2019 Energy Code

Nonresidential Envelope

California Energy Commission, Efficiency Division

Amie Brousseau

June 2020

PRIMARY FUNCTIONS OF THE

CALIFORNIA ENERGY COMMISSION

Advancing State Energy Policy

Investing in Energy Innovation

Developing Renewable Energy

Preparing for Energy Emergencies

Achieving Energy Efficiency

Transforming Transportation

Overseeing Energy Infrastructure

Intergovernmental Collaboration

Goals for this Training

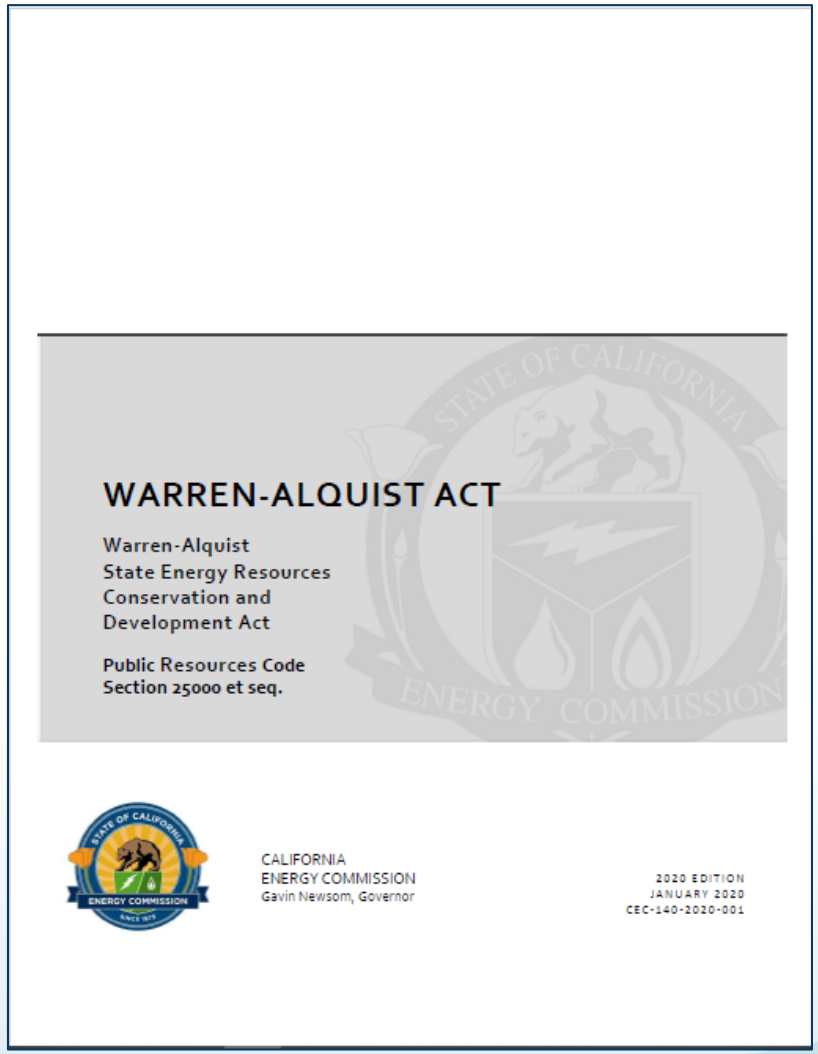
2019 Energy Code

- Envelope requirements
  - Nonresidential buildings
  - Additions and alterations
- Simplify compliance and enforcement
  - Plan review
  - Field inspection

2019 Energy Code Basics

Nonresidential

Energy Code History



The Warren-Alquist Act established the California Energy Commission (CEC) in 1974

- Authority to develop and maintain Building Energy Efficiency Standards
- Requires the CEC to update periodically, usually every three years
- Requires the Energy Code to be cost-effective over the economic life of the building

Nonresidential Buildings

Nonresidential, high-rise residential, hotel and motel buildings

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, I, M, R, S, U
- 2019 added I-1 and I-2
- 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
- Healthcare facilities
- Apartment and multi-family buildings, four or more stories
- Long-term care facilities, four or more stories

2019 Energy Savings

Nonresidential, high-rise residential, hotel and motels

- 30% more efficient than 2016 Standards
- Savings due mainly to lighting upgrades
- LED lighting first year savings of 480 GWh

Energy Code Requirements

Mandatory measures

- Minimum efficiency requirements must always be met
- Can never trade off

Prescriptive measures

- Predefined efficiency requirements
- May supersede mandatory measures
- Different requirements for newly constructed buildings, additions, and alterations

Compliance Approaches

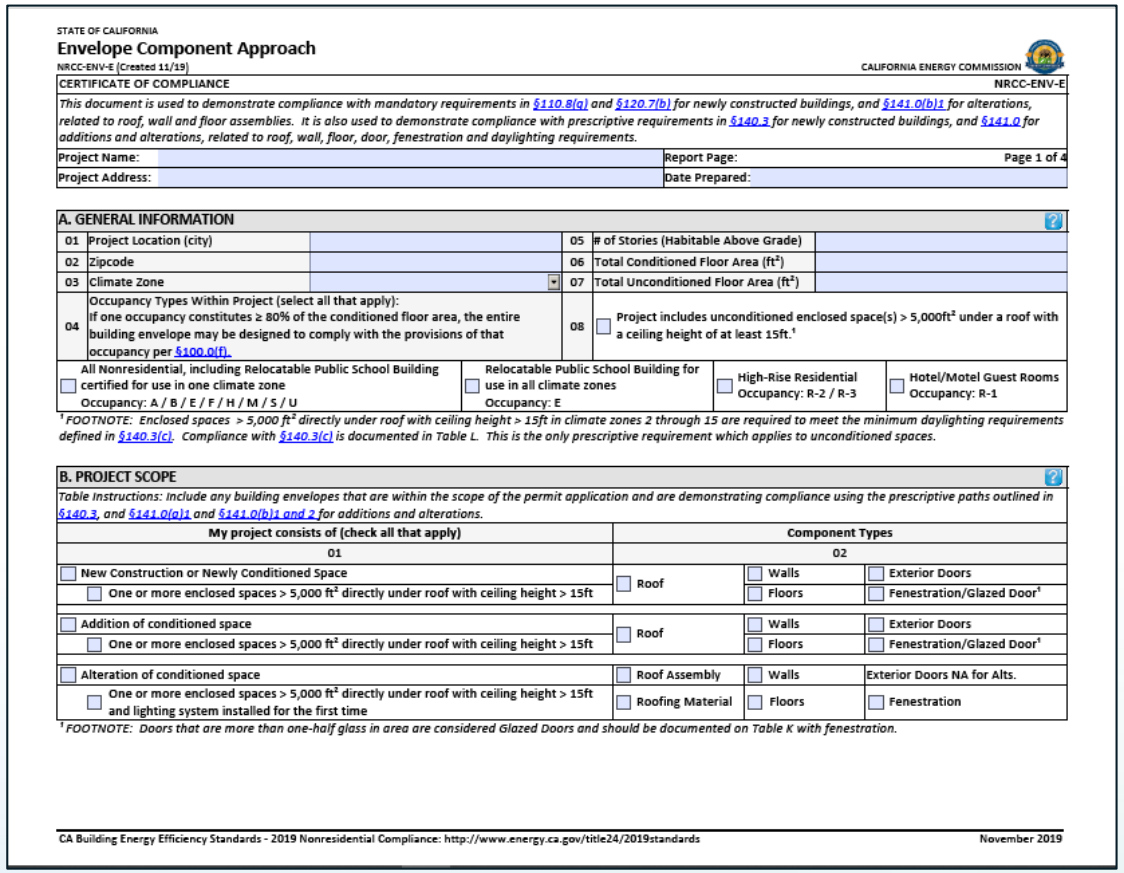
Prescriptive Approach

- Simple approach, no trade-offs
- Mostly used for alterations
- Standard building baseline

Performance Approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC-approved software
- Proposed design ≤ standard design
- Mostly used for newly constructed buildings and additions

Certificate of Compliance



STATE OF CALIFORNIA

Envelope Component Approach

NRCC-ENV-E (Created 11/19) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE NRCC-ENV-E

This document is used to demonstrate compliance with mandatory requirements in §110.8(g) and §120.7(b) for newly constructed buildings, and §141.0(b)1 for alterations, related to roof, wall and floor assemblies. It is also used to demonstrate compliance with prescriptive requirements in §140.3 for newly constructed buildings, and §141.0 for additions and alterations, related to roof, wall, floor, door, fenestration and daylighting requirements.

