140.3 NR Prescriptive Envelope

SECTION 140.3 – PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES

A building complies with this section by being designed with and having constructed and installed either (1) envelope components that comply with each of the requirements in Subsection (a) for each individual component and the requirements of Subsection (c) where they apply, or (2) an envelope that complies with the overall requirements in Subsection (b) and the requirements of Subsection (c) where they apply. ~~When making calculations under Subsection (a) or (b), all of the rules listed in Section 140.1(c)1, 4, and 5 shall apply.~~

(a) **Envelope Component Approach.**

1. **Exterior roofs and ceilings.** Exterior roofs and ceilings shall:

A. ~~**Roofs. All r**~~**Roofing Pp~~roducts.~~ s** Shall meet the requirements of Section 110.8 and the applicable requirements of Subsections i through ii~~i~~:

i. Nonresidential buildings:

a. ~~with l~~Low-sloped roofs in climate zones ~~2~~1 ~~1 15~~ through 16 shall have a minimum ~~3 year~~ aged solar reflectance of ~~0.55~~ 65 and a minimum thermal emittance of 0.75~~,~~ or a minimum ~~aged~~ SRI of ~~64~~78.

EXCEPTION 1 TO SECTION 140.3(a)1Aia: Wood-framed roofs in climate zones 3 and 5 are exempt from the minimum requirements for solar reflectance and thermal emittance or SRI if the roof assembly has a U-factor of 0.039 or lower.

EXCEPTION 2 TO SECTION 140.3(a)1Aia: Metal building roofs in climate zones 3 and 5 are exempt from the minimum requirements for solar reflectance and thermal emittance or SRI if the roof assembly has a U-factor of 0.048 or lower.

~~**EXCEPTION 3 TO SECTION 140.3(a)1Ai:** Roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels are not required to meet the minimum requirements for solar reflectance and thermal emittance or SRI.~~

~~**EXCEPTION 4 TO SECTION 140.3(a)1Ai:** Roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft².~~ **EXCEPTION 3 TO SECTION 140.3(a)1Aia:** Roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft².

~~ii.~~b. ~~Nonresidential~~ Ssteep-sloped roofs ~~with roofing products that have a roof weight of less than 5 pounds per square foot~~ in climate zones ~~2~~1through ~~1~~6 shall have a minimum ~~3 year~~ aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16. ~~Steep-sloped roofing products that have a roof weight of 5 pounds per square foot or more in climate zones 1 through 16 shall have a minimum 3-year aged reflectance of 0.15 and a minimum emittance of 0.75, or a minimum SRI of 10.~~

~~iii~~ii. High-rise residential buildings and hotels and motels:

a. ~~with l~~Low-sloped roofs in climate zones ~~10, 11, 13, 14, and~~2 through ~~1~~5 shall have a minimum ~~3 year~~ aged solar reflectance of 0.~~55~~ 65and a minimum thermal emittance of 0.75~~,~~ or a minimum SRI of ~~64~~78.

EXCEPTION TO SECTION 140.3(a)1Aiia: Roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft²

b. Steep-sloped roofs climate zones 2 through15 shall have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.

EXCEPTION TO SECTION 140.3(a)1A: Roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

B. ~~Have~~ **Roof I~~i~~nsulatio**n.n ~~placed in direct contact with a continuous roof or drywall ceiling where required by Section 118(e); and~~

Roofs shall ~~C.~~ h~~H~~ave an overall assembly U-factor no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~, and shall be placed in direct contact with a continuous roof or drywall ceiling where required by Section 110.8(e).~~.~~

2. **Exterior ~~walls~~Walls.** Exterior walls shall have an overall assembly U-factor no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~.

3. **Demising ~~walls~~Walls.** Demising walls shall meet the requirements of Section 110.8(f).

4. ~~External~~ **Exterior F~~f~~loors and S~~s~~offits.** External floors and soffits shall have an overall assembly U-factor no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~.

5. ~~Windows~~**Fenestration.** ~~Windows~~Vertical Windows shall:

A. Have (1) a west-facing area no greater than 40 percent of the gross west-facing exterior wall area, or 6 feet times the west-facing display perimeter, whichever is greater; and (2) a total area no greater than 40 percent of the gross exterior wall area, or 6 feet times the display perimeter, whichever is greater; and

EXCEPTION to Section 140.3(a)5A: Window area in demising walls is not counted as part of the window area for this requirement. Demising wall area is not counted as part of the gross exterior wall area or display perimeter.

