion	4A	Alpine	6B	Zone 4A		Tattnall	2A
Newton	4A	Mono	6B	Florida (FL)		Thomas	2A

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Toombs	2A	Lincoln	5B	Wabash	4A	Buchanan	6A
Ware	2A	Minidoka	5B	Washington	4A	Buena Vista	6A
Wayne	2A	Nez Perce	5B	Wayne	4A	Butler	6A
Banks	4A	Owyhee	5B	White	4A	Calhoun	6A
Catoosa	4A	Payette	5B	Williamson	4A	Cerro Gordo	6A
Chattooga	4A	Power	5B	Indiana (IN)		Cherokee	6A
Dade	4A	Shoshone	5B	Zone 5A Except		Chickasaw	6A
Dawson	4A	Twin Falls	5B	Brown	4A	Clay	6A
Fannin	4A	Washington	5B	Clark	4A	Clayton	6A
Floyd	4A	Illinois (IL)		Crawford	4A	Delaware	6A
Franklin	4A	Zone 5A Except		Daviess	4A	Dickinson	6A
Gilmer	4A	Alexander	4A	Dearborn	4A	Emmet	6A
Gordon	4A	Bond	4A	Dubois	4A	Fayette	6A
Habersham	4A	Christian	4A	Floyd	4A	Floyd	6A
Hall	4A	Clay	4A	Gibson	4A	Franklin	6A
Lumpkin	4A	Clinton	4A	Greene	4A	Grundy	6A
Murray	4A	Crawford	4A	Harrison	4A	Hamilton	6A
Pickens	4A	Edwards	4A	Jackson	4A	Hancock	6A
Rabun	4A	Effingham	4A	Jefferson	4A	Hardin	6A
Stephens	4A	Fayette	4A	Jennings	4A	Howard	6A
Towns	4A	Franklin	4A	Knox	4A	Humboldt	6A
Union	4A	Gallatin	4A	Lawrence	4A	Ida	6A
Walker	4A	Hamilton	4A	Martin	4A	Kossuth	6A
White	4A	Hardin	4A	Monroe	4A	Lyon	6A
Whitfield	4A	Jackson	4A	Ohio	4A	Mitchell	6A
Hawaii (HI)		Jasper	4A	Orange	4A	O'Brien	6A
Zone 1A		Jefferson	4A	Perry	4A	Osceola	6A
Idaho (ID)		Johnson	4A	Pike	4A	Palo Alto	6A
Zone 6B Except		Lawrence	4A	Posey	4A	Plymouth	6A
Ada	5B	Macoupin	4A	Ripley	4A	Pocahontas	6A
Benewah	5B	Madison	4A	Scott	4A	Sac	6A
Canyon	5B	Monroe	4A	Spencer	4A	Sioux	6A
Cassia	5B	Montgomery	4A	Sullivan	4A	Webster	6A
Clearwater	5B	Perry	4A	Switzerland	4A	Winnebago	6A
Elmore	5B	Pope	4A	Vanderburgh	4A	Winneshiek	6A
Gem	5B	Pulaski	4A	Warrick	4A	Worth	6A
Gooding	5B	Randolph	4A	Washington	4A	Wright	6A
Idaho	5B	Richland	4A	Iowa (IA)		Kansas (KS)	
Jerome	5B	Saline	4A	Zone 5A Except		Zone 4A Except	
Kootenai	5B	Shelby	4A	Allamakee	6A	Cheyenne	5A
Latah	5B	St. Clair	4A	Black Hawk	6A	Cloud	5A
Lewis	5B	Union	4A	Bremer	6A	Decatur	5A