Project Name:		Report Page:	Page 1 of 4
Project Address:		Date Prepared:	

A. GENERAL INFORMATION

01	Project Location (city)		05	# of Stories (Habitable Above Grade)	
02	Zipcode		06	Total Conditioned Floor Area (ft²)	
03	Climate Zone		07	Total Unconditioned Floor Area (ft²)	
04	Occupancy Types Within Project (select all that apply): if one occupancy constitutes ≥ 80% of the conditioned floor area, the entire building envelope may be designed to comply with the provisions of that occupancy per §100.0(f).		08	☐ Project includes unconditioned enclosed space(s) > 5,000ft² under a roof with a ceiling height of at least 15ft.[1]	

☐ All Nonresidential, including Relocatable Public School Building certified for use in one climate zone Occupancy: A / B / E / F / H / M / S / U	☐ Relocatable Public School Building for use in all climate zones Occupancy: E	☐ High-Rise Residential Occupancy: R-2 / R-3	☐ Hotel/Motel Guest Rooms Occupancy: R-1

[1] *FOOTNOTE: Enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft in climate zones 2 through 15 are required to meet the minimum daylighting requirements defined in §140.3(c). Compliance with §140.3(c) is documented in Table L. This is the only prescriptive requirement which applies to unconditioned spaces.*

B. PROJECT SCOPE

Table Instructions: Include any building envelopes that are within the scope of the permit application and are demonstrating compliance using the prescriptive paths outlined in §140.3, and §141.0(a)1 and §141.0(b)1 and 2 for additions and alterations.

My project consists of (check all that apply)	Component Types		
01	02		
☐ New Construction or Newly Conditioned Space	☐ Roof	☐ Walls	☐ Exterior Doors
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft		☐ Floors	☐ Fenestration/Glazed Door[1]
☐ Addition of conditioned space	☐ Roof	☐ Walls	☐ Exterior Doors
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft		☐ Floors	☐ Fenestration/Glazed Door[1]
☐ Alteration of conditioned space	☐ Roof Assembly	☐ Walls	Exterior Doors NA for Alts.
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft and lighting system installed for the first time	☐ Roofing Material	☐ Floors	☐ Fenestration

[1] *FOOTNOTE: Doors that are more than one-half glass in area are considered Glazed Doors and should be documented on Table K with fenestration.*

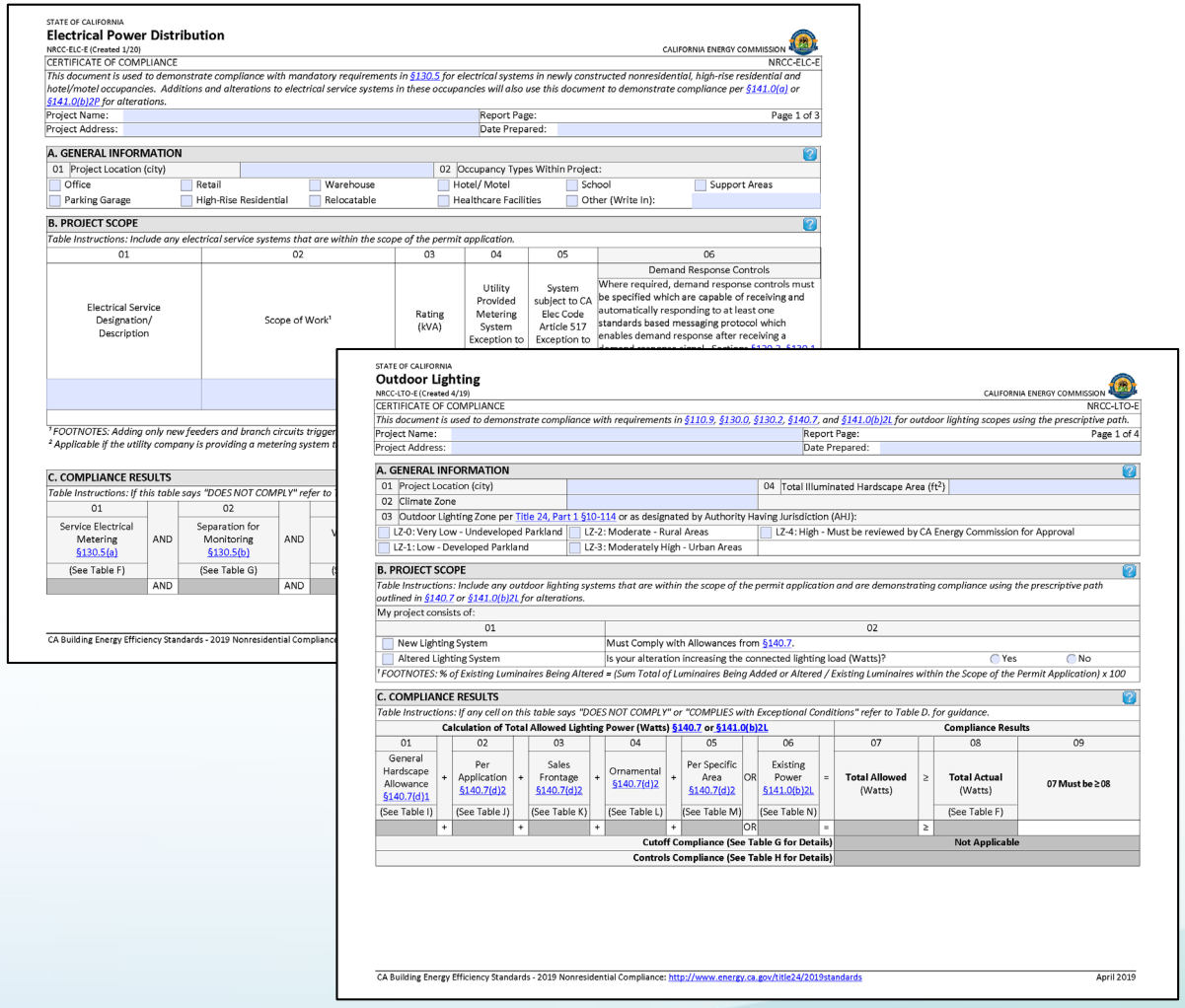
CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: http://www.energy.ca.gov/title24/2019standards November 2019

Nonresidential

Certificate of Compliance - NRCCs

- Dynamic fillable form
- Demonstrates compliance at design phase
- Completed by designer, architect, energy consultant, engineer, etc.
- Submit with permit application, include with plans
- Plans examiner verifies NRCC matches specs on plans

2019 NRCC Dynamic Forms



STATE OF CALIFORNIA
Electrical Power Distribution
NRCC-ELC-E (Created 1/20) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE — NRCC-ELC-E

This document is used to demonstrate compliance with mandatory requirements in §130.5 for electrical systems in newly constructed nonresidential, high-rise residential and hotel/motel occupancies. Additions and alterations to electrical service systems in these occupancies will also use this document to demonstrate compliance per §141.0(a) or §141.0(b)2P for alterations.