B. Have an Area-Weighted Performance Rating ~~a~~ U-factor no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~; and

C. Have an Area-Weighted Performance Rating Relative Solar Heat Gain ~~,~~Coefficient, SHGC,~~-~~ excluding the effects of interior shading, no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~. The relative solar heat gain of windows is:

i. The solar heat gain coefficient of the windows; or

ii. Relative solar heat gain as calculated by EQUATION 140.3-A~~EQUATION 140.3 AEQUATION 140.3 AEQUATION 140.3 A~~, if an overhang extends beyond both sides of the window jamb a distance equal to the overhang projection.

~~For fins, the fin projection is at least equal to the overhang projection, the fin offset is at least equal to the overhang offset and the fin extends from at least the sill to the head of the window.~~

EXCEPTION 1 to Section 140.3(a)5C: ~~The applicable "north" value for~~ A Relative S~~s~~olar H~~h~~eat G~~g~~ain of ~~in TABLE140.3 A, TABLE 140.3 B, or TABLE 140.3 C or~~ 0.56~~, whichever is greater,~~or less shall be used for windows:

a. That are in the first story of exterior walls that form a display perimeter; and

b. For which codes restrict the use of overhangs to shade the windows.

EXCEPTION 2 to Section 140.3(a)5C: For Fenestration containing dynamic glazing, the lower labeled SGHC shall be used to demonstrate compliance with this section. Dynamic glazing shall be considered separately from other fenestration and area-weighted averaging with other fenestration that is not dynamic shall not be permitted.

D. Have an Area-Weighted Performance Rating Visible Transmittance, VT, no less than the applicable value in TABLE 143-A, TABLE 143-B and TABLE 143-C, or shall have a VT determined in accordance with Equation 140.3-B.

EXCEPTION 1 to Section 140.3(a)5D: When the vertical fenestration primary and secondary sidelit daylit zones are completely overlapped by a skylit daylit zones.

EXCEPTION 2 to Section 140.3(a)5D: If the fenestration visible transmittance is not within the scope of NFRC 200, 2002 or ASTM E972, the VT shall be calculated according to EQUATION 140.3-C.

EXCEPTION 3 to Section 140.3(a)5D: When the fenestration containing dynamic glazing, the VT shall be used to demonstrate compliance with this section . Dynamic glazing shall be considered separately from other fenestration and area-weighted averaging with other fenestration that is not dynamic shall not be permitted.

EQUATION 140.3-A RELATIVE SOLAR HEAT GAIN

$$RSHG = SHGC_{win} \times \left[1 + \frac{aH}{V} + b\left(\frac{H}{V}\right)^2\right]$$

WHERE:

RSHG	=	Relative solar heat gain.
$SHGC_{win}$	=	Solar heat gain coefficient of the window.
H	=	Horizontal projection of the overhang from the surface of the window in feet, but no greater than *V*.
V	=	Vertical distance from the window sill to the bottom of the overhang in feet.
a	=	-0.41 for north-facing windows, -1.22 for south-facing windows, and -0.92 for east and west-facing windows.
b	=	0.20 for north-facing windows, 0.66 for south-facing windows, and 0.35 for east and west-facing windows.

~~,, or shall have a VT determined in accordance with Equation 140.3-Bcalculated in~~

~~daylit zonesdaylit zonesWhen the Prescriptive VT value is not met the Effective Aperture may be used when the minimum overall Effective Aperture is 0.11 or greater as determined by Equation 140.3-B.~~

~~If the Total Visible Transmittance performance value is not available it shall be calculated by using the manufacturers center of glass alone performance value in EQUATION 140.3-C. **1**A Minimum Effective Aperture Classic of 0.11.~~

~~*EQUATION 140.3-B VERTICAL FENESTRATION MINIMUM VTEFFECTIVE APERTURE*~~

~~*EFFECTIVE APERTURE VT >= 0.11/ WWR×VT*~~

WHERE~~Where~~:

WWR = Ratio of total window area to the total gross exterior wall area for the entire building

VT = Visible Transmittance of framed window

EQUATION 140.3-C – ALTERNATIVE VISIBLE TRANSMITTANCE OF CENTER OF GLASS CALCULATION

$$VT_T = VT_F \times VT_C$$

WHERE:

VT_T = Is the Total Performance of the fenestration including glass and frame

VT_F = 0.53 for projecting windows, such as casement and awning windows

VT_F = 0.67 for operable or sliding windows

VT_F = 0.77 for fixed or non operable windows

VT_F = 0.88 for curtain wall/storefront

VT_C = Is the performance value for the center of glass alone

~~EXCEPTION 2 to Section 140.3(a)5D: If the primary and secondary sidelit areas are completely overlapped by a skylit area~~ 6. **Skylights.** Skylights shall:

A. Have an area no greater than 5 percent of the gross exterior roof area; and

EXCEPTION to Section 140.3(a)6A: Atria over 55 feet high shall have a skylight area no greater than 10 percent of the gross exterior roof area.