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Ellis	5A	Madison	3A	Lake	6A	Itasca	7
Gove	5A	Morehouse	3A	Leelanau	6A	Kanabec	7
Graham	5A	Natchitoches	3A	Manistee	6A	Kittson	7
Greeley	5A	Ouachita	3A	Marquette	6A	Koochiching	7
Hamilton	5A	Red River	3A	Mason	6A	Lake	7
Jewell	5A	Richland	3A	Mecosta	6A	Lake of the Woods	7
Lane	5A	Sabine	3A	Menominee	6A	Mahnomen	7
Logan	5A	Tensas	3A	Missaukee	6A	Marshall	7
Mitchell	5A	Union	3A	Montmorency	6A	Mille Lacs	7
Ness	5A	Vernon	3A	Newaygo	6A	Norman	7
Norton	5A	Webster	3A	Oceana	6A	Otter Tail	7
Osborne	5A	West Carroll	3A	Ogemaw	6A	Pennington	7
Phillips	5A	Winn	3A	Osceola	6A	Pine	7
Rawlins	5A	Maine (ME)		Oscoda	6A	Polk	7
Republic	5A	Zone 6A Except		Otsego	6A	Red Lake	7
Rooks	5A	Aroostook	7	Presque Isle	6A	Roseau	7
Scott	5A	Maryland (MD)		Roscommon	6A	St. Louis	7
Sheridan	5A	Zone 4A Except		Sanilac	6A	Wadena	7
Sherman	5A	Garrett	5A	Wexford	6A	Wilkin	7
Smith	5A	Massachusetts (MA)		Baraga	7	Mississippi (MS)	
Thomas	5A	Zone 5		Chippewa	7	Zone 3A Except	
Trego	5A	Michigan (MI)		Gogebic	7	Hancock	2A
Wallace	5A	Zone 5A Except		Houghton	7	Harrison	2A
Wichita	5A	Alcona	6A	Iron	7	Jackson	2A
Kentucky (KY)		Alger	6A	Keweenaw	7	Pearl River	2A
Zone 4A		Alpena	6A	Luce	7	Stone	2A
Louisiana (LA)		Antrim	6A	Mackinac	7	Missouri (MO)	
Zone 2A Except		Arenac	6A	Ontonagon	7	Zone 4A Except	
Bienville	3A	Benzie	6A	Schoolcraft	7	Adair	5A
Bossier	3A	Charlevoix	6A	Minnesota (MN)		Andrew	5A
Caddo	3A	Cheboygan	6A	Zone 6A Except		Atchison	5A
Caldwell	3A	Clare	6A	Aitkin	7	Buchanan	5A
Catahoula	3A	Crawford	6A	Becker	7	Caldwell	5A
Claiborne	3A	Delta	6A	Beltrami	7	Chariton	5A
Concordia	3A	Dickinson	6A	Carlton	7	Clark	5A
De Soto	3A	Emmet	6A	Cass	7	Clinton	5A
East Carroll	3A	Gladwin	6A	Clay	7	Daviess	5A
Franklin	3A	Grand Traverse	6A	Clearwater	7	Gentry	5A
Grant	3A	Huron	6A	Cook	7	Grundy	5A
Jackson	3A	Iosco	6A	Crow Wing	7	Harrison	5A
La Salle	3A	Isabella	6A	Grant	7	Holt	5A
Lincoln	3A	Kalkaska	6A	Hubbard	7	Knox	5A

