2016 Energy Standards

Nonresidential Envelope

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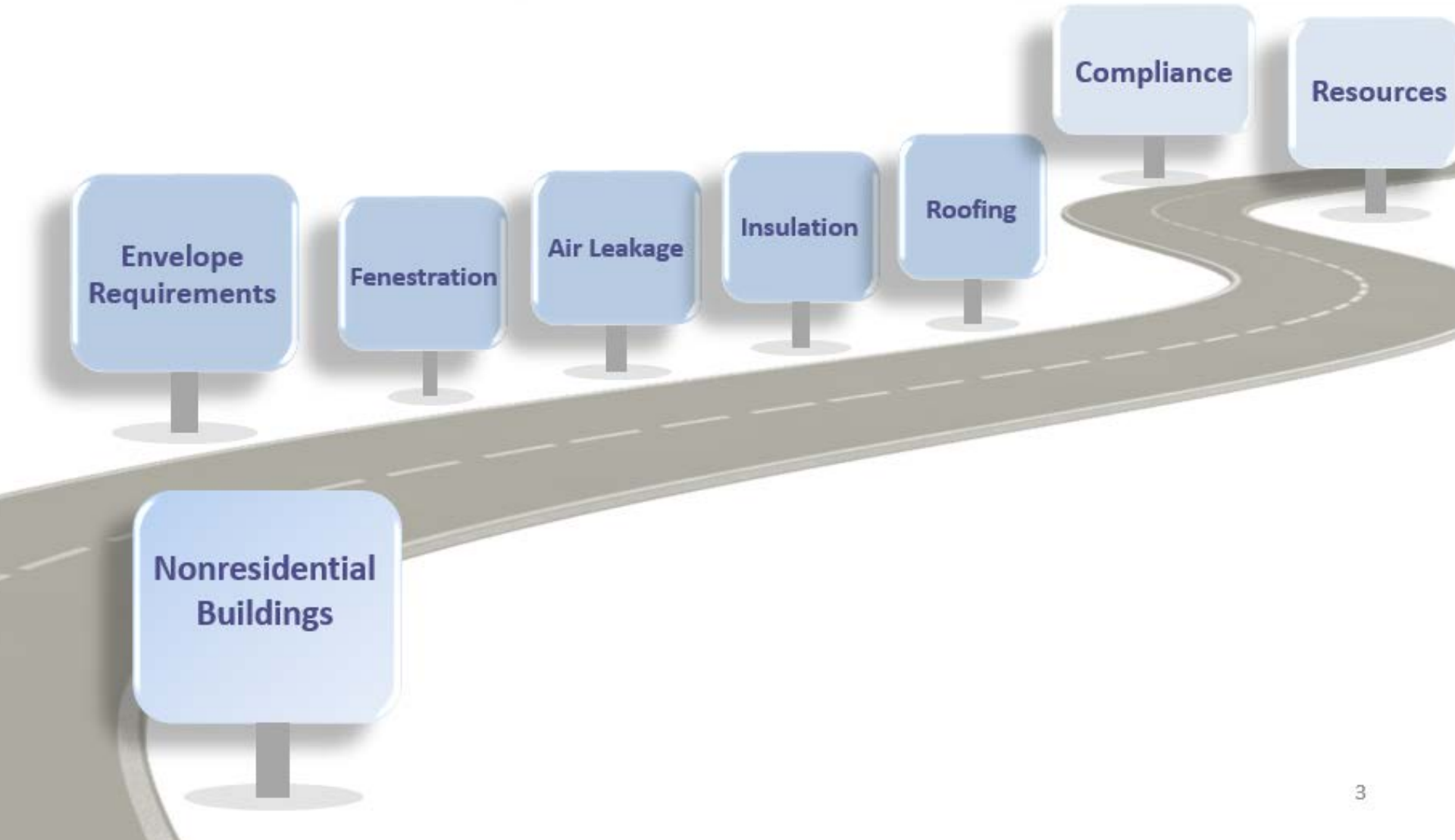
California Energy Commission

Overview

- Nonresidential Buildings
- Envelope Requirements
  - Fenestration
  - Air Leakage
  - Insulation
  - Roofing
- Compliance
- Resources

Overview


Nonresidential Buildings
Envelope Requirements
Fenestration
Air Leakage
Insulation
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Compliance
Resources

Nonresidential

Nonresidential and commercial buildings

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, M, R, S, U
- Hotels and motels
- High-rise residential buildings

- ✓ Offices
- ✓ Retail and wholesale stores
- ✓ Restaurants
- ✓ Assembly and conference areas
- ✓ Industrial work buildings
- ✓ Commercial or industrial storage
- ✓ Schools and churches
- ✓ Theaters
- ✓ Hotels and motels
- ✓ Apartment and multi-family buildings, four or more stories
- ✓ Long-term care facilities, four or more stories

2016 Energy Savings

Nonresidential Buildings

5% more efficient than 2013 Standards

- Electric Savings = 192 GWhs
- Demand Reduction = 80 MW
- Gas Savings = (0.9) Mtherms

2016 Building Energy Efficiency Standards

Title 24 - Part 1 and 6

Nonresidential

Part 1 Administrative Code

All Buildings § 10-101 to § 10-114

Regulations, definitions, permitting, compliance, enforcement, acceptance testing providers, local ordinances, interpretations, certification, labeling for fenestration and roofs, outdoor lighting zones

§ 10-111 - Fenestration

§ 10-112 - Default Tables

§ 10-113 - Roofing Products

Part 6 Section 100.0

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Nonresidential, High-Rise Residential, And Hotels/Motels	General	120.0	140.0, 140.2	140.0, 140.1	141.0
	Envelope (conditioned)	110.6, 110.7, 110.8,120.7	140.3		
	Envelope (unconditioned process spaces)	N.A.	140.3(c)		
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4		
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5		
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7		
	Electrical Power Distribution	110.11, 130.5	N.A.		
	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N. A.		141.0
	Solar Ready Buildings	110.10	N.A.		141.0(a)

Mandatory Requirements

All Buildings § 110.0-110.10

Regulates the manufacture and installation of components and systems for all buildings

§ 110.6 - Fenestration and exterior doors
§ 110.7 - Air leakage
§ 110.8 - Insulation and roofing

Mandatory Requirements

Nonresidential § 120.1-120.9

Covers requirements for design and installation of building envelopes, ventilation, space conditioning, service water heating systems and equipment, covered processes

§120.7 – Insulation

Performance and Prescriptive Requirements

Nonresidential §140.0-140.9

Performance and prescriptive compliance approaches

§ 140.3 - Prescriptive Building Envelope

Additions, Alterations, Repairs

Nonresidential § 141.0

Requirements for additions, alterations and repairs

§ 141.0 - Additions and Alterations

Fenestration

Fenestration Definitions

Fenestration - a transparent or translucent material plus any sash, frame, mullions and dividers

U-factor - a measure of the heat transmission through the fenestration

Lower U-factor and SHGC are more efficient

Solar Heat Gain Coefficient (SHGC) - the fraction of solar radiation entering the space through the fenestration which is released as heat into the space

Visible Transmittance (VT) **-** the ratio of visible light that is transmitted through the fenestration, higher is better

Fenestration Definitions

Three types of fenestration

Site-Built – plant-fabricated and field-assembled

- Storefront or curtain wall system
- Referred to as knock-down

Field-Fabricated – field-made

- Custom made at site for a specific application

Manufactured – preassembled glazing and frame

- Typical window or skylight

Fenestration Administrative Regulations

All Buildings § 10-111 and § 10-112

Labeling and Certification Requirements § 10-111

- National Fenestration Rating Council (NFRC) is designated to administer certification program
- Temporary labels
  - NFRC manufactured window labels
  - Energy Commission default table values
- Label certificates
  - NFRC Component Modeling Approach (CMA)
  - NA6 Alternate Default Fenestration Procedure (NRCC-ENV-05)
- Permanent labels

Default Tables § 10-112

- Energy Commission calculates, maintains, and revises

Fenestration Default U-factor

TABLE 110.6-A DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE [3,4] U-FACTOR	DOUBLE PANE [1,3,4] U-FACTOR	GLASS BLOCK [2,3] U-FACTOR
Metal	Operable	1.28	0.79	0.87
	Fixed	1.19	0.71	0.72
	Greenhouse/garden window	2.26	1.40	N.A.
	Doors	1.25	0.77	N.A.
	Skylight	1.98	1.30	N.A.
Metal, Thermal Break	Operable	N.A.	0.66	N.A.
	Fixed	N.A.	0.55	N.A.
	Greenhouse/garden window	N.A.	1.12	N.A.
	Doors	N.A.	0.59	N.A.
	Skylight	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
	Fixed	1.04	0.55	0.57
	Doors	0.99	0.53	N.A.
	Greenhouse/garden windows	1.94	1.06	N.A.
	Skylight	1.47	0.84	N.A.

[1] For all dual-glazed fenestration products, adjust the listed U-factors as follows:

a. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide.

b. Add 0.05 to any product with true divided lite (dividers through the panes).

[2] Translucent or transparent panels shall use glass block values when not rated by NFRC 100.

[3] Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.

[4] Windows with window film applied that is not rated by NFRC 100 shall use the default values from this table.

Fenestration Default SHGC

TABLE 110.6-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)

FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane[2,3] SHGC	Double Pane[2,3] SHGC	Glass Block[1,2] SHGC
Metal	Operable	Clear	0.80	0.70	0.70
	Fixed	Clear	0.83	0.73	0.73
	Operable	Tinted	0.67	0.59	N.A.
	Fixed	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
	Fixed	Clear	N.A.	0.69	N.A.
	Operable	Tinted	N.A.	0.53	N.A.
	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
	Fixed	Clear	0.76	0.67	0.67
	Operable	Tinted	0.60	0.53	N.A.
	Fixed	Tinted	0.63	0.55	N.A.

[1] Translucent or transparent panels shall use glass block values when not rated by NFRC 200.

[2] Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.