B. Have an Area-Weighted Performance Rating U-factor no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~ , or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 143 C~~; and

C. Have an Area-Weighted Performance Rating solar heat gain coefficient no greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 143 C~~; and~~.~~

D. Have an Area-Weighted Performance Rating VT no less than the applicable value in TABLE 140.3-A, or TABLE 140.3-B.

E. Have a glazing material or diffuser that has a measured haze value greater than 90 percent, tested according to ASTM D1003 (notwithstanding its scope) or other test method approved by the Commission.

7. **Opaque Exterior ~~doors~~ doors.** All exterior doors that separate~~for~~ conditioned space from unconditioned space or ambient air~~s~~ shall have a U-factor not greater than the applicable value in TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE140.3 A~~, TABLE 140.3-B~~TABLE 140.3 BTABLE 140.3 BTABLE 140.3 B~~, or TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~. Doors that are more than one-half glass in area are considered Glazed Doors. ~~.~~

8. **Relocatable Public School Buildings.** In complying with Sections 140.3(a)1 to 7, relocatable public school buildings shall comply either with TABLE140.3-A~~TABLE140.3 ATABLE 140.3 ATABLE 140.3 A~~, including the non-north window RSHG and skylight SHGC requirements, when the manufacturer/builder certifies that the relocatable building is manufactured only for use in a specific climate zone(s) and that the relocatable building cannot be lawfully used in other climate zones or with TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~ when the manufacturer/builder certifies that the relocatable building is manufactured for use in any climate zone. When the relocatable building complies with TABLE 140.3-C~~TABLE 140.3 CTABLE 140.3 CTABLE 140.3 C~~ for use in more than one climate zone, the relocatable building shall meet the most stringent requirements for each building component in all of the climate zones for which the relocatable building is certified.

The manufacturer/builder shall place 2 metal identification labels on each relocatable building module, one mechanically fastened and visible from the exterior and the other mechanically fastened to the interior frame above the ceiling, at the end of the module. In addition to information required by the Division of the State Architect (DSA), the labels shall state either "Complies with Title 24, Part 6 for all Climate Zones" or "Complies with Title 24, Part 6 for Climate Zones" and then list all of the climate zones for which the manufacturer has manufactured the relocatable building to comply. The location of the identification labels shall be shown on the building plans.

9. **Air Barrier. A continuous air barrier meeting the requirements of Section 110.7~~(a) and~~ (b)2 shall be installed to the building envelope in Climate Zones 10-16 of TABLE 140.3-A.**

EXCEPTION to Section 140.3(a)9: Relocatable Public School Buildings.

TABLE140.3-A – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)

					Climate Zone															
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ENVELOPE	INSULATION	Roofs/ Ceilings[3]	Metal Building		0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
			Wood Framed and Other		0.049	0.039	0.039	0.039	0.049	0.075	0.067	0.067	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
		Roofing Products	Low-sloped	Aged Reflectance	~~NR~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~NR~~0.65
				Emittance	~~NR~~0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	~~NR~~0.75
			Steep Sloped ~~(less than 5 lb/ft²)~~	Aged Reflectance	~~NR~~0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
				Emittance	~~NR~~0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	~~0.75~~0.75
		Walls[3]	Metal Building		0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061
			Metal-framed		0.098	0.062	0.082	0.062	0.062	0.098	0.098	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
			Mass Light		0.196	0.170	0.278	0.227	0.44	0.44	0.44	0.44	0.44	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy		0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
			Wood-framed and Other		0.102	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059
		Floors/ Soffits[3]	Mass		0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058
			Other		0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039
		Air Barrier[4] ~~Air Leakage~~			NR	NR	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ
Opaque Exterior Doors, U-factor			Non-Swinging		0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
			Swinging		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