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Lewis	5A	Chaves	3B	Jefferson	6A	Martin	3A
Linn	5A	Dona Ana	3B	Lewis	6A	Mecklenburg	3A
Livingston	5A	Eddy	3B	Madison	6A	Montgomery	3A
Macon	5A	Hidalgo	3B	Montgomery	6A	Moore	3A
Marion	5A	Lea	3B	Oneida	6A	New Hanover	3A
Mercer	5A	Luna	3B	Otsego	6A	Onslow	3A
Nodaway	5A	Otero	3B	Schoharie	6A	Pamlico	3A
Pike	5A	Bernalillo	4B	Schuyler	6A	Pasquotank	3A
Putnam	5A	Curry	4B	St. Lawrence	6A	Pender	3A
Ralls	5A	DeBaca	4B	Steuben	6A	Perquimans	3A
Schuyler	5A	Grant	4B	Sullivan	6A	Pitt	3A
Scotland	5A	Guadalupe	4B	Tompkins	6A	Randolph	3A
Shelby	5A	Lincoln	4B	Ulster	6A	Richmond	3A
Sullivan	5A	Quay	4B	Warren	6A	Robeson	3A
Worth	5A	Roosevelt	4B	Wyoming	6A	Rowan	3A
Montana (MT)		Sierra	4B	North Carolina (NC)		Sampson	3A
Zone 6B		Socorro	4B	Zone 4A Except		Scotland	3A
Nebraska (NE)		Union	4B	Anson	3A	Stanly	3A
Zone 5A		Valencia	4B	Beaufort	3A	Tyrrell	3A
Nevada (NV)		New York (NY)		Bladen	3A	Union	3A
Zone 5B Except		Zone 5A Except		Brunswick	3A	Washington	3A
Clark	3B	Bronx	4A	Cabarrus	3A	Wayne	3A
New Hampshire (NH)		Kings	4A	Camden	3A	Wilson	3A
Zone 6A Except		Nassau	4A	Carteret	3A	Alleghany	5A
Cheshire	5A	New York	4A	Chowan	3A	Ashe	5A
Hillsborough	5A	Queens	4A	Columbus	3A	Avery	5A
Rockingham	5A	Richmond	4A	Craven	3A	Mitchell	5A
Strafford	5A	Suffolk	4A	Cumberland	3A	Watauga	5A
New Jersey (NJ)		Westchester	4A	Currituck	3A	Yancey	5A
Zone 4A Except		Allegany	6A	Dare	3A	North Dakota (ND)	
Bergen	5A	Broome	6A	Davidson	3A	Zone 7 Except	
Hunterdon	5A	Cattaraugus	6A	Duplin	3A	Adams	6A
Mercer	5A	Chenango	6A	Edgecombe	3A	Billings	6A
Morris	5A	Clinton	6A	Gaston	3A	Bowman	6A
Passaic	5A	Delaware	6A	Greene	3A	Burleigh	6A
Somerset	5A	Essex	6A	Hoke	3A	Dickey	6A
Sussex	5A	Franklin	6A	Hyde	3A	Dunn	6A
Warren	5A	Fulton	6A	Johnston	3A	Emmons	6A
New Mexico (NM)		Hamilton	6A	Jones	3A	Gold Valley	6A
Zone 5B Except		Herkimer	6A	Lenoir	3A	Grant	6A

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Hettinger	6A	Hood River	5B	Yankton	5A	Cherokee	2A
LaMoure	6A	Jefferson	5B	Tennessee (TN)		Colorado	2A
Logan	6A	Klamath	5B	Zone 4A Except		Comal	2A
McIntosh	6A	Lake	5B	Chester	3A	Coryell	2A
McKenzie	6A	Malheur	5B	Crockett	3A	DeWitt	2A
Mercer	6A	Morrow	5B	Dyer	3A	Dimmit	2B
Morton	6A	Sherman	5B	Fayette	3A	Duval	2A
Oliver	6A	Umatilla	5B	Hardeman	3A	Edwards	2B
Ransom	6A	Union	5B	Hardin	3A	Falls	2A
Richland	6A	Wallowa	5B	Haywood	3A	Fayette	2A
Sargent	6A	Wasco	5B	Henderson	3A	Fort Bend	2A
Sioux	6A	Wheeler	5B	Lake	3A	Freestone	2A
Slope	6A	Pennsylvania (PA)		Lauderdale	3A	Frio	2B
Stark	6A	Zone 5A Except		Madison	3A	Galveston	2A
Ohio (OH)		Bucks	4A	McNairy	3A	Goliad	2A
Zone 5A Except		Chester	4A	Shelby	3A	Gonzales	2A
Adams	4A	Delaware	4A	Tipton	3A	Grimes	2A
Brown	4A	Montgomery	4A	Texas (TX)		Guadalupe	2A
Clermont	4A	Philadelphia	4A	Zone 3A Except		Hardin	2A
Gallia	4A	York	4A	Anderson	2A	Harris	2A
Hamilton	4A	Rhode Island (RI)		Angelina	2A	Hays	2A
Lawrence	4A	Zone 5A		Aransas	2A	Hidalgo	2A
Pike	4A	South Carolina (SC)		Atascosa	2A	Hill	2A
Scioto	4A	Zone 3A		Austin	2A	Houston	2A
Washington	4A	South Dakota (SD)		Bandera	2B	Jackson	2A
Oklahoma (OK)		Zone 6A Except		Bastrop	2A	Jasper	2A
Zone 3A Except		Bennett	5A	Bee	2A	Jefferson	2A
Beaver	4A	Bon Homme	5A	Bell	2A	Jim Hogg	2A
Cimarron	4A	Charles Mix	5A	Bexar	2A	Jim Wells	2A
Texas	4A	Clay	5A	Bosque	2A	Karnes	2A
Oregon (OR)		Douglas	5A	Brazoria	2A	Kenedy	2A
Zone 4C Except		Gregory	5A	Brazos	2A	Kinney	2B
Baker	5B	Hutchinson	5A	Brooks	2A	Kleberg	2A
Crook	5B	Jackson	5A	Burleson	2A	La Salle	2B
Deschutes	5B	Mellette	5A	Caldwell	2A	Lavaca	2A
Gilliam	5B	Todd	5A	Calhoun	2A	Lee	2A
Grant	5B	Tripp	5A	Cameron	2A	Leon	2A
Harney	5B	Union	5A	Chambers	2A	Liberty	2A