[3] Windows with window film applied that is not rated by NFRC 200 shall use the default values from this table

Fenestration Temporary Labels

NFRC

NFRC

National Fenestration Rating Council®

CERTIFIED

World's Best Window Co.

Millennium 2000+

Vinyl-Clad Wood Frame

Double Glazing • Argon Fill • Low E

Product Type: **Vertical Slider**

ENERGY PERFORMANCE RATINGS

U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	**0.30**

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Leakage (U.S./I-P)
0.51	**0.2**

Manufacturer stipulates that these ratings conform tc applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.
www.nfrc.org

Energy Commission

2016 California Energy Commission Default Label
XYZ Manufacturing Co.

Key Features:	☐ Doors	☐ Double-Pane
	☐ Skylight	☐ Glass Block
Frame Type	**Product Type:**	**Product Glazing Type:**
☐ Metal	☐ Operable	☐ Clear
☐ Non-Metal	☐ Fixed	☐ Tinted
☐ Metal, Thermal Break	☐ Greenhouse/Garden Window	☐ Single-Pane
☐ Air space 7/16 in. or greater ☐ With built-in curb ☐ Meets Thermal-Break Default Criteria	----------	To calculate VT see NA6
California Energy Commission Default U-factor =	**California Energy Commission** Default SHGC =	**California Energy Commission** Calculated VT =

Product meets the air infiltration requirements of §110.6(a)1, U-factor criteria of §110.6(a)2, SHGC criteria of §110.6(a)3 and VT criteria of §110.6(a)4 of the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings.

NFRC CMA Label Certificate

NATIONAL FENESTRATION RATING COUNCIL
LABEL CERTIFICATE

PROJECT INFORMATION

LABEL CERTIFICATE ID: *XYZ-001* Issuance Date: mm/dd/yyyy

This is to be completed by an NFRC Approved Calculation Entity (ACE), based on information provided by the Specifying Authority and calculated in accordance with NFRC procedures.

PROJECT LOCATION:

Address: _____,

City: _____, **State,** _____, **Zip code:** _____,

Contact person: _____, **Title:** _____

Phone: _____, **Facsimile:** _____, **Email:** _____

Project name (optional): _____, **Designer (optional):** _

PRODUCT LISTING

FOR CODE COMPLIANCE

LABEL CERTIFICATE ID: *XYZ-001* Issuance Date: mm/dd/yyyy

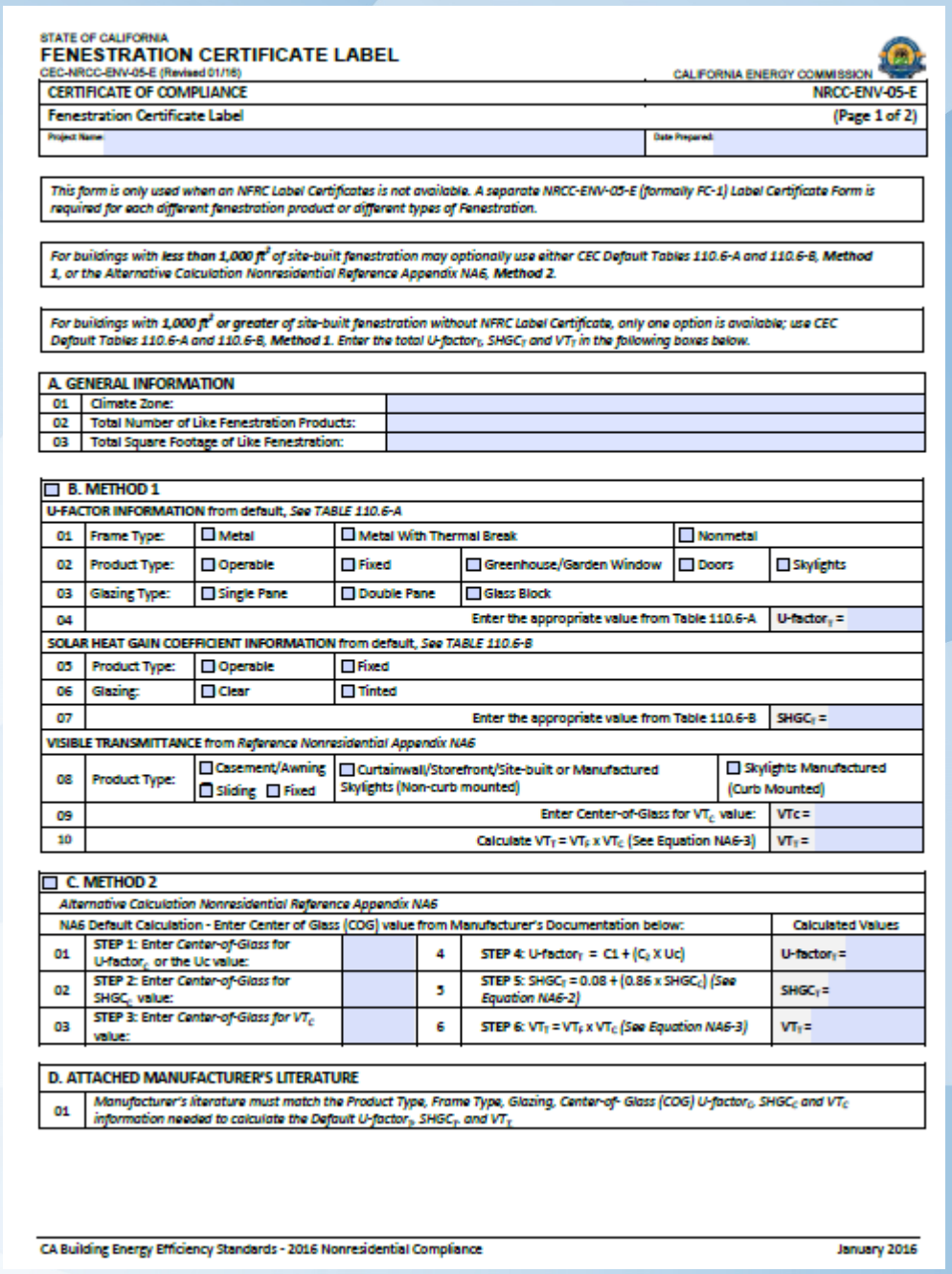
NFRC CERTIFIED PRODUCT RATING INFORMATION:*

The NFRC Certified Product Rating Information listed here is to be used to verify that the ratings meet applicable energy code requirements.

PRODUCT LISTING:

CPD ID	Total Area ft²	Name	Framing Ref	Glazing Ref	Spacer Ref	CERTIFIED Performance Rating at NFRC Model Size U** Btu/hr·ft²·°F	SHGC** -	VT** -
P-PL-010	88.89	PL-2200 / PL-2210	FA-PL2210	GA-TT-001	SA-AM-001	0.53	0.58	0.66
P-PL-005	192.67	PL-3400 / PL-3401	FA-PL3401	GA-TT-001	SA-AM-002	0.56	0.57	0.65
P-PL-012	382.22	PL-5700 / PL-5720	FA-PL5720	GA-TO-002	SA-AM-001	0.52	0.21	0.30
P-PL-002	60.00	PL-1100 / PL-1152	FA-PL1152	GA-TT-001	SA-AM-001	0.42	0.51	0.62
P-PL-022	525.00	PL-9900 / PL-9915	FA-PL9915	GA-TO-003	SA-AM-002	0.45	0.15	0.19

NRCC-ENV-05 Fenestration Certificate Label



STATE OF CALIFORNIA

FENESTRATION CERTIFICATE LABEL

CEC-NRCC-ENV-05-E (Revised 01/16) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-ENV-05-E
Fenestration Certificate Label	(Page 1 of 2)
Project Name:	Date Prepared:

This form is only used when an NFRC Label Certificates is not available. A separate NRCC-ENV-05-E (formally FC-1) Label Certificate Form is required for each different fenestration product or different types of Fenestration.

*For buildings with **less than 1,000 ft²** of site-built fenestration may optionally use either CEC Default Tables 110.6-A and 110.6-B, **Method 1**, or the Alternative Calculation Nonresidential Reference Appendix NA6, **Method 2**.*

*For buildings with **1,000 ft² or greater** of site-built fenestration without NFRC Label Certificate, only one option is available; use CEC Default Tables 110.6-A and 110.6-B, **Method 1**. Enter the total U-factor$_T$, SHGC$_T$ and VT$_T$ in the following boxes below.*

A. GENERAL INFORMATION

01	Climate Zone:	
02	Total Number of Like Fenestration Products:	
03	Total Square Footage of Like Fenestration:	

☐ **B. METHOD 1**

U-FACTOR INFORMATION from default, *See TABLE 110.6-A*

01	Frame Type:	☐ Metal	☐ Metal With Thermal Break		☐ Nonmetal	
02	Product Type:	☐ Operable	☐ Fixed	☐ Greenhouse/Garden Window	☐ Doors	☐ Skylights
03	Glazing Type:	☐ Single Pane	☐ Double Pane	☐ Glass Block		
04	Enter the appropriate value from Table 110.6-A					U-factor$_T$ =

SOLAR HEAT GAIN COEFFICIENT INFORMATION from default, *See TABLE 110.6-B*

05	Product Type:	☐ Operable	☐ Fixed
06	Glazing:	☐ Clear	☐ Tinted
07	Enter the appropriate value from Table 110.6-B		SHGC$_T$ =

VISIBLE TRANSMITTANCE from *Reference Nonresidential Appendix NA6*

08	Product Type:	☐ Casement/Awning ☐ Sliding ☐ Fixed	☐ Curtainwall/Storefront/Site-built or Manufactured Skylights (Non-curb mounted)	☐ Skylights Manufactured (Curb Mounted)
09	Enter Center-of-Glass for VT$_C$ value:			VTc =
10	Calculate VT$_T$ = VT$_T$ x VT$_C$ (See Equation NA6-3)			VT$_T$ =