ENVELOPE	FENESTRATION			All Climate Zones				
		Vertical			Fixed Window	Operable Window	Curtainwall/ Storefront	Glazed Doors
			Area-Weighted Performance Rating	Max U-factor	0.36	0.47	0.41	0.45
				Max RSHG	0.25	0.22	0.26	0.23
			Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
			Max WWR%	40%				
		Skylights			Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	
			Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	
				Max RSHG	0.25	0.25	NR	
			Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64	
			Max SRR%	5%				

	~~RSHG North~~	~~0 to < 10% WWR~~	~~0.72~~	~~0.61~~	~~0.61~~	~~0.61 1~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.72~~
		~~10 to <20% WWR~~	~~0.49~~	~~0.51~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.51~~	~~0.51~~	~~0.51~~	~~0.51~~	~~0.51~~	~~0.51~~	~~0.49~~
		~~20 to <30% WWR~~	~~0.47~~	~~0.47~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.47~~
		~~30-40% WWR~~	~~0.47~~	~~0.47~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.61~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.47~~	~~0.40~~	~~0.40~~	~~0.47~~

	RSHG Non-North	0 to < 10% WWR	0.49	0.47	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.47	0.47	0.47	0.47	0.46	0.46	0.49
		10 to < 20% WWR	0.43	0.36	0.55	0.55	0.55	0.61	0.61	0.61	0.61	0.36	0.36	0.36	0.36	0.36	0.36	0.43
		20 to < 30% WWR	0.43	0.36	0.41	0.41	0.41	0.39	0.39	0.39	0.39	0.36	0.36	0.36	0.36	0.36	0.36	0.43
		30-40% WWR	0.43	0.31	0.41	0.41	0.41	0.34	0.34	0.34	0.34	0.31	0.31	0.31	0.31	0.31	0.31	0.43
Doors, U-factor	Non-Swinging		0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
	Swinging		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Skylight	U-factor	Glass, curb	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
		Glass, no curb	0.68	0.68	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.68	0.68	0.68	0.68	0.68	0.68	0.68
		Plastic	1.04	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.04
	SHGC	Glass, 0 to<2%	NR	0.46	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.46	0.46	0.46	0.46	0.46	0.46	NR
		Glass, 2.1-5%	NR	0.36	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.36	0.36	0.36	0.36	0.36	0.36	NR
		Plastic, 0 to < 2%	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
		Plastic, 2.1-5%	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

Notes:

1. Mass, Light walls are defined as having a heat capacity greater than or equal to 7.0 Btu/h-ft² and less than 15.0 Btu/h-ft². Heavy mass walls are defined as having a heat capacity greater than or equal to 15.0 Btu/h-ft².

2. No skylight SHGC requirements are defined for climate zones 1 and 16. A climate zone without a requirement is designated as "NR".

3.Closed-cell polyurethane foam insulation shall meet the procedure specified in Reference Appendices, RA3.5

4. Relocatable Public School Buildings are not subject to the requirements of Section 140.3(a)9.

TABLE 140.3-B – PRESCRIPTIVE ENVELOPE CRITERIA FOR HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS

					Climate Zone															
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ENVELOPE	INSULATION	Roofs/ Ceilings[2]	Metal Building		0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
			Wood Framed and Other		0.034	0.028	0.039	0.028	0.039	0.039	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
		Roofing Products	Low-sloped	Aged Reflectance	NR	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~NR~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~NR~~0.65	~~0.55~~0.65	~~0.55~~0.65	~~0.55~~0.65	NR
				Emittance	NR	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~NR~~0.75	~~0.75~~75	~~0.75~~0.75	~~NR~~0.75	0.75	0.75	0.75	NR
			Steep Sloped	Aged Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	NR
				Emittance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR
		Walls[2]	Metal Building		0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
			Metal-framed		0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105
			Mass Light[1]		0.170	0.170	0.170	0.170	0.170	0.227	0.227	0.227	0.196	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy		0.160	0.160	0.160	0.184	0.211	0.690	0.690	0.690	0.690	0.690	0.184	0.253	0.211	0.184	0.184	0.160
			Wood-framed and Other		0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059	0.059	0.042	0.042	0.042
		Floors/ Soffits[2]	Mass		0.045	0.045	0.058	0.058	0.058	0.069	0.092	0.092	0.092	0.069	0.058	0.058	0.058	0.045	0.058	0.037
			Other		0.034	0.034	0.039	0.039	0.039	0.039	0.071	0.039	0.039	0.039	0.039	0.039	0.039	0.034	0.039	0.034
Opaque Exterior Doors, U-factor			Non-Swinging		0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
			Swinging		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70