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**	**County**	**Zone**
Limestone	2A	Andrews	3B	Knox	3B	Castro	4B
Live Oak	2A	Baylor	3B	Lipscomb	3B	Cochran	4B
Madison	2A	Borden	3B	Loving	3B	Dallam	4B
Matagorda	2A	Brewster	3B	Lubbock	3B	Deaf Smith	4B
Maverick	2B	Callahan	3B	Lynn	3B	Donley	4B
McLennan	2A	Childress	3B	Martin	3B	Floyd	4B
McMullen	2A	Coke	3B	Mason	3B	Gray	4B
Medina	2B	Coleman	3B	McCulloch	3B	Hale	4B
Milam	2A	Concho	3B	Menard	3B	Hansford	4B
Montgomery	2A	Cottle	3B	Midland	3B	Hartley	4B
Newton	2A	Crane	3B	Mitchell	3B	Hockley	4B
Nueces	2A	Crockett	3B	Motley	3B	Hutchinson	4B
Orange	2A	Crosby	3B	Nolan	3B	Lamb	4B
Polk	2A	Culberson	3B	Pecos	3B	Lipscomb	4B
Real	2B	Dawson	3B	Presidio	3B	Moore	4B
Refugio	2A	Dickens	3B	Reagan	3B	Ochiltree	4B
Robertson	2A	Ector	3B	Reeves	3B	Oldham	4B
San Jacinto	2A	El Paso	3B	Runnels	3B	Parmer	4B
San Patricio	2A	Fisher	3B	Schleicher	3B	Potter	4B
Starr	2A	Foard	3B	Scurry	3B	Randall	4B
Travis	2A	Gaines	3B	Shackelford	3B	Roberts	4B
Trinity	2A	Garza	3B	Sterling	3B	Sherman	4B
Tyler	2A	Glasscock	3B	Stonewall	3B	Swisher	4B
Uvalde	2B	Hackell	3B	Sutton	3B	Yoakum	4B
Val Verde	2B	Hall	3B	Taylor	3B	Utah (UT)	
Victoria	2A	Hardeman	3B	Terrell	3B	Zone 5B Except	
Walker	2A	Haskell	3B	Terry	3B	Washington	3B
Waller	2A	Hemphill	3B	Throckmorton	3B	Box Elder	6B
Washington	2A	Howard	3B	Upton	3B	Cache	6B
Webb	2B	Hudspeth	3B	Ward	3B	Carbon	6B
Wharton	2A	Irion	3B	Wheeler	3B	Daggett	6B
Willacy	2A	Jeff Davis	3B	Wilbarger	3B	Duchesne	6B
Williamson	2A	Jones	3B	Winter ?	3B	Morgan	6B
Wilson	2A	Kendall	3B	Armstrong	4B	Rich	6B
Zapata	2B	Kent	3B	Bailey	4B	Summit	6B
Zavala	2B	Kerr	3B	Briscoe	4B	Uintah	6B
Tom Green	3B	King	3B	Carson	4B	Wasatch	6B