☐ **C. METHOD 2**

Alternative Calculation Nonresidential Reference Appendix NA6

	NA6 Default Calculation - Enter Center of Glass (COG) value from Manufacturer's Documentation below:				Calculated Values
01	**STEP 1:** Enter *Center-of-Glass* for U-factor$_C$ or the Uc value:		4	**STEP 4:** U-factor$_T$ = C1 + (C$_1$ X Uc)	U-factor$_T$ =
02	**STEP 2:** Enter *Center-of-Glass* for SHGC$_C$ value:		5	**STEP 5:** SHGC$_T$ = 0.08 + (0.86 x SHGC$_C$) *(See Equation NA6-2)*	SHGC$_T$ =
03	**STEP 3:** Enter *Center-of-Glass for VT$_C$* value:		6	**STEP 6:** VT$_T$ = VT$_T$ x VT$_C$ *(See Equation NA6-3)*	VT$_T$ =

D. ATTACHED MANUFACTURER'S LITERATURE

01	*Manufacturer's literature must match the Product Type, Frame Type, Glazing, Center-of- Glass (COG) U-factor$_C$, SHGC$_C$ and VT$_C$ information needed to calculate the Default U-factor$_T$, SHGC$_T$, and VT$_T$*

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance — January 2016

Fenestration Mandatory Requirements

All Buildings § 110.6

Manufactured and **site-built**

- Certified by NFRC to meet requirements for air leakage, U-factor, solar heat gain coefficient (SHGC), and visible transmittance (VT)

Site-built

- Less than 1,000 ft² Alternate Default Fenestration Procedure in Nonresidential Reference Appendix NA6
- Meet Acceptance Requirements in Nonresidential Reference Appendix NA7

Field-fabricated

- Must use U-factor in Table 110.6-A and SHGC in Table 110.6-B
- VT calculated using Nonresidential Reference Appendix NA6
- Must be caulked and weather-stripped

Fenestration Mandatory Requirements

All Buildings § 110.6

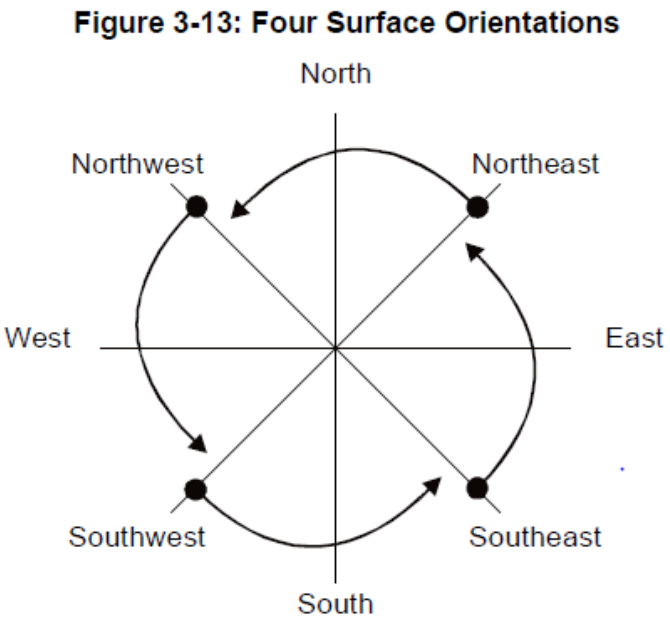
Methods for determining U-factor and SHGC

	Manufactured Windows	Manufactured Skylights	Site-Built Fenestration	Field-Fabricated Fenestration	Glass Block
NFRC	✓	✓	✓	n/a	n/a
NFRC - CMA	✓	✓	✓	n/a	n/a
Default Table 110-6A, B	✓	✓	✓	✓	✓
NA6 - less than 1,000ft²	n/a	n/a	✓	n/a	n/a

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5

Vertical Windows and Storefronts



- Meet U-factor, SHGC and VT requirements of Table 140.3-B,C or D
  - Overhangs use relative SHGC calculation equation 140.3-A
- Total fenestration area 40% or less of total wall area or 6 feet times total display perimeter, whichever is greater
- West fenestration area 40% or less of west wall area or 6 feet times total west-facing display perimeter, whichever is greater

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5

Vertical Windows and Storefronts

CONTINUED: TABLE 140.3-B – 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)

				All Climate Zones			
				Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors[2]
Envelope	Fenestration	Vertical	Area-Weighted Performance Rating	Max U-factor	0.36	0.46	0.41	0.45
				Max RSHGC	0.25	0.22	0.26	0.23
			Area-Weighted Performance Rating	Min VT	0.42	0.32	0.46	0.17
			Maximum 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 SHGC	0.25	0.25	NR	
			Area-Weighted Performance Rating	Min VT	0.49	0.49	0.64	
			Maximum SRR%	5%			

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5C

Overhangs on Vertical Windows and Storefronts

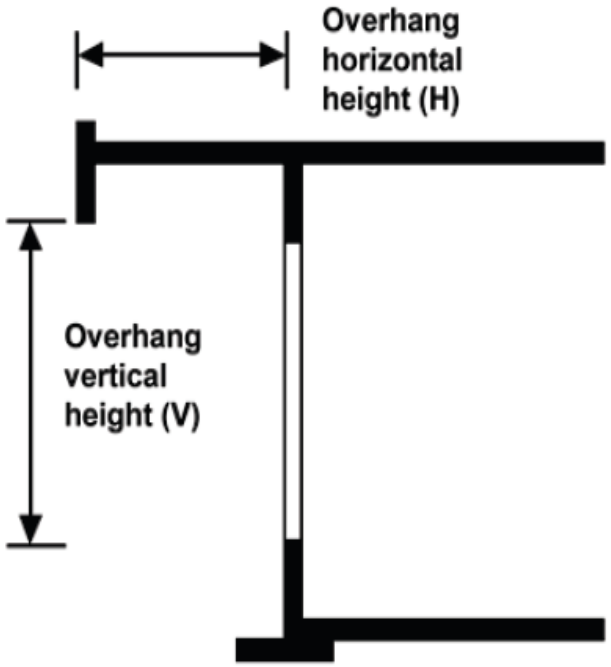
Relative SHGC calculation

- External shading correction
- Multiple SHGC by overhang factor
- NCM Table 3-18 overhang factors
- Equation 140.3-A

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

Example: East-facing window SHGC 0.71

- Overhang extends out 3 ft, 6 ft above the bottom of the glass H/V: 3 / 6 = 0.50
- East-facing overhang factor Table 3-18 = 0.63
- SHGC x overhang factor
- RSHGC: 0.63 x 0.71 = 0.45



Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)6,7

Skylights

- Meet U-factor, SHGC and VT requirements of Table 140.3-B,C or D
- Not more than 5% of total roof area
- Haze value more than 90%

Exterior doors

- Meet U-factor of Tables 140.3-B,C or D
- More than 50% glazed is fenestration

Daylighting Prescriptive Requirements

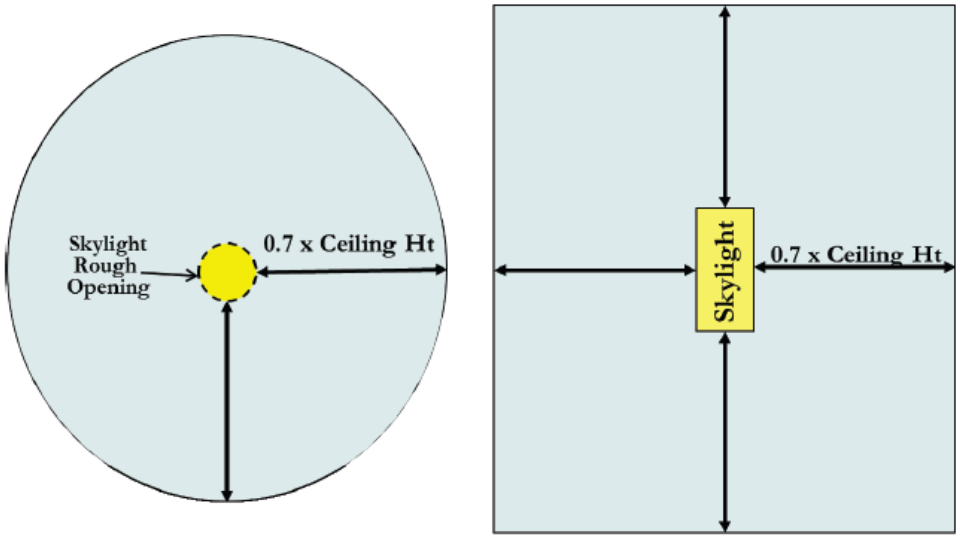
Nonresidential § 140.3(c)

Climate Zones 2-15

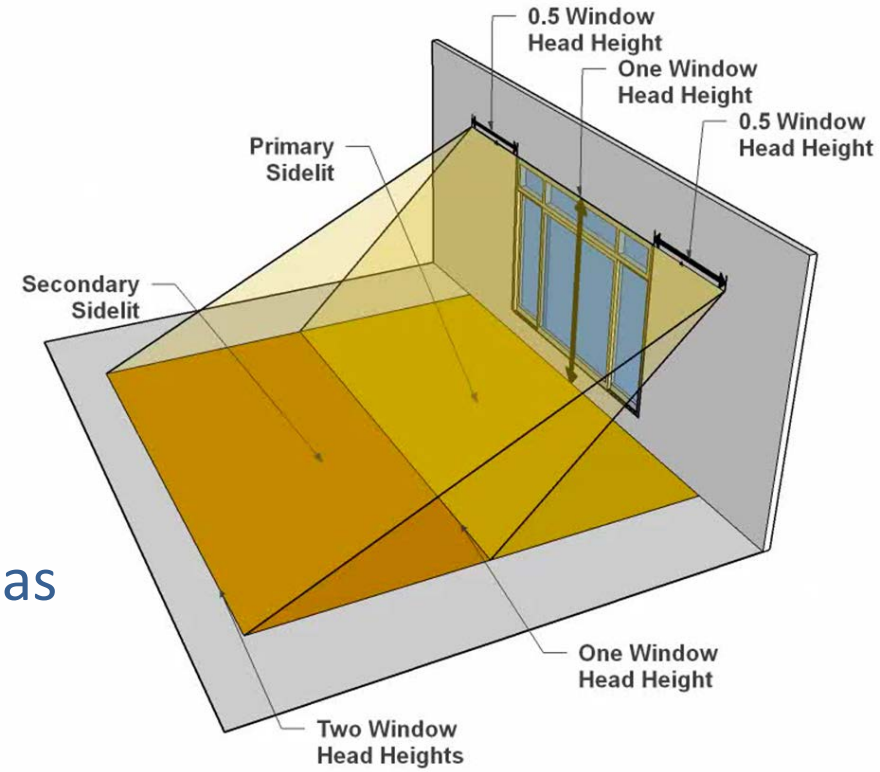
- Large enclosed spaces greater than 5,000 ft²
- Conditioned or unconditioned
- Ceilings greater than 15 feet height directly under roof
- Requirements
  - 75% of floor area within skylit daylit zone *or* primary sidelit daylit zone
  - Shown on plans
  - Daylighting controls per §130.1(d)
  - Skylight area at least 3% of floor area *or* calculate with higher VT to install less skylight area (minimum 1.5%)
  - Haze value and VT requirements of skylights per §140.3(a)6