Project Name: | Report Page: Page 1 of 3
Project Address: | Date Prepared:

A. GENERAL INFORMATION

01 Project Location (city) | 02 Occupancy Types Within Project:

☐ Office ☐ Retail ☐ Warehouse ☐ Hotel/ Motel ☐ School ☐ Support Areas
☐ Parking Garage ☐ High-Rise Residential ☐ Relocatable ☐ Healthcare Facilities ☐ Other (Write In):

B. PROJECT SCOPE

Table Instructions: Include any electrical service systems that are within the scope of the permit application.

01	02	03	04	05	06
					Demand Response Controls
Electrical Service Designation/ Description	Scope of Work[1]	Rating (kVA)	Utility Provided Metering System Exception to	System subject to CA Elec Code Article 517 Exception to	Where required, demand response controls must be specified which are capable of receiving and automatically responding to at least one standards based messaging protocol which enables demand response after receiving a

[1] FOOTNOTES: Adding only new feeders and branch circuits trigger
[2] Applicable if the utility company is providing a metering system t

C. COMPLIANCE RESULTS

Table Instructions: If this table says "DOES NOT COMPLY" refer to

01		02		
Service Electrical Metering §130.5(a)	AND	Separation for Monitoring §130.5(b)	AND	
(See Table F)		(See Table G)		
	AND		AND	

CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance

STATE OF CALIFORNIA
Outdoor Lighting
NRCC-LTO-E (Created 4/19) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE — NRCC-LTO-E

This document is used to demonstrate compliance with requirements in §110.9, §130.0, §130.2, §140.7, and §141.0(b)2L for outdoor lighting scopes using the prescriptive path.

Project Name: | Report Page: Page 1 of 4
Project Address: | Date Prepared:

A. GENERAL INFORMATION

01	Project Location (city)	04	Total Illuminated Hardscape Area (ft²)
02	Climate Zone		
03	Outdoor Lighting Zone per Title 24, Part 1 §10-114 or as designated by Authority Having Jurisdiction (AHJ):		

☐ LZ-0: Very Low - Undeveloped Parkland ☐ LZ-2: Moderate - Rural Areas ☐ LZ-4: High - Must be reviewed by CA Energy Commission for Approval
☐ LZ-1: Low - Developed Parkland ☐ LZ-3: Moderately High - Urban Areas

B. PROJECT SCOPE

Table Instructions: Include any outdoor lighting systems that are within the scope of the permit application and are demonstrating compliance using the prescriptive path outlined in §140.7 or §141.0(b)2L for alterations.

My project consists of:

01	02
☐ New Lighting System	Must Comply with Allowances from §140.7.
☐ Altered Lighting System	Is your alteration increasing the connected lighting load (Watts)? ○ Yes ○ No

[1] FOOTNOTES: % of Existing Luminaires Being Altered = (Sum Total of Luminaires Being Added or Altered / Existing Luminaires within the Scope of the Permit Application) x 100

C. COMPLIANCE RESULTS

Table Instructions: If any cell on this table says "DOES NOT COMPLY" or "COMPLIES with Exceptional Conditions" refer to Table D. for guidance.

Calculation of Total Allowed Lighting Power (Watts) §140.7 or §141.0(b)2L									Compliance Results			
01		02		03		04		05	06		07	08	09
General Hardscape Allowance §140.7(d)1	+	Per Application §140.7(d)2	+	Sales Frontage §140.7(d)2	+	Ornamental §140.7(d)2	+	Per Specific Area §140.7(d)2 OR	Existing Power §141.0(b)2L	=	**Total Allowed** (Watts)	≥	**Total Actual** (Watts)	**07 Must be ≥ 08**
(See Table I)		(See Table J)		(See Table K)		(See Table L)		(See Table M)	(See Table N)				(See Table F)	
	+		+		+		+	OR		=		≥		
Cutoff Compliance (See Table G for Details)											**Not Applicable**			
Controls Compliance (See Table H for Details)														

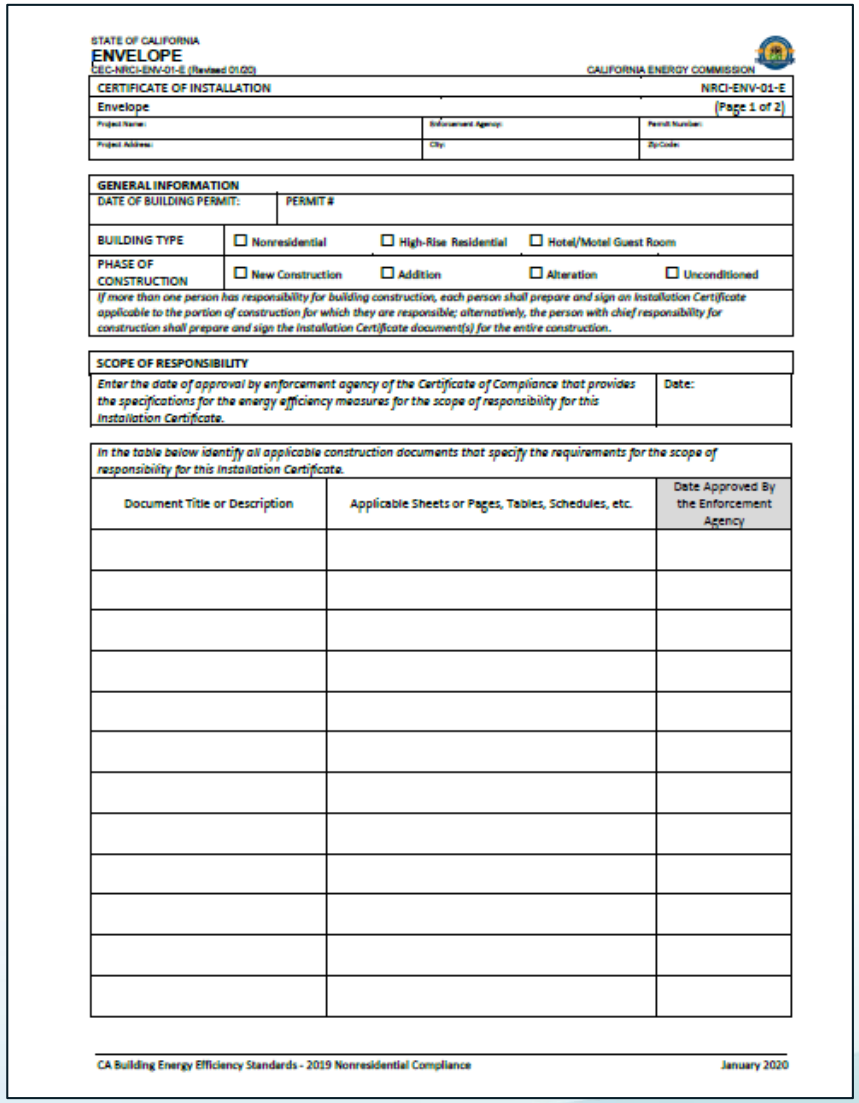
CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: http://www.energy.ca.gov/title24/2019standards — April 2019

Nonresidential

Certificate of Compliance - NRCCs

- Auto-fill fields
- Automatic calculations
- Drop down selections
- Interactive instructions
- Add and delete table rows
- Condensed 47 forms into 10

Certificate of Installation



STATE OF CALIFORNIA
ENVELOPE
CEC-NRCI-ENV-01-E (Revised 01/20)
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 #			
BUILDING TYPE	☐ Nonresidential	☐ High-Rise Residential	☐ Hotel/Motel Guest Room	
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 by enforcement agency of the Certificate of Compliance that provides the specifications for the energy efficiency measures for the scope of responsibility for this Installation Certificate.	Date:

In the table below identify all applicable construction documents that specify the requirements for the scope of responsibility for this Installation Certificate.