TABLE B-1 *(Continued)*
U.S. Climate Zones

State		State		State	
County	**Zone**	**County**	**Zone**	**County**	**Zone**
Vermont (VT)		Kanawha	4A	Goshen	5B
Zone 6A		Lincoln	4A	Platte	5B
Virginia (VA)		Logan	4A	Lincoln	7B
Zone 4A		Mason	4A	Sublette	7B
Washington (WA)		McDowell	4A	Teton	7B
Zone 5B Except		Mercer	4A	Pacific Rim (PR)	
Clallam	4C	Mingo	4A	Zone 1 Except	
Clark	4C	Monroe	4A	Barranquitas 2 SSW	2B
Cowlitz	4C	Morgan	4A	Cayey 1 E	2B
Grays Harbor	4C	Pleasants	4A	Pacific Islands (PI)	
Jefferson	4C	Putnam	4A	Zone 1 Except	
King	4C	Ritchie	4A	Midway Sand Island	2B
Kitsap	4C	Roane	4A	Virgin Islands (VI)	
Lewis	4C	Tyler	4A	Zone 1A	
Mason	4C	Wayne	4A		
Pacific	4C	Wirt	4A		
Pierce	4C	Wood	4A		
Skagit	4C	Wyoming	4A		
Snohomish	4C	Wisconsin (WI)			
Thurston	4C	Zone 6A Except			
Wahkiakum	4C	Ashland	7A		
Whatcom	4C	Bayfield	7A		
Ferry	6B	Burnett	7A		
Okanogan	6B	Douglas	7A		
Pend Oreille	6B	Florence	7A		
Stevens	6B	Forest	7A		
West Virginia (WV)		Iron	7A		
Zone 5A Except		Langlade	7A		
Berkeley	4A	Lincoln	7A		
Boone	4A	Oneida	7A		
Braxton	4A	Price	7A		
Cabell	4A	Sawyer	7A		
Calhoun	4A	Taylor	7A		
Clay	4A	Vilas	7A		
Gilmer	4A	Washburn	7A		
Jackson	4A	Wyoming (WY)			
Jefferson	4A	Zone 6B Except			

TABLE B-2
Canadian Climatic Zones

Province / City	Zone
Alberta (AB)	
Calgary International A	7
Edmonton International A	7
Grande Prairie A	7
Jasper	7
Lethbridge A	6
Medicine Hat A	6
Red Deer A	7
British Columbia (BC)	
Dawson Creek A	7
Ft Nelson A	8
Kamloops	5
Nanaimo A	5
New Westminster BC Pen	5
Penticton A	5
Prince George	7
Prince Rupert A	6
Vancouver International A	5
Victoria Gonzales Hts	5
Manitoba (MB)	
Brandon CDA	7
Churchill A	8
Dauphin A	7
Flin Flon	7
Portage La Prairie A	7
The Pas A	7
Winnipeg International A	7
New Brunswick (NB)	
Chatham A	7
Fredericton A	6
Moncton A	6
Saint John A	6
Newfoundland (NF)	
Corner Brook	6
Gander International A	7
Goose A	7
St John's A	6
Stephenville A	6

TABLE B-2 *(Continued)*
Canadian Climatic Zones

Province / City	Zone
Northwest Territories (NW)	
Ft Smith A	8
Inuvik A	8
Resolute A	8
Yellowknife A	8
Nova Scotia (NS)	
Halifax International A	6
Kentville CDA	6
Sydney A	6
Truro	6
Yarmouth A	6
Ontario (ON)	
Belleville	6
Cornwall	6
Hamilton RBG	5
Kapuskasing A	7
Kenora A	7
Kingston A	6
London A	6
North Bay A	7
Oshawa WPCP	6
Ottawa International A	6
Owen Sound MOE	6
Peterborough	6
St Catharines	5
Sudbury A	7
Thunder Bay A	7
Timmins A	7
Toronto Downsview A	6
Windsor A	5
Prince Edward Island (PE)	
Charlottetown A	6
Summerside A	6
Quebec (PQ)	
Bagotville A	7
Drummondville	6
Granby	6
Montreal Dorval International A	6
Quebec A	7
Rimouski	7
SeptIles A	7

TABLE B-2 *(Continued)*
Canadian Climatic Zones

Province / City	Zone
Shawinigan	7
Sherbrooke A	7
St Jean de Cherbourg	7
St Jerome	7
Thetford Mines	7
Trois Rivieres	7
Val d'Or A	7
Valleyfield	6
Saskatchewan (SK)	
Estevan A	7
Moose Jaw A	7
North Battleford A	7
Prince Albert A	7
Regina A	7
Saskatoon A	7
Swift Current A	7
Yorkton A	7
Yukon Territory (YT)	
Whitehorse A	8