ENVELOPE	FENESTRATION			All Climate Zones			
		Vertical			Fixed Window	Operable Window	Curtainwall/ Storefront	Glazed Doors
			Area-Weighted Performance Rating	Max U-factor	0.36	0.45	0.41	0.45
				Max RSHG	0.25	0.22	0.26	0.23
			Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
			Max WWR%	40%				
		Skylights			Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	
			Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	
				Max RSHG	0.25	0.25	NR	
			Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64	
			Max SRR%	5%				

Windows	U-factor		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
	RSHG North	0 to <= 10% WWR	0.68	0.49	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.49	0.49	0.49	0.49	0.47	0.47	0.68
		10 to <= 20% WWR	0.68	0.49	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.49	0.49	0.49	0.49	0.43	0.43	0.68
		20 to <= 30% WWR	0.47	0.40	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.40	0.40	0.40	0.40	0.43	0.43	0.47
		30-40% WWR	0.47	0.40	0.55	0.55	0.55	0.61	0.61	0.61	0.61	0.40	0.40	0.40	0.40	0.41	0.41	0.47
	RSHG Non-North	0 to <= 10% WWR	0.46	0.36	0.41	0.41	0.41	0.47	0.47	0.47	0.47	0.36	0.36	0.36	0.36	0.36	0.36	0.46
		10 to <= 20% WWR	0.46	0.36	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.36	0.36	0.36	0.36	0.31	0.31	0.46
		20 to <= 30% WWR	0.36	0.31	0.31	0.31	0.31	0.36	0.36	0.36	0.36	0.31	0.31	0.31	0.31	0.26	0.26	0.36
		30-40% WWR	0.30	0.26	0.26	0.26	0.26	0.31	0.31	0.31	0.31	0.26	0.26	0.26	0.26	0.26	0.26	0.30

Doors, U factor	Non-Swinging		0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
	Swinging		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Skylight	U factor	Glass, curb	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
		Glass, no curb	0.68	0.68	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.68	0.68	0.68	0.68	0.68	0.68	0.68
		Plastic	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
	SHGC	Glass, 0 to ≤2%	0.46	0.46	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.46	0.46	0.46	0.46	0.46	0.46	0.46
		Glass, 2.1-5%	0.36	0.32	0.32	0.32	0.32	0.40	0.40	0.40	0.40	0.32	0.32	0.32	0.32	0.31	0.31	0.36
		Plastic, 0 to ≤ 2%	0.69	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
		Plastic, 2.1-5%	0.55	0.34	0.39	0.39	0.39	0.57	0.57	0.57	0.57	0.34	0.34	0.34	0.34	0.27	0.27	0.55

Notes:

1. Mass, Light walls are defined as having a heat capacity greater than or equal to 7.0 Btu/h-ft² and less than 15.0 Btu/h-ft². Heavy mass walls are defined as having a heat capacity greater than or equal to 15.0 Btu/h-ft².

2. Closed-cell polyurethane foam insulation shall meet the procedure specified in Reference Residential Appendices, RA3.5

TABLE 140.3-C PRESCRIPTIVE ENVELOPE CRITERIA FOR RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE IN ALL CLIMATE ZONES

Roof Ceiling U-factor[1]		ALL CLIMATE ZONES
Metal Building		0.048
Wood-framed and other		0.039
Roofing Products – Aged Reflectance/Emittance		
Low-Sloped		0.6755/0.75
Steep-Sloped ~~— Less than 5lb/ft²~~		0.20/0.75
~~5lb/ft² or more~~		~~0.15/0.75~~
Wall U-factor[1]		
Wood frame		0.059
Metal frame		0.062
Metal building		0.057
Mass/7.0≤ HC		0.170
Other		0.059
Floor/Soffit U-factor[1]		
Wood-Framed and Other		0.048
Windows		
U-factor		0.47
Relative Ssolar H-heat gGain		
0-10% WWR		0.36
11-20% WWR		0.31
21-30% WWR		0.26
31-40% WWR		0.26
Glazed Doors		
Max Average Weighted U-factor		0.45
Max Average Weighted RSHG		0.23
Max Average Weighted VT		0.19
Opaque Exterior Doors, U-factor		
Non-Swinging		0.50
Swing		0.70
Skylights		
U-factor	Glass w/Curb	0.99
	Glass wo/Curb	0.57
	Plastic w/Curb	0.87
SHGC Glass	0-2%	0.46
	2.1-5%	0.36
SHGC Plastic	0-2%	0.69

	2.1-5%	0.57

Note: Construction assembly U-factors shall be calculated in accordance with Reference Joint Appendix JA4.