Daylighting Prescriptive Requirements

Nonresidential § 140.3(c)



Skylit and Sidelit areas

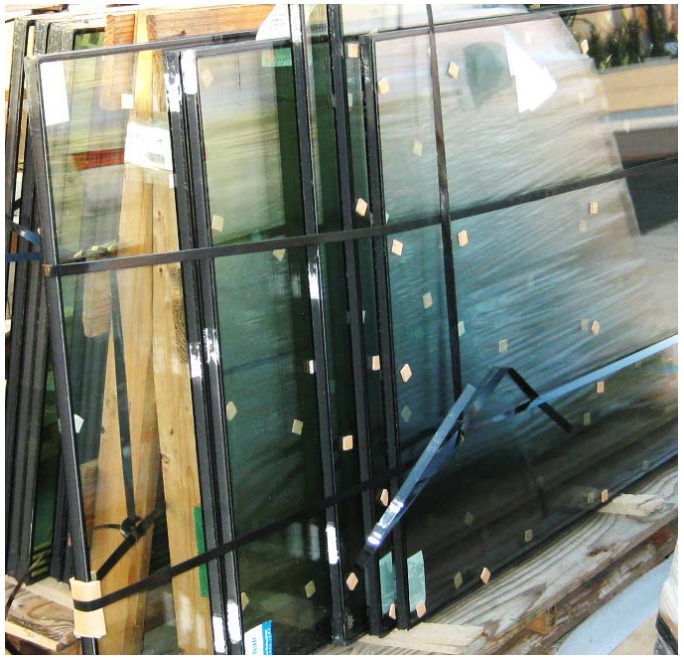


Fenestration Addition Requirements

Nonresidential § 141.0(a)

Addition - increase in conditioned floor area and volume

- Prescriptive
  - Added windows, skylights, doors must comply as new construction
- Performance
  - Addition alone complies
  - Option for existing, plus addition, plus alteration



Fenestration Addition Requirements

Nonresidential § 141.0(b)

Replacing existing fenestration

- Vertical windows
  - Meet U-factor, SHGC and VT requirements in Table 141.0-A
  - If replacing 150 ft^2 or less of vertical glazing, meet U-factor only
- Skylights
  - Meet U-factor, SHGC and VT requirements in Table 140.3-B,C, or D

Additional fenestration to existing building

- Vertical windows and skylights
  - Meet U-factor, SHGC and VT requirements in Table 140.3-B,C, or D
  - If adding 50 ft^2 or less, only need to meet U-factor

Test Your Knowledge

When does an exterior door become fenestration?

Photo courtesy of Marvin Windows and Doors

When the door has 50% or more glass

Now considered part of the total fenestration

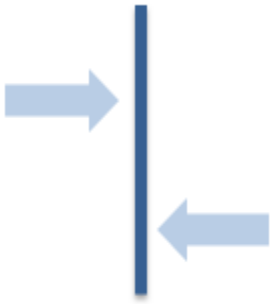
- Glass area meets all fenestration requirements
- Solid area meets exterior door requirements

Air Leakage

Air Leakage Definitions

Infiltration - uncontrolled air leakage from outside to inside, through cracks, joints, windows, doors, partitions or penetrations

Exfiltration - uncontrolled air leakage from inside to outside, through cracks, joints, windows, doors, partitions or penetrations



Air Barrier – a system of materials joined and sealed together to control air flow through the building envelope that separates conditioned from unconditioned space, or that separates adjoining conditioned spaces of different occupancies or uses

Air Leakage Mandatory Requirements

All Buildings § 110.7

Limit infiltration and exfiltration

- Must caulk, gasket, weather-strip, or seal all joints, penetrations, openings

Most overlooked **MANDATORY** requirement. Major impacts on energy use.

Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9

Continuous air barrier - required in climate zones 10-16 with all joints sealed and materials installed per manufacturer

- Materials with maximum air permeance of 0.004 cfm/ft² *or* per Table 140.3-A
- Assemblies average air leakage not to exceed 0.04 cfm/ft² *or* these materials
  - Concrete masonry walls with two coatings of paint or sealer, or with integral rigid board insulation
  - Structurally Insulated Panels (SIPS)
  - Portland cement, sand parge, stucco, or gypsum plaster with minimum ½”
- Entire building air leakage not to exceed 0.40 cfm/ft², tested in accordance with ASTM E779

Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9

TABLE 140.3-A *MATERIALS DEEMED TO COMPLY WITH SECTION 140.3(a)9A*

	MATERIALS AND THICKNESS		MATERIALS AND THICKNESS
1	Plywood – min. 3/8 inches thickness	9	Built up roofing membrane
2	Oriented strand board – min. 3/8 inches thickness	10	Modified bituminous roof membrane
3	Extruded polystyrene insulation board – min. ½ inches thickness	11	Fully adhered single-ply roof membrane
4	Foil-back polyisocyanurate insulation board – min. ½ inches thickness	12	A Portland cement or Portland sand parge, or a gypsum plaster, each with min. 5/8 inches thickness
5	Closed cell spray foam with a minimum density of 2.0 pcf and a min. 2.0 inches thickness	13	Cast-in-place concrete, or precast concrete
6	Open cell spray foam with a density no less than 0.4 pcf and no greater than 1.5 pcf, and a min. 5½ inches thickness	14	Fully grouted concrete block masonry
7	Exterior or interior gypsum board min. 1/2 inches thickness	15	Sheet steel or sheet aluminum
8	Cement board – min. 1/2 inches thickness	---	----------

Insulation

Insulation Definitions

U-factor - a measure of the heat transmission through a wall, roof, floor, or a given thickness of a material, like insulation

R-value - capacity of an insulating material to resist heat flow

Lower U-factor is better
Higher R-value is better

Insulation Definitions

Exterior wall - separates conditioned space from outdoors

***Demising wall* -** separates conditioned space from enclosed unconditioned space

Roof - outside cover of a building, including the structural supports, decking, and top layer that is exposed to the outside

Ceiling - demising partition over conditioned space and under unconditioned space

Floor - exterior partition under conditioned space and above outdoor conditions.

***Soffit* -** demising partition under conditioned space and above unconditioned space

Insulation Mandatory Requirements

All Buildings § 110.8(a-c)

All Materials

- Certified to California Quality Standards for Insulation Materials by the California Department of Consumer Affairs
- Restricts use of formaldehyde foam
- Must have fire-retardant on exposed surfaces and be installed according to California Building Code

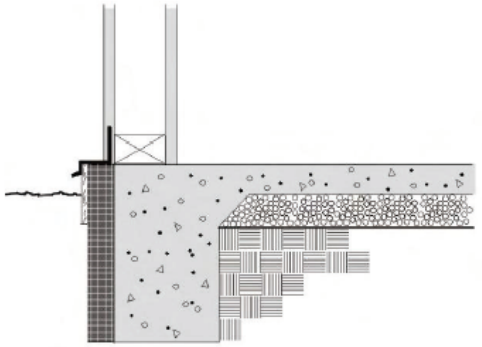
Insulation Mandatory Requirements

All Buildings § 110.8(g-h)

Heated slab floors

- Meet requirements in Table 110.8-A for R-value a climate zone
- Must be certified per § 110.8(a)
- Requirements for direct contact with slab and gr (water absorption and vapor permeable)
- Protect exposed material to wind, equipment, moisture and UV
- Rigid plate to prevent intrusion of insects into foundation

Figure 3-6: Perimeter Slab Insulation



Wet insulation systems above roofs waterproof membrane

- Meet effective R-value in Reference Joint Appendix JA4.2

Insulation Mandatory Requirements

Nonresidential § 120.7(a)

Ceilings and Roofs

- Weighted U-factor of roof assembly
  - Metal buildings shall not exceed 0.098
  - Wood-framed and others shall not exceed 0.075
- Placement of insulation
  - Direct contact with continuous ceiling or roof, above or below roof deck
  - When insulation at roof, cannot have openings or vents into unconditioned space between ceiling and roof
  - No insulation on removable panels of suspended ceiling

Insulation Mandatory Requirements

Nonresidential § 120.7(b)

Walls

Wall Assembly Type	Maximum U-factor
Metal buildings	0.113
Metal-framed walls (including demising)	0.151
Heavy mass walls	0.690
Light mass walls	0.440
Wood-framed walls and others	0.110
Wood-framed demising walls	0.099
Spandrel panel and opaque curtain walls	0.280

Insulation Mandatory Requirements

Nonresidential § 120.7(b)