TABLE B-3
International Climatic Zones

Country	City	Province or Region	Zone
Argentina			
	Buenos Aires/Ezeiza		3
	Cordoba		3
	Tucuman/Pozo		2
Australia			
	Adelaide	SA	4
	Alice Springs	NT	2
	Brisbane	QL	2
	Darwin Airport	NT	1
	Perth/Guildford	WA	3
	Sydney/K Smith	NSW	3
Azores			
	Lajes	Terceira	3
Bahamas			
	Nassau		1
Belgium			
	Brussels Airport		5
Bermuda			
	St Georges/Kindley		2
Bolivia			
	La Paz/El Alto		5
Brazil			
	Belem		1
	Brasilia		2
	Fortaleza		1
	Porto Alegre		2
	Recife/Curado		1
	Rio de Janeiro		1
	Salvador/Ondina		1
	Sao Paulo		2
Bulgaria			
	Sofia		5
Chile			
	Concepcion		4
	Punta Arenas/Chabunco		6
	Santiago/Pedahuel		4
China			
	Shanghai/Hongqiao		3

TABLE B-3 *(Continued)*
International Climatic Zones

Country	City	Province or Region	Zone
Cuba			
	Guantanamo Bay NAS	Ote.	1
Cyprus			
	Akrotiri		3
	Larnaca		3
	Paphos		3
Czech Republic (Former Czechoslovakia)			
	Prague/Libus		5
Dominican Republic			
	Santo Domingo		1
Egypt			
	Cairo		2
	Luxor		1
Finland			
	Helsinki/Seutula		7
France			
	Lyon/Satolas		4
	Marseille		4
	Nantes		4
	Nice		4
	Paris/ Le Bourget		4
	Strasbourg		5
Germany			
	Berlin/Schoenfeld		5
	Hamburg		5
	Hannover		5
	Mannheim		5
Greece			
	Souda	Crete	3
	Thessalonika/Mikra		4
Greenland			
	Narssarssuaq		7
Hungary			
	Budapest/Lorinc		5
Iceland			
	Reykjavik		7
India			
	Ahmedabad		1
	Bangalore		1
	Bombay/Santa Cruz		1

TABLE B-3 *(Continued)*
International Climatic Zones

Country	City	Province or Region	Zone
	Calcutta/Dum Dum		1
	Madras		1
	Nagpur Sonegaon		1
	New Delhi/Safdarjung		1
Indonesia			
	Djakarta/Halimperda	Java	1
	Kupang Penfui	Sunda Island	1
	Makassar	Celebes	1
	Medan	Sumatra	1
	Palembang	Sumatra	1
	Surabaja Perak	Java	1
Ireland			
	Dublin Airport		5
	Shannon Airport		4
Israel			
	Jerusalem		3
	Tel Aviv Port		2
Italy			
	Milano/Linate		4
	Napoli/Capodichino		4
	Roma/Fiumicino		4
Jamaica			
	Kingston/Manley		1
	Montego Bay/Sangster		1
Japan			
	Fukaura		5
	Sapporo		5
	Tokyo		3
Jordan			
	Amman		3
Kenya			
	Nairobi Airport		3
Korea			
	Pyonggang		5
	Seoul		4
Malaysia			
	Kuala Lumpur		1
	Penang/Bayan Lepas		1
Mexico			
	Mexico City	Distrito Federal	3

TABLE B-3 ***(Continued)***
International Climatic Zones

Country	City	Province or Region	Zone
	Guadalajara	Jalisco	1
	Monterrey	Nuevo Laredo	3
	Tampico	Tamaulipas	1
	Veracruz	Veracruz	4
	Merida	Yucatan	1
Netherlands			
	Amsterdam/Schiphol		5
New Zealand			
	Auckland Airport		4
	Christchurch		4
	Wellington		4
Norway			
	Bergen/Florida		5
	Oslo/Fornebu		6
Pakistan			
	Karachi Airport		1
Papua New Guinea			
	Port Moresby		1
Paraguay			
	Asuncion/Stroessner		1
Peru			
	LimaCallao/Chavez		2
	San Juan de Marcona		2
	Talara		2
Philippines			
	Manila Airport	Luzon	1
Poland			
	Krakow/Balice		5
Romania			
	Bucuresti/Bancasa		5
Russia (Former Soviet Union)			
	Kaliningrad	East Prussia	5
	Krasnoiarsk		7
	Moscow Observatory		6
	Petropavlovsk		7
	RostovNaDonu		5
	Vladivostok		6
	Volgograd		6