Document Title or Description	Applicable Sheets or Pages, Tables, Schedules, etc.	Date Approved By the Enforcement Agency

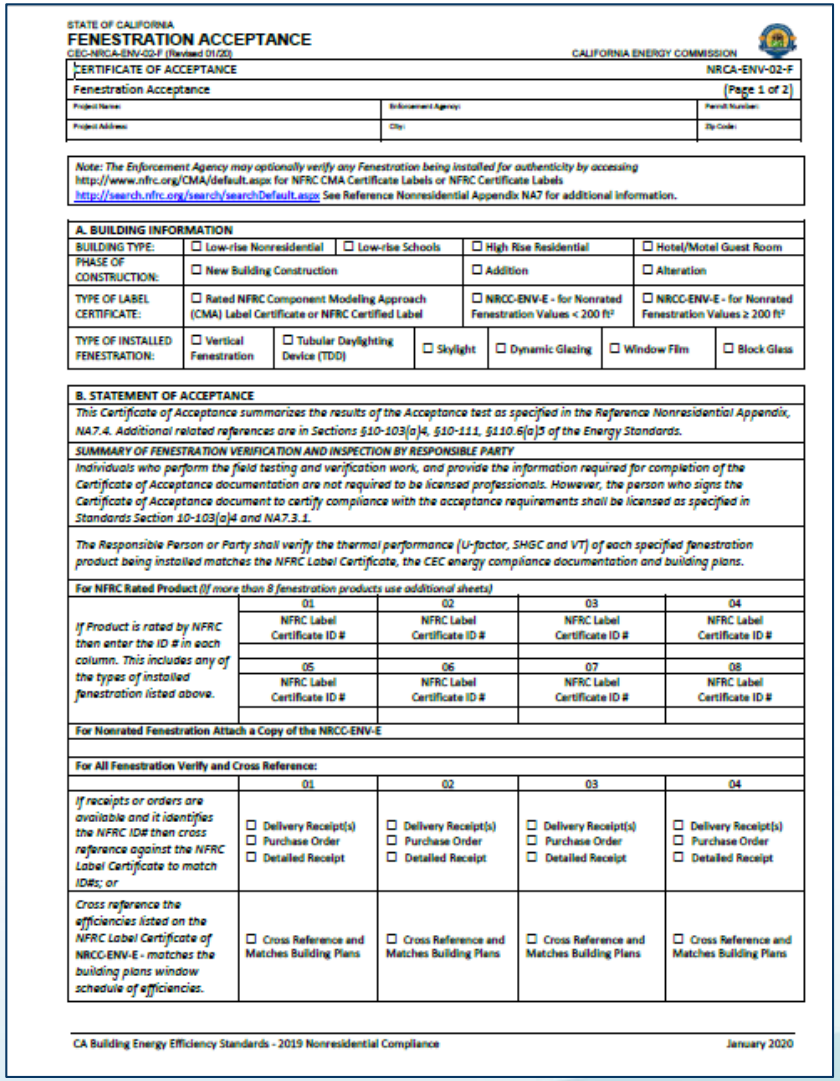
CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance — January 2020

Nonresidential

Certificate of Installation - NRCIs

- Completed by installing contractor
- Confirms compliance at installation
- Left on-site for building inspector
- Identifies construction documents that show energy features were installed as proposed in the certificate of compliance
- Inspector verifies documented efficiency and components match installed equipment and systems

Certificate of Acceptance



STATE OF CALIFORNIA
FENESTRATION ACCEPTANCE
CEC-NRCA-ENV-02-F (Revised 01/20)
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-E - for Nonrated Fenestration Values < 200 ft²	☐ NRCC-ENV-E - for Nonrated Fenestration Values ≥ 200 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)3 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 more than 8 fenestration products use additional sheets)*

If Product is rated by NFRC then enter the ID # in each column. This includes any of the types of installed fenestration listed above.	01	02	03	04
	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #
	05	06	07	08
	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #	NFRC Label Certificate ID #

For Nonrated Fenestration Attach a Copy of the NRCC-ENV-E

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-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

CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance — January 2020

Nonresidential

Certificate of Acceptance - NRCAs

- Completed by field technician
- Confirms compliance with acceptance requirements in Reference Nonresidential Appendix NA7
- Left on-site for building inspector
- Identifies construction documents that show energy features were installed as proposed in the certificate of compliance
- Inspector verifies documented efficiency and components match installed equipment and systems

Envelope Defined

The building envelope is the exterior components, including demising partitions, which enclose conditioned space, separating it from unconditioned space or outside space.