Walls

2016 Joint Appendices *Appendix JA4-33*

Table 4.3.3 – U-factors of Metal Framed Walls for Nonresidential Construction

Spacing	Cavity Insulation R-Value:	Nominal Framing Size		Rated R-value of Continuous Insulation [2] R-0 A	R-2 B	R-4 C	R-5 D	R-6 E	R-7 F	R-8 G	R-10 H	R-12 I	R-14 J	R-15 K
16 in. OC	None	Any	1	0.458	0.239	0.162	0.139	0.122	0.109	0.098	0.082	0.071	0.062	0.058
	R-5	2x4	2	0.351	0.206	0.146	0.127	0.113	0.102	0.092	0.078	0.067	0.059	0.056
	R-11	2x4	3	0.224	0.155	0.118	0.106	0.096	0.087	0.080	0.069	0.061	0.054	0.052
	R-13	2x4	4	0.217	0.151	0.116	0.104	0.094	0.086	0.079	0.068	0.060	0.054	0.051
	R-15	2x4	5	0.211	0.148	0.114	0.103	0.093	0.085	0.078	0.068	0.060	0.053	0.050
	R-19	2x6	6	0.183	0.134	0.106	0.096	0.087	0.080	0.074	0.065	0.057	0.051	0.049
	R-21[1]	2x6	7	0.178	0.131	0.104	0.094	0.086	0.079	0.073	0.064	0.057	0.051	0.049
	R-19	2x8	8	0.164	0.123	0.099	0.090	0.083	0.076	0.071	0.062	0.055	0.050	0.047
	R-22	2x8	9	0.160	0.121	0.098	0.089	0.082	0.075	0.070	0.062	0.055	0.049	0.047
	R-25	2x8	10	0.158	0.120	0.097	0.088	0.081	0.075	0.070	0.061	0.055	0.049	0.047
	R-30[1]	2x8	11	0.157	0.119	0.096	0.088	0.081	0.075	0.070	0.061	0.054	0.049	0.047
24 in. OC	None	Any	20	0.455	0.238	0.161	0.139	0.122	0.109	0.098	0.082	0.070	0.062	0.058
	R-5	2x4	21	0.333	0.200	0.143	0.125	0.111	0.100	0.091	0.077	0.067	0.059	0.056
	R-11	2x4	22	0.210	0.148	0.114	0.102	0.093	0.085	0.078	0.068	0.060	0.053	0.051
	R-13	2x4	23	0.203	0.144	0.112	0.101	0.092	0.084	0.077	0.067	0.059	0.053	0.051
	R-15	2x4	24	0.197	0.141	0.110	0.099	0.090	0.083	0.076	0.066	0.059	0.052	0.050
	R-19	2x6	25	0.164	0.123	0.099	0.090	0.083	0.076	0.071	0.062	0.055	0.050	0.047
	R-21[1]	2x6	26	0.161	0.122	0.098	0.089	0.082	0.076	0.070	0.062	0.055	0.049	0.047
	R-19	2x8	27	0.153	0.117	0.095	0.087	0.080	0.074	0.069	0.060	0.054	0.049	0.047
	R-22	2x8	28	0.149	0.115	0.093	0.085	0.079	0.073	0.068	0.060	0.053	0.048	0.046
	R-25	2x8	29	0.147	0.114	0.093	0.085	0.078	0.072	0.068	0.060	0.053	0.048	0.046
	R-30[1]	2x8	30	0.146	0.113	0.092	0.084	0.078	0.072	0.067	0.059	0.053	0.048	0.046

Notes

1. Higher density fiberglass batt is required in these cases.
2. Continuous insulation may be installed on either the inside or the exterior of the wall, or both.

Insulation Mandatory Requirements

Nonresidential § 120.7(c)

Floors and soffits

Floor Assembly Type	Maximum U-factor
Raised mass floors	0.269
Other floors	0.071
Heated slab	Table 110.8-A

U-factors can be found in Reference Joint Appendix JA4 Tables

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)1-4

Exterior walls, roofs, ceilings, floors and soffits

- Nonresidential buildings overall assembly maximum U-factor per Tables 140.3-B
- High-rise, hotel and motel overall assembly maximum U-factor per Tables 140.3-C
- Relocatable school buildings overall assembly maximum U-factor per Tables 140.3-D

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)1-4

TABLE 140.3-B – 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)

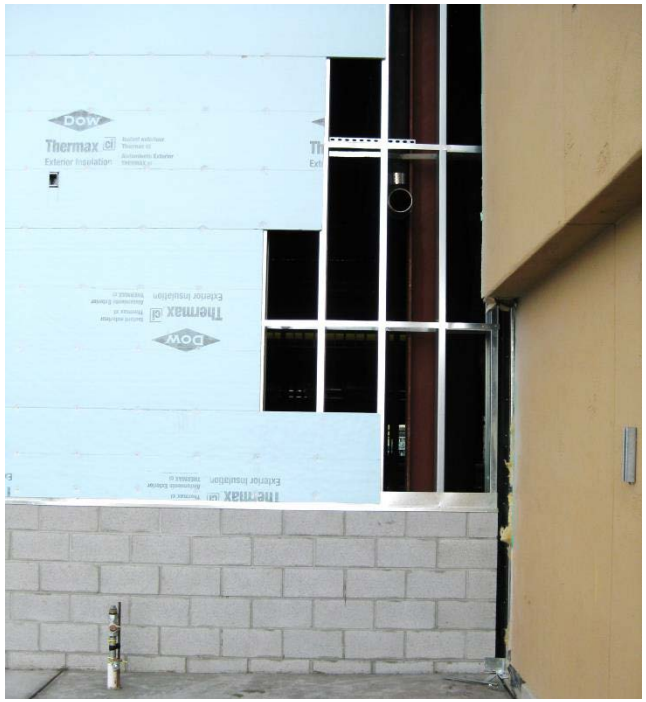
				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Envelope	Maximum U-factor	Roofs/ Ceilings	Metal Building	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
			Wood Framed and Other	0.034	0.034	0.034	0.034	0.034	0.049	0.049	0.049	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034
		Walls	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	0.069	0.062	0.082	0.062	0.062	0.069	0.069	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
			Mass Light[1]	0.196	0.170	0.278	0.227	0.440	0.440	0.440	0.440	0.440	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy[1]	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	0.095	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.045	0.059	0.059	0.059	0.042	0.059
		Floors/ Soffits	Raised 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
	Roofing Products	Low-sloped	Aged Solar Reflectance	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
			Thermal Emittance	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
		Steep-Sloped	Aged Solar Reflectance	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
			Thermal Emittance	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
	Air Barrier			NR	NR	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ
	Exterior Doors, Maximum 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

Insulation Addition Requirements

Nonresidential § 141.0(a)

Addition - increase in conditioned floor area and volume

- Prescriptive
  - Added walls, roof and ceiling must comply as new construction
- Performance
  - Addition alone complies
  - Option for existing, plus addition, plus alteration



Insulation Alteration Prescriptive Requirements

Nonresidential § 141.0(b)1A

Roofs

- Meet requirements of 141.0(b)2Biii when it is stripped to the deck or recover boards per Table 141.0-C

TABLE 141.0-C INSULATION REQUIREMENTS FOR ROOF ALTERATIONS

	Nonresidential		High-Rise Residential and Guest Rooms of Hotel/Motel Buildings	
Climate Zone	Continuous Insulation R-value	U-factor	Continuous Insulation R-value	U-factor
1	R-8	0.082	R-14	0.055
2	R-14	0.055	R-14	0.055
3-9	R-8	0.082	R-14	0.055
10-16	R-14	0.055	R-14	0.055

Insulation Alteration Requirements

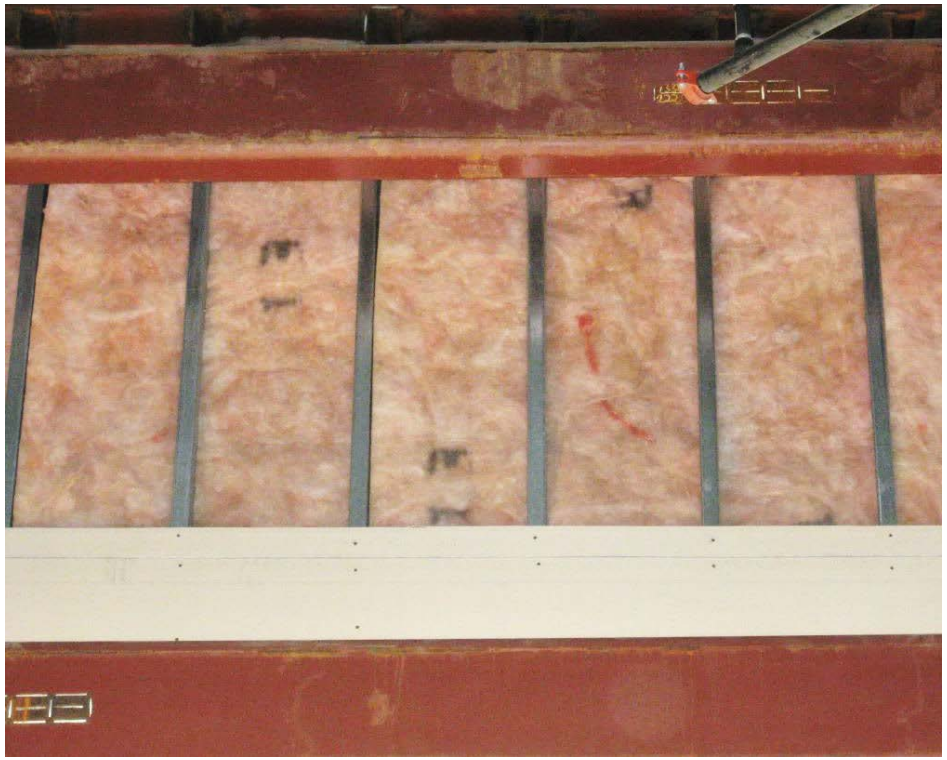
Nonresidential § 141.0(b)1B,C

Walls, floors and soffits

Wall Assembly Type	Minimum R-value	Maximum U-factor
Metal buildings	R-13	0.113
Metal-framed walls	R-13	0.217
Wood-framed walls and others	R-11	0.110
Spandrel panel and curtain walls	R-4	0.280
Floor Assembly Type	**Minimum R-value**	**Maximum U-factor**
Raised framed floors	R-11	0.071
Raised mass floors in high rise, hotel and motel	R-6	0.111

Test Your Knowledge

Do metal-framed demising walls need insulation?