1. Closed-cell polyurethane foam insulation shall meet the procedure specified in Reference Residential Appendices, RA3.5

(b) O**ther Envelope Energy Tradeoff Approaches.** ~~Overall Other Envelope TDV Energy Tradeoff Approaches.~~ Other envelope tradeoffs alternatives approved by the Executive Director may be allowed provided that the~~The~~ total TDV Energy of the overall envelope of the proposed building, TDVprop, shall be no greater than the total TDV Energy of the overall envelope of a standard building, TDVstd.~~, as calculated in Reference Nonresidential Appendix NA5 "Envelope Tradeoff Procedure". In making the calculations, it shall be assumed that the orientation and area of each envelope component of the standard building are the same as in the proposed building. If the proposed building has Window-Wall Ratio greater than 40 percent or Skylight-Roof Ratio greater than 5 percent, the area of walls and windows or roofs and skylights will be adjusted accordingly in the standard building to cap the WWR at 40 percent and SRR at 5 percent.~~

(c) **Minimum ~~Skylight Area~~ Daylighting Requirement for Large Enclosed Spaces ~~in Buildings with Three or Fewer Stories~~.** In climate zones 2 through 15, ~~low rise~~ conditioned or unconditioned enclosed spaces that are greater than ~~8~~5,000 ft² directly under a roof with ceiling heights greater than 15 feet shall meet ~~Sections 143(c)1-4 below~~the following requirements:~~.~~

~~1. **Daylit Area.** At least one half of the floor area shall be in the skylit daylight area, the primary sidelit daylight area, or a combination of the skylit and primary sidelit daylight areas. The skylit and primary sidelit daylight areas shall be shown on the building plans. Skylit and primary sidelit daylight areas are defined in Section 131(c)1.~~

~~2. **Minimum Skylight Area or Effective Aperture.** Areas that are skylit shall have a minimum skylight area to skylit area ratio of at least 3.3 percent or minimum skylight effective aperture of at least 1.1 percent. Skylight effective aperture shall be determined as specified in EQUATION 146-C. If primary sidelit area is used to comply with Section 143(c)1, the primary sidelit daylight areas shall have an effective aperture greater than 10 percent. The effective aperture for primary sidelit daylight areas is specified in Section 146(a)2E.~~

1. A combined total of at least 75% of the floor area, in plan view, shall be within any of the following:
    i. One head height from windows in a rectangular pattern, or
    ii. 0.7 times the average ceiling height from the edge of rough opening of skylights in the identical shape of the skylight.
2. All Skylit Daylit Zones and the Primary Sidelit Daylit Zones shall be shown on- building plans.
3. General lighting in daylit zones shall be controlled in accordance with Section 130.1(d).

~~3~~4~~6~~. ~~**Skylight Characteristics.**~~ Skylights shall:

A. Have a glazing material or diffuser that has a measured haze value greater than 90 percent, tested according to ASTM D1003 (notwithstanding its scope) or other test method approved by the Commission; and

B. If the space is conditioned, meet the requirements in Section 140.3(a)6 or 140.3(b).

~~4. **Controls.** Electric lighting in the daylit area shall be controlled as described in Section 131(c)2.~~

EXCEPTION 1 to Section 140.3(c): Auditoriums, churches, movie theaters, museums, and refrigerated warehouses.

EXCEPTION 2 to Section 140.3(c): In buildings with unfinished interiors, future enclosed spaces where it is planned to have less than or equal to ~~8~~5,000 square feet of floor area, or ceiling heights less than or equal to 15 feet, based on proposed future interior wall and ceiling locations as delineated in the plans. This exception shall not apply to these future enclosed spaces when interior walls and ceilings are installed for the first time, the enclosed space floor area is greater than ~~8~~5,000 square feet, and the ceiling height is greater than 15 feet (see Section 141.0.~~9~~(b)1M). This exception shall not be used for S-1 or S-2 (storage), or for F-1 or F-2 (factory) occupancies.

EXCEPTION 3 to Section 140.3(c): Enclosed spaces having a designed general lighting system with a lighting power density less than 0.5 watts per square foot.