Locating Envelope Requirements
Nonresidential

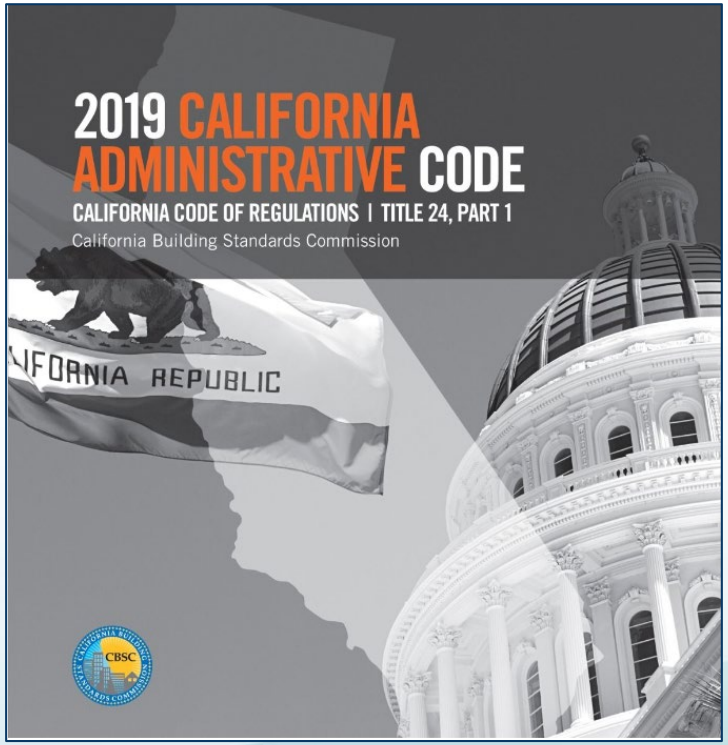
Title 24, Part 1 Administrative Code

Title 24, Part 6 Energy Code

Title 24 – California Building Code

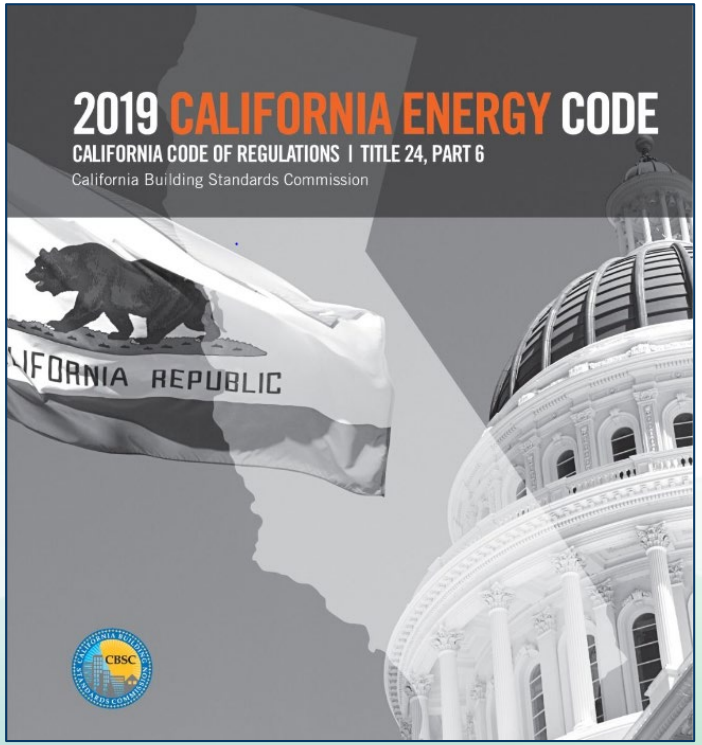
Part 1 - Administrative Code

- Chapter 10
- Sections 10-101 – 10-115
- Administrative requirements



Part 6 - Energy Code

- Subchapters 1 - 9
- Sections 100.0 - 150.2
- Technical requirements



Part 1 Administrative Code

All Buildings § 10-101 to § 10-115

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

Relevant sections

§ 10-111 – Fenestration and door labels

§ 10-112 – Default tables

§ 10-113 – Roofing products

Part 6 Energy Code

All Buildings § 100.0 - Table 100.0-A

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				
	Envelope (conditioned)	110 11	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	140.0, 1	140.0, 140.1
	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		141.0
	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)
Covered Processes[1]	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9, 141.1
Signs	Indoor and Outdoor	110.9, 130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H

Nonresidential envelope relevant sections

§ 100.1 Definitions

§ 110.6 - § 110.8 All buildings

§ 120.7 Mandatory measures

§ 140.3 Prescriptive requirements

§ 141.0 Additions and alterations

Mandatory Requirements

All Buildings § 110.0 to § 110.12

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

Relevant sections

§ 110.6 – Envelope
§ 110.7 – Air leakage
§ 110.8 – Insulation and roofing

Mandatory Requirements

Nonresidential § 120.1 to 120.9

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

Relevant sections

§ 120.7 – Insulation

Performance and Prescriptive Requirements

Nonresidential §140.0 to 140.9

Performance and prescriptive compliance approaches

Relevant sections

§ 140.3 – Prescriptive building envelope

Additions, Alterations, Repairs

Nonresidential § 141.0

Requirements for additions, alterations, and repairs

Relevant sections

§ 141.0(a) – Additions

§ 141.0(b) – Alterations

Fenestration and Exterior Door Requirements

Nonresidential

Administrative § 10-111, § 10-112

Mandatory § 100.1, § 110.6

Prescriptive § 140.3(a), § 140.3(c), § 140.3(d)

Additions and Alterations § 141.0(a), § 141.0(b)

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

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

Lower U-factor and SHGC are more efficient

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: pre-assembled glazing and frame
  - Most commonly used in residential

Fenestration and Exterior Doors Administrative Regulations

All Buildings § 10-111, § 10-112

Labeling and Certification Requirements § 10-111

- National Fenestration Rating Council (NFRC) is designated to administer certification program
- Temporary labels
  - NFRC manufactured window and door 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 Temporary Labels

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 to 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

CEC

2019 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 2019 Energy 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 ft^2	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

Fenestration and Exterior Door Mandatory Requirements

All Buildings § 100.1, §110.6

- Exterior doors require U-factor rating
  - NFRC
  - Doors with 25% or more glazing treated as fenestration
- Reduced NA6 to 200 square feet
- Updated definitions
  - *Fenestration Product*
  - *Clerestory*
  - *Door*
  - *Glazed Door*
  - *Overhang Projection*
  - *Overhang Rise*

National Fenestration Rating Council™
CERTIFIED

World's Best Door Co.

Entrance Door
CPD#000-x-000
Insulated Steel Wood Edge Door

ENERGY PERFORMANCE RATINGS

Product Description* Default Frame** Wood	U-Factor/Solar Heat Gain Coefficient (SHGC)			
	1/4 Lite <41Dt	1/2 Lite <90Dt	3/4 Lite <110Dt	Full Lite >110Dt
2/A1/ha/AIR/0.250	0.23 —	0.30 —	0.36 0.33	0.40 0.40
2/A1/.020(3)/ARG/0.750	0.21 —	0.24 —	0.26 0.31	0.28 0.36
2/A1/ha/AIR/0.675	0.23 —	0.28 —	0.33 0.34	0.34 0.40
3/SS/ha/AIR/0.250	0.21 —	0.25 —	0.27 0.35	0.29 0.40
Flush/Embossed	U-Factor 0.19 SHGC 0.04			

Manufacturer stipulates that these ratings conform to 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.

* #glazing layers / spacer type / low-e emissivity (surface) / gap fill / gap width (na=not applicable)
**per NFRC 100 Section 83.24 ‡ square inches

www.nfrc.org

Fenestration and Exterior Door Mandatory Requirements

All Buildings § 110.6

Manufactured and site-built

- Certified by NFRC to meet requirements for air leakage, U-factor, SHGC, and VT

Site-built

- Less than 200 ft² may use alternate default fenestration procedure in Reference Nonresidential Appendix NA6
- Meet acceptance requirements in Reference Nonresidential Appendix NA7

Field-fabricated

- Must use U-factor in Table 110.6-A and SHGC in Table 110.6-B
- Exterior doors less than 25% glazing use U-factor in JA4.5 Table 4.5.1
- VT calculated using Reference Nonresidential Appendix NA6
- Must be caulked and weather-stripped

Fenestration and Exterior Door Mandatory Requirements

All Buildings § 110.6

Methods for determining U-factor and SHGC

	Manufactured Windows	Manufactured Skylights	Manufactured Doors	Site-Built Fenestration and Doors	Field-Fabricated Fenestration and Doors	Glass Block
NFRC	✓	✓	✓	✓	n/a	n/a
NFRC - CMA	✓	✓	✓	✓	n/a	n/a
Default Table 110.6-A, B	✓	✓	n/a	✓	✓	✓
Default Table JA 4.5.1	n/a	n/a	✓	✓	✓	n/a
NA6 - less than 200 ft²	n/a	n/a	n/a	✓	n/a	n/a

Fenestration Default U-factor

All Buildings § 110.6

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.
	Glazed 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.
	Glazed 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
	Glazed 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

All Buildings § 110.6

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.

Exterior Doors Default U-factor

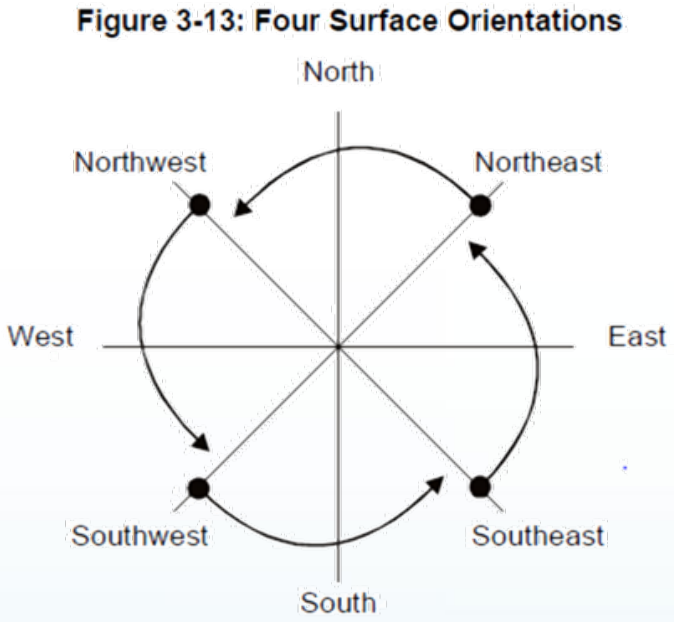
All Buildings Reference Joint Appendix JA4.5