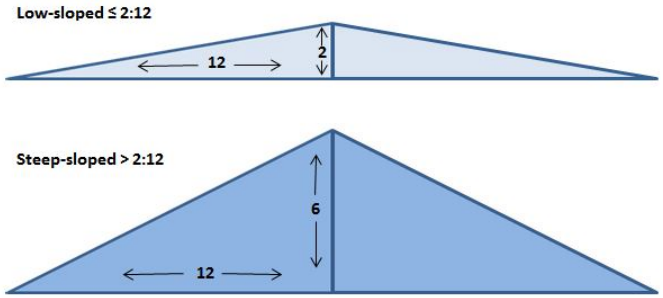


Yes, they need to meet § 120.7

- Metal-framed demising walls require the same U-factor as metal-framed exterior walls

Roofing

Roofing Definitions



Low-sloped – rise to run 2:12 or lower

Steep-sloped – rise to run higher than 2:12

Solar Reflectance (SR) - ability to reflect solar energy from the sun back into the atmosphere

Thermal Emittance (TE) - the ability to release heat that has been absorbed

Solar Reflectance Index (SRI) - combines SR three year *aged* value and TE in an equation

The higher the number, the cooler the roof

Roofing Administrative Regulations

All Buildings § 10-113

Certification Requirements

- Cool Roof Rating Council (CRRC) is responsible for certifying

Labeling Requirements

- Solar Reflectance and Thermal Emittance must be listed

CRRC
COOL ROOF RATING COUNCIL ®

	Initial	Weathered
Solar Reflectance	0.00	Pending
Thermal Emittance	0.00	Pending

Rated Product ID Number	_ _ _ _
Licensed Seller ID Number	_ _ _ _
Classification	Production Line

Cool Roof Rating Council ratings are determined for a fixed set of conditions, and may not be appropriate for determining seasonal energy performance. The actual effect of solar reflectance and thermal emittance on building performance may vary.

Manufacturer of product stipulates that these ratings were determined in accordance with the applicable Cool Roof Rating Council procedures.

Roofing Mandatory Requirements

All Buildings § 110.8(i)

Roofing products - meet aged solar reflectance and thermal emittance thresholds

- Certified and labeled per § 10-113
- Default values for non-certified products
- *Solar reflectance index* may be used as alternative to aged SR and TE values
- Liquid-applied roof coatings to meet Table 110.8-C requirements for coverage and thickness

Roofing Prescriptive Requirements

Nonresidential § 140.3(a)1A

Roofing products - Meet requirements in § 110.8

- Cool roof requirements by climate zone, roof slope and building type per Tables 140.3-B,C or D
  - Minimum Aged Solar Reflectance
  - Minimum Thermal Emittance

Building Type	Table
Nonresidential	140.3 B
High-rise, hotel and motel	140.3-C
Relocatable schools	140.3-D

Roofing Prescriptive Requirements

Nonresidential § 140.3(a)1

TABLE 140.3-C – 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	Maximum U-factor	Roofs/ Ceilings	Metal Building	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
			Wood Framed and Other	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
		Walls	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	0.069	0.069	0.069	0.069	0.069	0.069	0.105	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.048	0.069
			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[1]	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	Raised 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
	Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	0.55	0.55	0.55	NR	0.55	0.55	0.55	NR
			Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	NR	0.75	0.75	0.75	NR
		Steep-Sloped	Aged Solar 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
			Thermal 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
	Exterior Doors, Maximum 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

Roofing Prescriptive Requirements

Nonresidential § 140.3(a)1Aia

Exception for low-sloped roofs

- Aged solar reflectance insulation trade-off per Table 140.3

TABLE 140.3 ROOF/CEILING INSULATION TRADEOFF FOR AGED SOLAR REFLECTANCE

Nonresidential			
Aged Solar Reflectance	Metal Building Climate Zone 1-16 U-factor	Wood framed and Other Climate Zone 6 & 7 U-factor	Wood Framed and Other All Other Climate Zones U-factor
0.62-0.56	0.038	0.045	0.032
0.55-0.46	0.035	0.042	0.030
0.45-0.36	0.033	0.039	0.029
0.35-0.25	0.031	0.037	0.028

Roofing Addition Requirements

Nonresidential § 141.0(a)

Addition - increase in conditioned floor area and volume

- Prescriptive
  - Added roof and ceiling assemblies must comply as new construction
- Performance
  - Addition alone complies
  - Option for existing, plus addition, plus alteration

Roofing Alterations

Nonresidential § 141.0(b)2B

Replacement, recoated, or recovered

- Greater than 50% of roofing or more than 2,000 ft² roofing being altered, whichever is less
  - Meet requirements per §110.8(i)
  - Roofing products meet SR and TE requirements per Tables 140.3-B, C, or D
  - Exception to aged SR for tradeoff with insulation, per Table 141.0-B
  - Low-sloped exposed roof deck insulated per Table 141.0-C

Roofing Alterations

Nonresidential § 141.0(b)2B

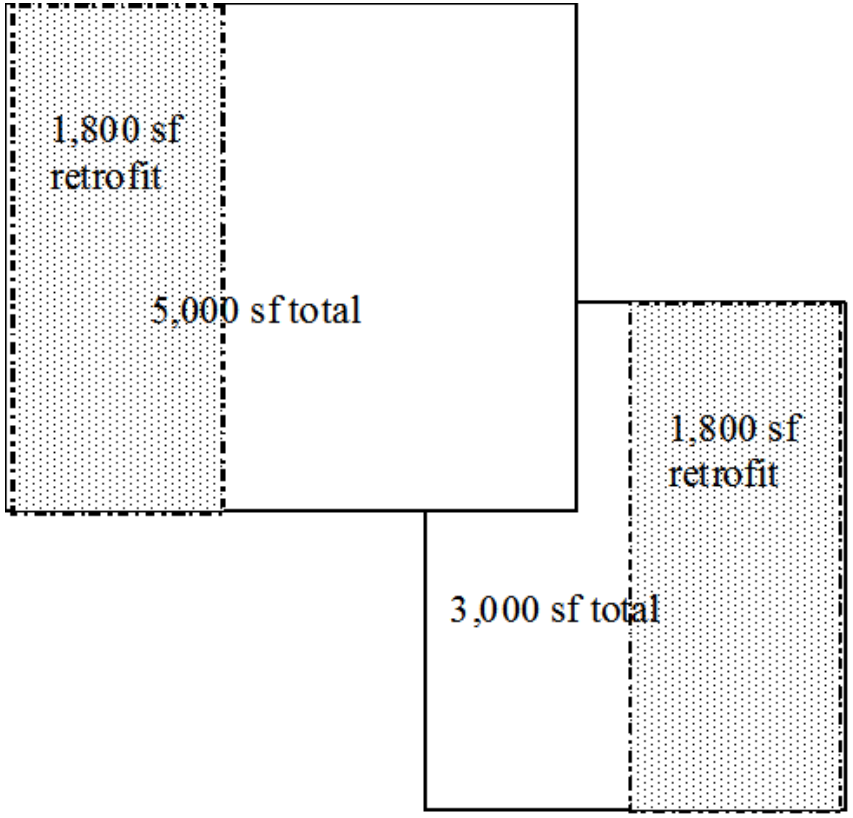
Reroof Examples

1,800 ft² of 5,000 ft² roof is replaced

- No insulation or cool roof required on that portion of the roof. 1,800 ft² is 36% of 5,000 ft². It is less than 50% of the roof area and less than 2,000 ft².

1,800 ft² of 3,000 ft² roof is reroofed and roof deck is exposed

- Reroofed section must be insulated and have a cool roof. 1,800 ft² is 60% of 3,000 ft²



Test Your Knowledge

Does an alteration to the roof of an unconditioned building trigger cool roof requirements?

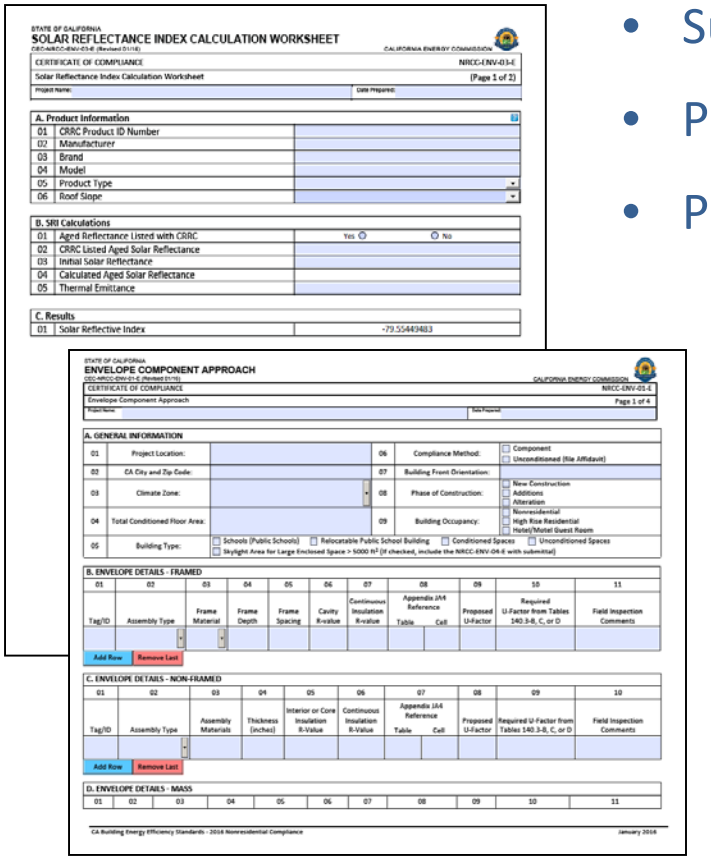
No, alterations to the roof of an unconditioned building do not trigger cool roof requirements