TABLE B-3 *(Continued)*
International Climatic Zones

Country	City	Province or Region	Zone
Saudi Arabia			
	Dhahran		1
	Riyadh		1
Senegal			
	Dakar/Yoff		1
Singapore			
	Singapore/Changi		1
South Africa			
	Cape Town/D F Malan		4
	Johannesburg		4
	Pretoria		3
Spain			
	Barcelona		4
	Madrid		4
	Valencia/Manises		3
Sweden			
	Stockholm/Arlanda		6
Switzerland			
	Zurich		5
Syria			
	Damascus Airport		3
Taiwan			
	Tainan		1
	Taipei		2
Tanzania			
	Dar es Salaam		1
Thailand			
	Bangkok		1
Tunisia			
	Tunis/El Aouina		3
Turkey			
	Adana		3
	Ankara/Etimesgut		4
	Istanbul/Yesilkoy		4
United Kingdom			
	Birmingham	England	5
	Edinburgh	Scotland	5
	Glasgow Apt	Scotland	5
	London/Heathrow	England	4

TABLE B-3 *(Continued)*
International Climatic Zones

Country	City	Province or Region	Zone
Uruguay			
	Montevideo/Carrasco		3
Venezuela			
	Caracas/Maiquetia		1
Vietnam			
	Hanoi/Gialam		1
	Saigon (Ho Chi Minh)		1

B2 Major Climate Type Definitions. Use the following information along with Table B-4 to determine climate zone numbers and letters for international climate zones.

Marine (C) Definition - Locations meeting all four criteria:

1. Mean temperature of coldest month between –3ºC (27ºF) and 18ºC (65ºF)
2. Warmest month mean < 22ºC (72ºF)
3. At least four months with mean temperatures over 10ºC (50ºF)
4. Dry season in summer. The month with the heaviest precipitation in the cold season has at least three times as much precipitation as the month with the least precipitation in the rest of the year. The cold season is October through March in the Northern Hemisphere and April through September in the Southern Hemisphere.

Dry (B) Definition—Locations meeting the following criteria: Not Marine and

$$P_{in} < 0.44 \times (TF - 19.5) \qquad \text{(I-P units)}$$

$$P_{cm} < 2.0 \times (TC + 7) \qquad \text{(SI units)}$$

where:

P = annual precipitation in inches (cm)

T = annual mean temperature in ºF (ºC)

Moist (A) Definition—Locations that are not Marine and not Dry.

TABLE B-4 INTERNATIONAL CLIMATE ZONE DEFINITIONS

Zone Number	Description	THERMAL CRITERIA IP Units	THERMAL CRITERIA SI Units
1	Very Hot – Humid (1A), Dry (1B)	9000 < CDD50°F	5000 < CDD10°C
2	Hot – Humid (2A), Dry (2B)	6300 < CDD50°F ≤ 9000	3500 < CDD10°C ≤ 5000
3A and 3B	Warm – Humid (3A), Dry (3B)	4500 < CDD50°F ≤ 6300	2500 < CDD10°C ≤ 3500
3C	Warm – Marine	CDD50°F 4500 AND HDD65°F 3600	CDD10°C 2500 AND HDD18°C 2000
4A and 4B	Mixed – Humid (4A), Dry (4B)	CDD50°F ≤ 4500 AND HDD65°F ≤ 5400	CDD10°C ≤ 2500 AND HDD18°C ≤ 3000
4C	Mixed – Marine	3600 < HDD65°F ≤ 5400	2000 < HDD18°C ≤ 3000
5A, 5B and 5C	Cool– Humid (5A), Dry (5B), Marine (5C)	5400 < HDD65°F ≤ 7200	3000 < HDD18°C ≤ 4000
6A and 6B	Cold – Humid (6A), Dry (6B)	7200 < HDD65°F ≤ 9000	4000 < HDD18°C ≤ 5000
7	Very Cold	9000 < HDD65°F ≤ 12600	5000 < HDD18°C ≤ 7000
8	Subarctic	12600 < HDD65°F	7000 < HDD18°C

[In Appendix D, delete the column entitled "Table" in Tables D-1, D-2, and D-3. In the current 2001 edition of the standard, this column provides a cross reference to various tables in Appendix B. These cross references are no longer needed and so the column is being deleted in all three tables in Appendix D in this addendum.]

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.