Table 4.5.1 – Doors

Description		U-factor (Btu/°F-ft²)
		A
Uninsulated single-layer metal *swinging doors* or *non-swinging doors*, including single-layer uninsulated access hatches and uninsulated smoke vents:	1	1.45
Uninsulated double-layer metal *swinging doors* or *non-swinging doors*, including double-layer uninsulated access hatches and uninsulated smoke vents:	2	0.70
Insulated metal *swinging doors*, including fire-rated *doors*, insulated access hatches, and insulated smoke vents:	3	0.50
Wood *doors*, minimum nominal thickness of 1-3/4 in. (44 mm), including panel *doors* with minimum panel thickness of 1-1/8 in. (28 mm), and solid core flush *doors*, and hollow core flush *doors*:	4	0.50
Any other wood *door*:	5	0.60
Uninsulated single layer metal *roll up doors* including fire rated *door*	6	1.45
Insulated single layer metal *sectional doors*, minimum insulation nominal thickness of 1-3/8 inch; expanded polystyrene (R-4 per inch).	7	0.179
Source: ASHRAE 90.1-2007, Section A7.		

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5



Exterior Vertical Windows

- 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 and Exterior Door Prescriptive Requirements

Nonresidential § 140.3(a)5

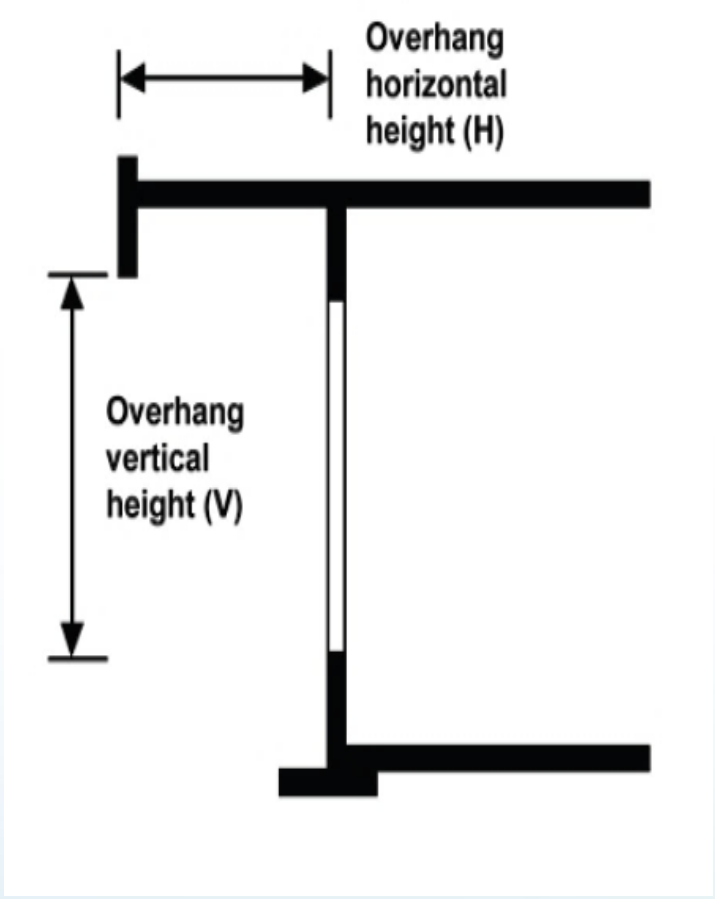
Exterior Vertical Windows

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%				
					Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	Tubular Daylighting Devices (TDDs)
		Skylights	Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	0.88
				Max SHGC	0.25	0.25	NR	NR
			Area-Weighted Performance Rating	Min VT (Min VT_{annual} for TDDs)	0.49	0.49	0.64	0.38
			Maximum SRR%	5%				

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5C



Overhangs on Exterior Vertical Windows

- Relative SHGC calculation
- Recognizes external shading
- Multiple SHGC by overhang factor
- NCM Table 3-17 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 feet, 6 feet above the bottom of the glass H/V: 3 / 6 = 0.50
- East-facing overhang factor Table 3-17 = 0.63
- SHGC x overhang factor
- RSHGC: 0.63 x 0.71 = 0.45

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)3, 6

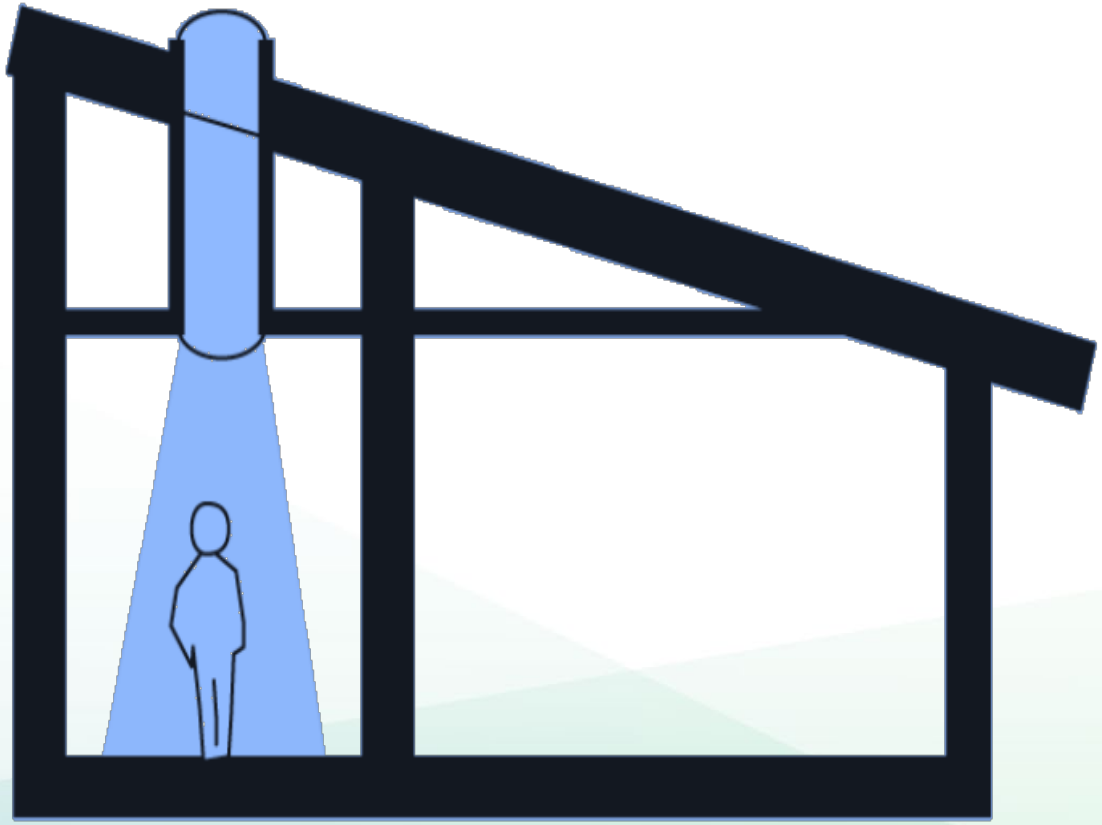
Demising wall windows

- Maximum U-factors
- No SHGC requirements
- No VT requirements

Tubular skylights added

- Maximum U-factor 0.88
- Minimum VT 0.38
- No SHGC requirements

See Tables 140.3-B, C, or D



Fenestration Prescriptive Requirements

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%			
					Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	Tubular Daylighting Devices (TDDs)
		Skylights	Area-Weighted Performance Rating	Max U-factor	0.58	0.46	0.88	0.88
				Max SHGC	0.25	0.25	NR	NR
			Area-Weighted Performance Rating	Min VT (Min VT_{annual} for TDDs)	0.49	0.49	0.64	0.38
			Maximum SRR%	5%			