- Generally, building envelope requirements do not apply to unconditioned buildings
  (only skylight requirements)

Compliance and Enforcement

Certificate of Compliance

Certificate of Compliance - NRCCs


STATE OF CALIFORNIA
SOLAR REFLECTANCE INDEX CALCULATION WORKSHEET
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE — NRCC-ENV-03-E
Solar Reflectance Index Calculation Worksheet — (Page 1 of 2)
Project Name: — Date Prepared:

A. Product Information

01	CRRC Product ID Number
02	Manufacturer
03	Brand
04	Model
05	Product Type
06	Roof Slope

B. SRI Calculations

01	Aged Reflectance Listed with CRRC	Yes / No
02	CRRC Listed Aged Solar Reflectance	
03	Initial Solar Reflectance	
04	Calculated Aged Solar Reflectance	
05	Thermal Emittance	

C. Results

01	Solar Reflective Index	-79.55449483

STATE OF CALIFORNIA
ENVELOPE COMPONENT APPROACH
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE — NRCC-ENV-01-E
Envelope Component Approach — Page 1 of 4
Project Name: — Date Prepared:

A. GENERAL INFORMATION

01	Project Location:		06	Compliance Method:	☐ Component ☐ Unconditioned (file Affidavit)
02	CA City and Zip Code:		07	Building Front Orientation:	
03	Climate Zone:		08	Phase of Construction:	☐ New Construction ☐ Additions ☐ Alteration
04	Total Conditioned Floor Area:		09	Building Occupancy:	☐ Nonresidential ☐ High Rise Residential ☐ Hotel/Motel Guest Room
05	Building Type:	☐ Schools (Public Schools) ☐ Relocatable Public School Building ☐ Conditioned Spaces ☐ Unconditioned Spaces ☐ Skylight Area for Large Enclosed Space > 5000 ft² (If checked, include the NRCC-ENV-06-E with submittal)			

B. ENVELOPE DETAILS - FRAMED

01	02	03	04	05	06	07	08		09	10	11
Tag/ID	Assembly Type	Frame Material	Frame Depth	Frame Spacing	Cavity R-value	Continuous Insulation R-value	Appendix JA4 Reference Table	Appendix JA4 Reference Cell	Proposed U-Factor	Required U-Factor from Tables 140.3-B, C, or D	Field Inspection Comments

Add Row — Remove Last

C. ENVELOPE DETAILS - NON-FRAMED

01	02	03	04	05	06	07		08	09	10
Tag/ID	Assembly Type	Assembly Materials	Thickness (inches)	Interior or Core Insulation R-Value	Continuous Insulation R-Value	Appendix JA4 Reference Table	Appendix JA4 Reference Cell	Proposed U-Factor	Required U-Factor from Tables 140.3-B, C, or D	Field Inspection Comments

Add Row — Remove Last

D. ENVELOPE DETAILS - MASS

01	02	03	04	05	06	07	08	09	10	11

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance — January 2016

- Submit with permit application, include with plans
- Plans examiner to verify compliance
- Prescriptive Envelope Forms
  - *NRCC-ENV-01 - Envelope Components*
  - *NRCC-ENV-02 – Fenestration Worksheet*
  - *NRCC-ENV-03 – Cool Roof SRI Worksheet*
  - *NRCC-ENV-04 – Daylit Zone Worksheet*
  - *NRCC-ENV-05 – Fenestration Certificate Label*
  - *NRCC-ENV-06 – Area Weighted Average*

Plans Examiner

NRCCs at plan check

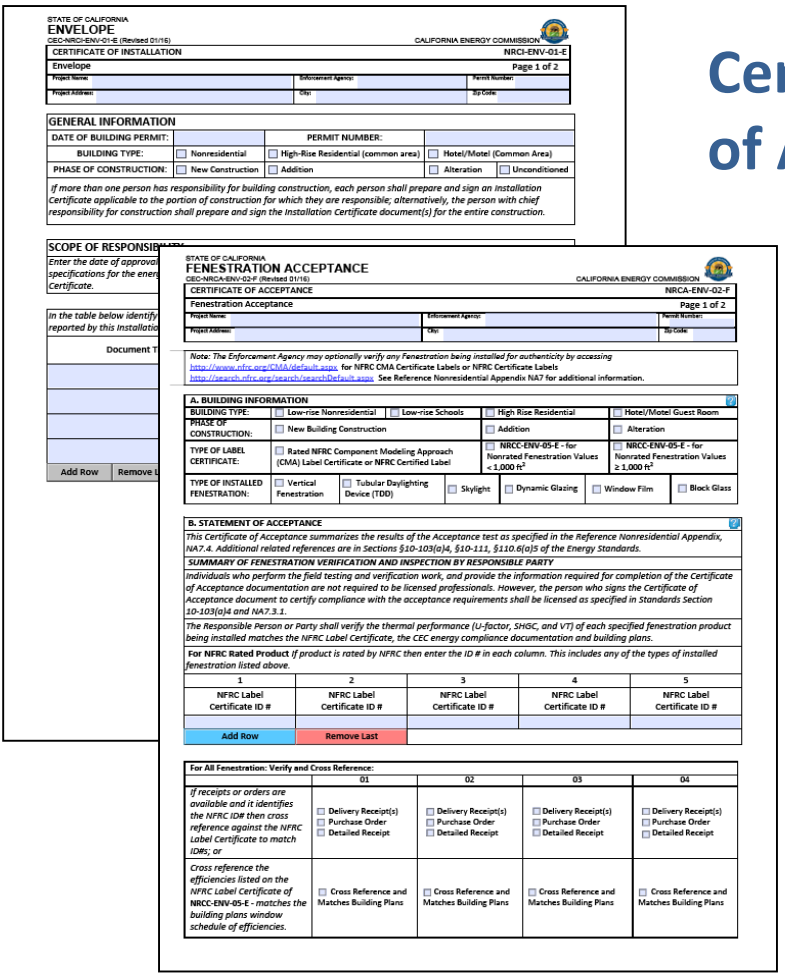
- Verify specifications on plans match the values on the NRCC
  - Check U-factors and SHGC for fenestration
  - Check R-values for insulation
  - Check aged SR and TE for roof products
  - Check skylight area

Plans Examiner

NRCC-ENV-05

☑ **B. METHOD 1**						
U-FACTOR INFORMATION from default, *See TABLE 110.6-A*						
01	Frame Type:	☑ Metal	☐ Metal With Thermal Break		☐ Nonmetal	
02	Product Type:	☐ Operable	☑ Fixed	☐ Greenhouse/Garden Window	☐ Doors	☐ Skylights
03	Glazing Type:	☐ Single Pane	☑ Double Pane	☐ Glass Block		
04	Enter the appropriate value from Table 110.6-A					**U-factor$_T$ =** 0.71
SOLAR HEAT GAIN COEFFICIENT INFORMATION from default, *See TABLE 110.6-B*						
05	Product Type:	☐ Operable	☑ Fixed			
06	Glazing:	☑ Clear	☐ Tinted			
07	Enter the appropriate value from Table 110.6-B					**SHGC$_T$ =** 0.73
VISIBLE TRANSMITTANCE from *Reference Nonresidential Appendix NA6*						
08	Product Type:	☐ Casement/Awning ☐ Sliding ☐ Fixed	☑ Curtainwall/Storefront/Site-built or Manufactured Skylights (Non-curb mounted)		☐ Skylights Manufactured (Curb Mounted)	
09	Enter Center-of-Glass for VT$_C$ value:					**VTc =** 0.75
10	Calculate VT$_T$ = VT$_F$ x VT$_C$ (See Equation NA6-3)					**VT$_T$ =** 0.66

Certificate of Installation
Certificate of Acceptance



STATE OF CALIFORNIA
ENVELOPE
CEC-NRCI-ENV-01-E (Revised 01/16)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION — NRCI-ENV-01-E
Envelope — Page 1 of 2

Project Name | Enforcement Agency | Permit Number
Project Address | City | Zip Code

GENERAL INFORMATION

DATE OF BUILDING PERMIT:		PERMIT NUMBER:	
BUILDING TYPE:	☐ Nonresidential	☐ High-Rise Residential (common area)	☐ Hotel/Motel (Common Area)
PHASE OF CONSTRUCTION:	☐ New Construction ☐ Addition	☐ Alteration	☐ Unconditioned

If more than one person has responsibility for building construction, each person shall prepare and sign an installation Certificate applicable to the portion of construction for which they are responsible, alternatively, the person with chief responsibility for construction shall prepare and sign the Installation Certificate document(s) for the entire construction.

SCOPE OF RESPONSIBILITY

Enter the date of approval specifications for the energ Certificate.

In the table below identify reported by this installatio

Document T

Add Row | Remove L

STATE OF CALIFORNIA
FENESTRATION ACCEPTANCE
CEC-NRCA-ENV-02-F (Revised 01/16)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE — NRCA-ENV-02-F
Fenestration Acceptance — Page 1 of 2

Project Name | Enforcement Agency | Permit Number
Project Address | City | Zip Code

Note: The Enforcement Agency may optionally verify any Fenestration being installed for authenticity by accessing http://www.nfrc.org/CMA/default.aspx for NFRC CMA Certificate Labels or NFRC Certificate Labels http://search.nfrc.org/search/searchDefault.aspx See Reference Nonresidential Appendix NA7 for additional information.