Fenestration and Exterior Door 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 Table 140.3-B
- Less than 25% glazing

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

Daylighting Prescriptive Requirements

Nonresidential § 140.3(c)

Large enclosed spaces greater than 5,000 ft² in climate zones 2-15

- Conditioned or unconditioned
- Ceilings greater than 15 feet height directly under roof

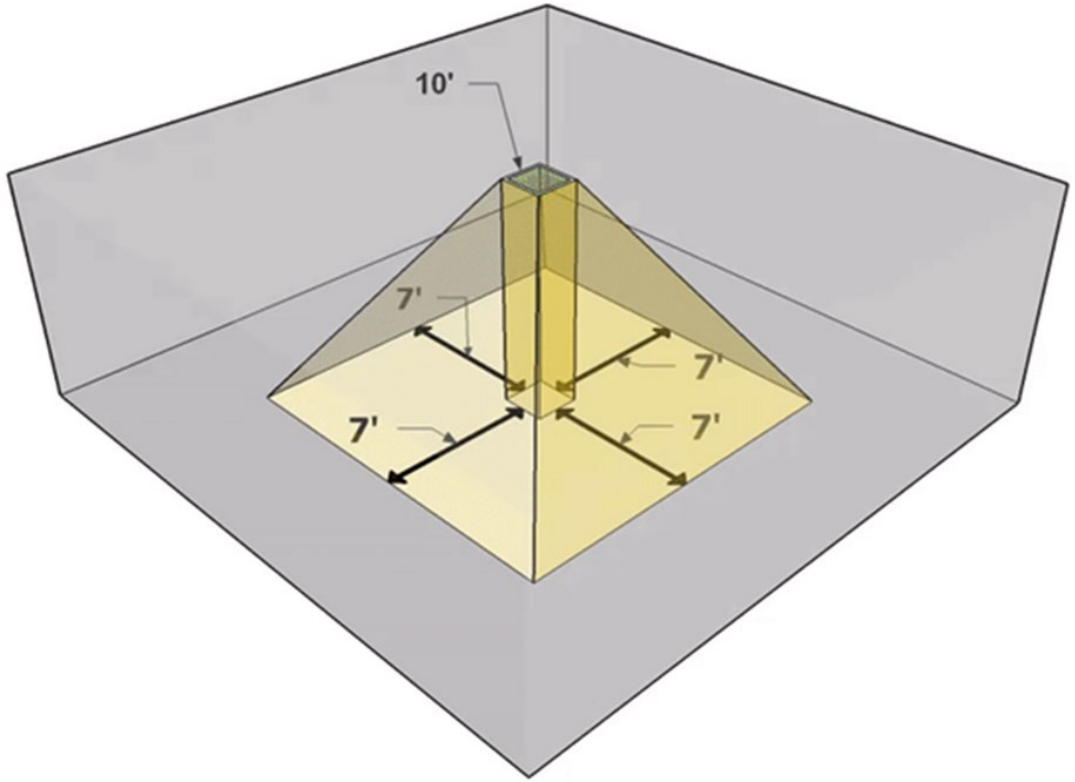
Requirements

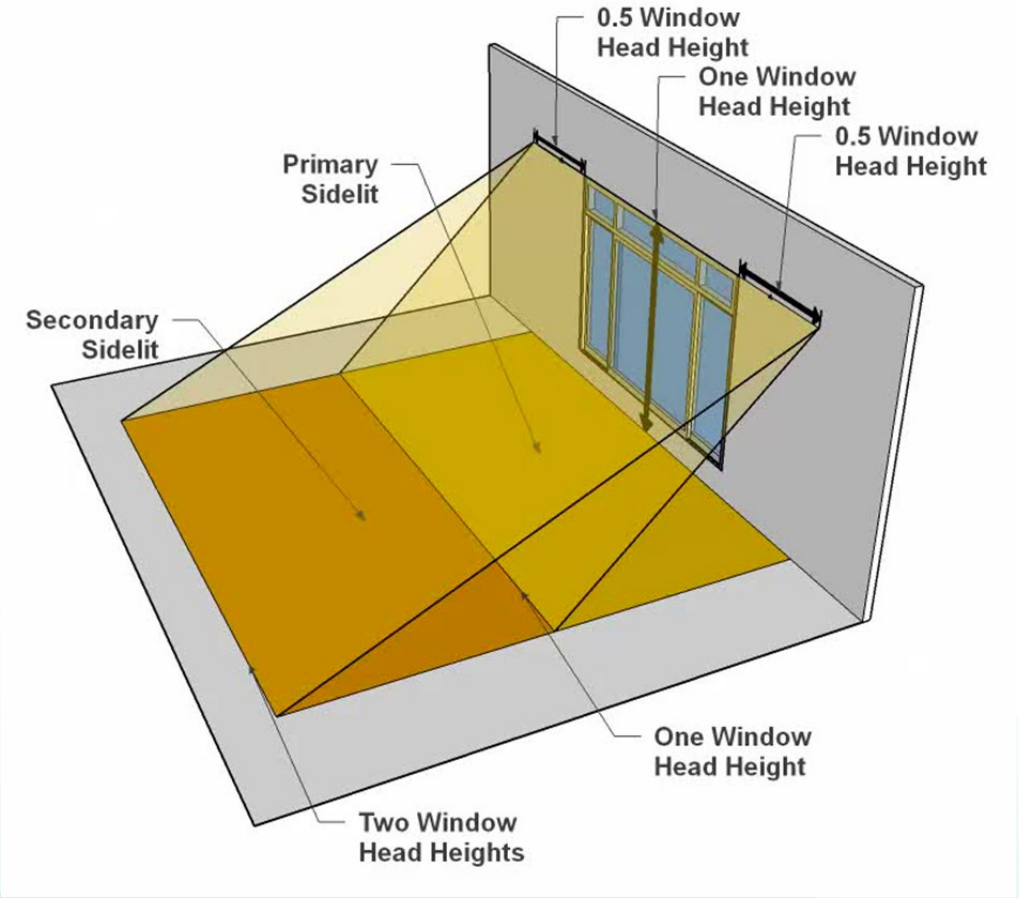
- At least 75% of floor area within skylit daylit zone or primary sidelit daylit zone
- Shown on plans
- Daylighting controls per § 130.1(d)
- Skylight area at least 3% of floor area or calculate with higher VT to install less skylight area (minimum 1.5%)
- Haze value greater than 90%
- VT requirements of skylights per §140.3(a)6D

Daylighting Prescriptive Requirements

Nonresidential § 140.3(c)