A. BUILDING INFORMATION

BUILDING TYPE:	☐ Low-rise Nonresidential	☐ Low-rise Schools	☐ High Rise Residential	☐ Hotel/Motel Guest Room
PHASE OF CONSTRUCTION:	☐ New Building Construction		☐ Addition	☐ Alteration
TYPE OF LABEL CERTIFICATE:	☐ Rated NFRC Component Modeling Approach (CMA) Label Certificate or NFRC Certified Label		☐ NRCC-ENV-05-E - for Nonrated Fenestration Values < 1,000 ft²	☐ NRCC-ENV-05-E - for Nonrated Fenestration Values ≥ 1,000 ft²
TYPE OF INSTALLED FENESTRATION:	☐ Vertical Fenestration	☐ Tubular Daylighting Device (TDD)	☐ Skylight	☐ Dynamic Glazing ☐ Window Film ☐ Block Glass

B. STATEMENT OF ACCEPTANCE

This Certificate of Acceptance summarizes the results of the Acceptance test as specified in the Reference Nonresidential Appendix, NA7.4. Additional related references are in Sections §10-103(a)4, §10-111, §110.6(a)5 of the Energy Standards.

SUMMARY OF FENESTRATION VERIFICATION AND INSPECTION BY RESPONSIBLE PARTY

Individuals who perform the field testing and verification work, and provide the information required for completion of the Certificate of Acceptance documentation are not required to be licensed professionals. However, the person who signs the Certificate of Acceptance document to certify compliance with the acceptance requirements shall be licensed as specified in Standards Section 10-103(a)4 and NA7.3.1.

The Responsible Person or Party shall verify the thermal performance (U-factor, SHGC, and VT) of each specified fenestration product being installed matches the NFRC Label Certificate, the CEC energy compliance documentation and building plans.

For NFRC Rated Product *if product is rated by NFRC then enter the ID # in each column. This includes any of the types of installed fenestration listed above.*

1	2	3	4	5
NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #

Add Row | Remove Last

For All Fenestration: Verify and Cross Reference:

	01	02	03	04
If receipts or orders are available and it identifies the NFRC ID# then cross reference against the NFRC Label Certificate to match ID#s; or	☐ Delivery Receipt(s) ☐ Purchase Order ☐ Detailed Receipt	☐ Delivery Receipt(s) ☐ Purchase Order ☐ Detailed Receipt	☐ Delivery Receipt(s) ☐ Purchase Order ☐ Detailed Receipt	☐ Delivery Receipt(s) ☐ Purchase Order ☐ Detailed Receipt
Cross reference the efficiencies listed on the NFRC Label Certificate of **NRCC-ENV-05-E** *- matches the building plans window schedule of efficiencies.*	☐ Cross Reference and Matches Building Plans	☐ Cross Reference and Matches Building Plans	☐ Cross Reference and Matches Building Plans	☐ Cross Reference and Matches Building Plans

Certificate of Installation - NRCIs Certificate of Acceptance - NRCAs

- Completed by installing contractor
- Left on-site for building inspector
- Identifies construction documents that show envelope features were installed as proposed in the certificate of compliance
- Envelope forms
  - NRCI-ENV-01 - Envelope
  - NRCA-ENV-02 - Fenestration Acceptance

Field Inspector

NRCIs and NRCAs at inspection

- At appropriate phase of construction
  - Visually verify U-factors and SHGC values on fenestration labels
  - Visually verify R-values for insulation
  - Visually verify aged SR and TE values on roof product labels
- At final inspection
  - All NRCIs and NCRAs are complete, correct and match NRCCs

Successful Verification

- Check as built against plans
  - Air barriers
  - Air sealing
  - Window values
  - Roofing product values
  - Insulation installation and values
- If installed does not match documents
  - Must make corrections
  - Re-inspection

Resources

Online Resource Center

Online Resource Center

The Online Resource Center is provided to assist the building community and enforcement agencies with Building Energy Efficiency Standards (Energy Standards) compliance. Energy Standards apply to newly constructed buildings, as well as additions and alterations for existing buildings. Presently, the Energy Standards are updated every three years.

To assist in the compliance process, we provide compliance documents and free Public Domain Compliance Software programs for commercial and residential buildings. Training and links to the Energy Standards and compliance software are available on the Energy Commission website and at utility training centers throughout the state. To help direct you to an appropriate resource, Energy Commission and external resource information are provided on this page.

Building Energy Efficiency Standards

2016 Energy Standards

2013 Energy Standards

Past Energy Standards

Energy Standards Information and Training Materials

Overview

Commissioning

Covered Processes

Follow

Energy Standards Questions?

- Energy Standards Hotline

Energy Standards Booth Handouts

- Handouts - 02212017 (zip file, 507 mb)
- Help with the zip file

Forms

- 2016 Residential Compliance Forms
- 2016 Nonresidential Compliance Forms

Trainings & Events

- Energy Standards Outreach & Education Schedule
- Utility Sponsored Training Schedules

Subscribe

Building Standards List Serve

Automated Email Notifications

First name:

Last name:

Email address:

www.energy.ca.gov/title24/orc/

Blueprint Newsletter

- Email Newsletter
- Published quarterly
- Clarifications on frequently asked questions

Issue 113 | March – April 2016

BLUEPRINT

California Energy Commission
Efficiency Division

In This Issue

New Mechanical Acceptance Test Technician Certification Provider

On January 13, 2016, the California Energy Commission (Energy Commission) approved the National Environmental Balancing Bureau (NEBB), as a mechanical Acceptance Test Technician Certification Provider (ATTCP). This gives NEBB the authority to train, certify, and oversee acceptance test technicians (ATTs) and their employers. NEBB will train and certify ATTs to perform all 17 mechanical acceptance tests required in the *2013 Building Energy Efficiency Standards* (Energy Standards).

The Conditions of Approval are available for review in the **Executive Director's recommendation**.

For more information, please visit: **http://energy.ca.gov/title24/attcp/**.

Small Duct High Velocity Space Conditioning Systems

Small duct high velocity (SDHV) systems may be used to comply with the Energy Standards. The following is a list of requirements with direction on how SDHV systems can comply with the low-rise residential requirements of the Energy Standards.

Mandatory Requirements

United States Department of Energy Standards:

SDHV systems manufactured on or after January 23, 2006, and before January 1, 2015, must have a minimum Seasonal Energy Efficiency Ratio (SEER) of 11, and a minimum Heating Seasonal Performance Factor (HSPF) of 6.8.

SDHV systems manufactured on or after January 1, 2015, must have a minimum SEER of 12, and a minimum HSPF of 7.2.

Energy Standards:

Section 150.0(m)13B - Single zone systems that use forced air ducts to supply cooled air to an occupiable space must either meet minimum airflow and fan efficacy requirements, or meet the return duct and grille sizing requirements of **TABLES 150.0-C or 150.0-D**.

NOTE: The return duct and grille sizing alternative will likely be the method chosen for compliance when installing a SDHV system.

Section 150.0(m)15 - Specific to systems with multiple thermostatically controlled zones, this section requires the same mandatory airflow and fan efficacy requirements as **Section 150.0(m)13B**. However, it does not have the same duct and grille sizing alternative. If such systems cannot satisfy the airflow and fan efficacy requirements of this section, compliance must be demonstrated via the performance approach.

The duct leakage and insulation requirements apply as with any other system.

Prescriptive Requirements

The refrigerant charge and duct insulation requirements apply as with any other system.

1

www.energy.ca.gov/efficiency/blueprint/

Email Lists

- Receive updates on the Energy Standards
- Sign up

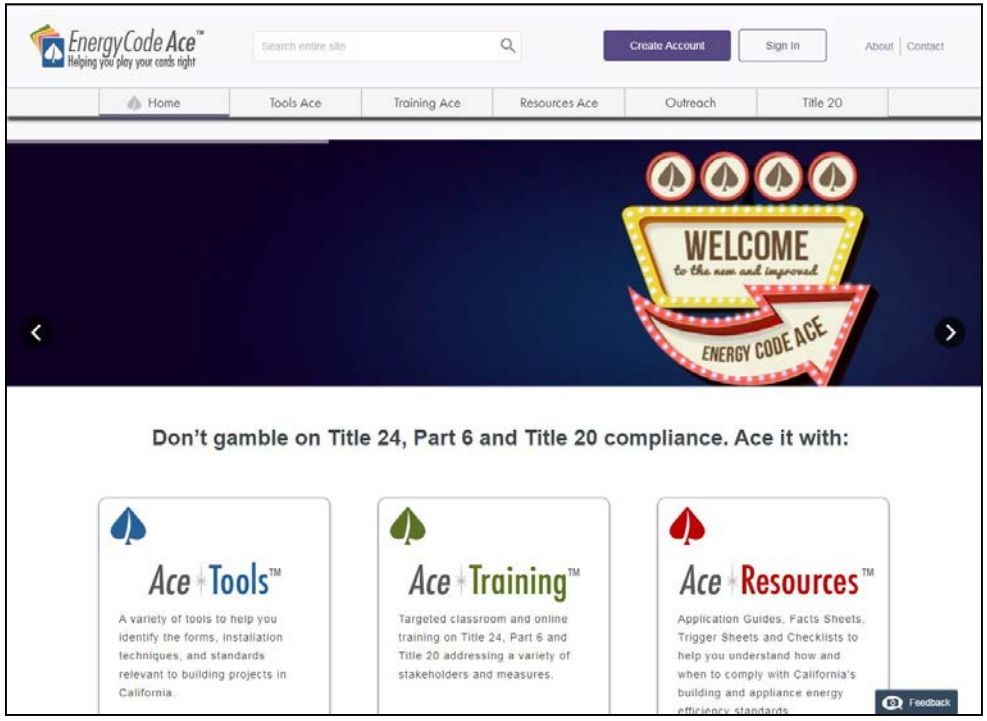
  www.energy.ca.gov/listservers/
- Subscribe to the following Efficiency Lists

  Building Standards
  Blueprint
  Appliances
- Respond to confirmation email within 24 hours

Energy Standards Hotline

- Open Monday through Friday
  8:00 a.m. to 12:00 p.m.
  1:00 p.m. to 4:30 p.m.
- Call
  800-772-3300 (in CA)
  916-654-5106 (outside CA)
- Email
  Title24@energy.ca.gov

Energy Code Ace



- Forms & Resource tools
- Free training in person and online
- Checklists, Trigger Sheets for building departments

www.energycodeace.com

Questions?