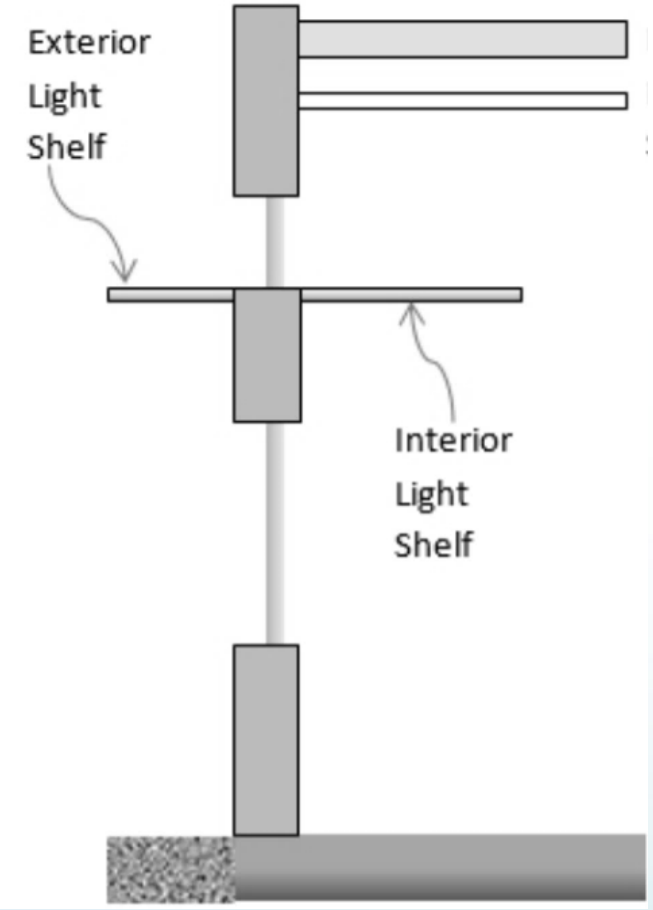
Skylit and Sidelit areas





Daylighting Prescriptive Requirements

Nonresidential § 140.3(d)



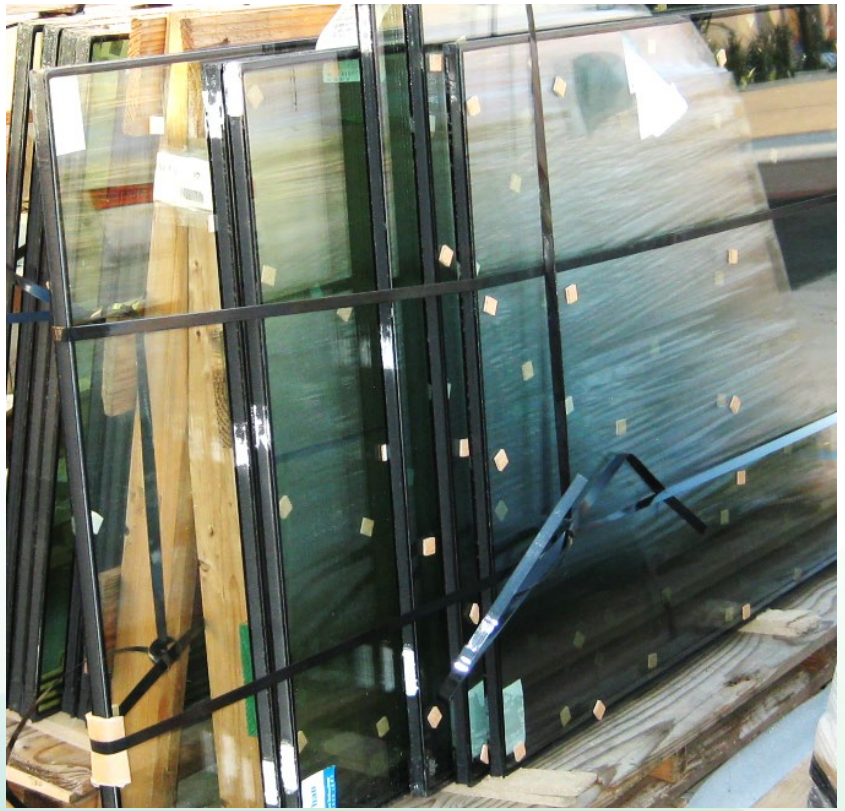
- New power adjustment factors (PAF)
  - Clerestory window
  - Horizontal slats
  - Light shelves
- Meet orientation and installation requirements in §140.3(d) to qualify

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 Alteration Requirements

Nonresidential § 141.0(b)2A

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

Fenestration Alteration Requirements

Nonresidential § 141.0(b)2A

Table 141.0-A ALTERED VERTICAL FENESTRATION MAXIMUM U-FACTOR AND MAXIMUM RSHGC

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
U-factor	0.47	0.47	0.58	0.47	0.58	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
RSHGC	0.41	0.31	0.41	0.31	0.41	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.41
VT	See TABLE 140.3-B, C, and D for all Climate Zones															

Test Your Knowledge

Photo courtesy of Marvin Windows and Doors

When does an exterior door become fenestration?

When the door has 25% or more glass

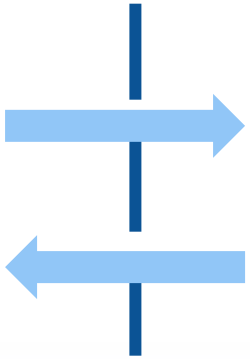
- Now considered part of the total fenestration
- Glass area meets all fenestration requirements
- Solid area meets exterior door requirements

Air Leakage Requirements
Nonresidential

Mandatory § 110.7

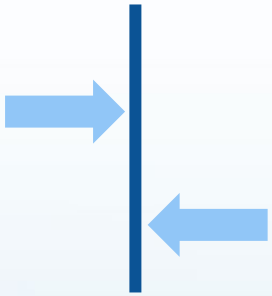
Prescriptive § 140.3(a)9

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.

Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9

Continuous air barrier

- Climate zones 10-16
- All joints sealed and materials installed per manufacturer
- Meet one of these:
  - 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 Requirements
Nonresidential

Mandatory § 110.8, § 120.7

Prescriptive § 140.3(a)

Alterations § 140.1(b)

Energy Code Definitions

Exterior wall - separates conditioned space from outdoor space

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 space

Soffit - demising partition under conditioned space and above unconditioned space

Insulation Definitions

U-factor - a measure of the heat transmission through a wall, roof, floor (all materials in assembly), or a given thickness of a material (insulation)

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

Lower U-factor is better

Higher R-value is better

Insulation Mandatory Requirements

All Buildings § 110.8(a-c)

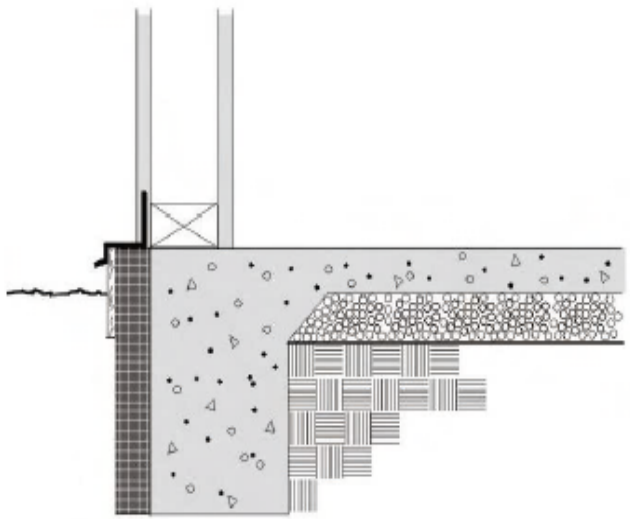
All Materials

- 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)

Figure 3-6: Perimeter Slab Insulation



Heated slab floors

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

Wet insulation systems above roofs waterproof membrane

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

Insulation Mandatory Requirements

Nonresidential § 120.7

	Assembly Type	Maximum U-factor
Roof and Ceiling	Metal building	0.098
	Wood framed and other	0.075
Walls	Metal buildings	0.113
	Metal-framed walls (includes demising)	0.151
	Heavy mass walls	0.690
	Light mass walls	0.440
	Wood-framed walls and other	0.110
	Wood-framed demising walls	0.099
	Spandrel panel and opaque curtain walls	0.280
Floor and Soffit	Raised mass	0.269
	Other	0.071

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)1-4

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[1]	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

Insulation Mandatory Requirements

Nonresidential Alterations § 141.0(b)1A

Roofs

- Meet prescriptive requirements of 141.0(b)2Biii when roof 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 Mandatory Requirements

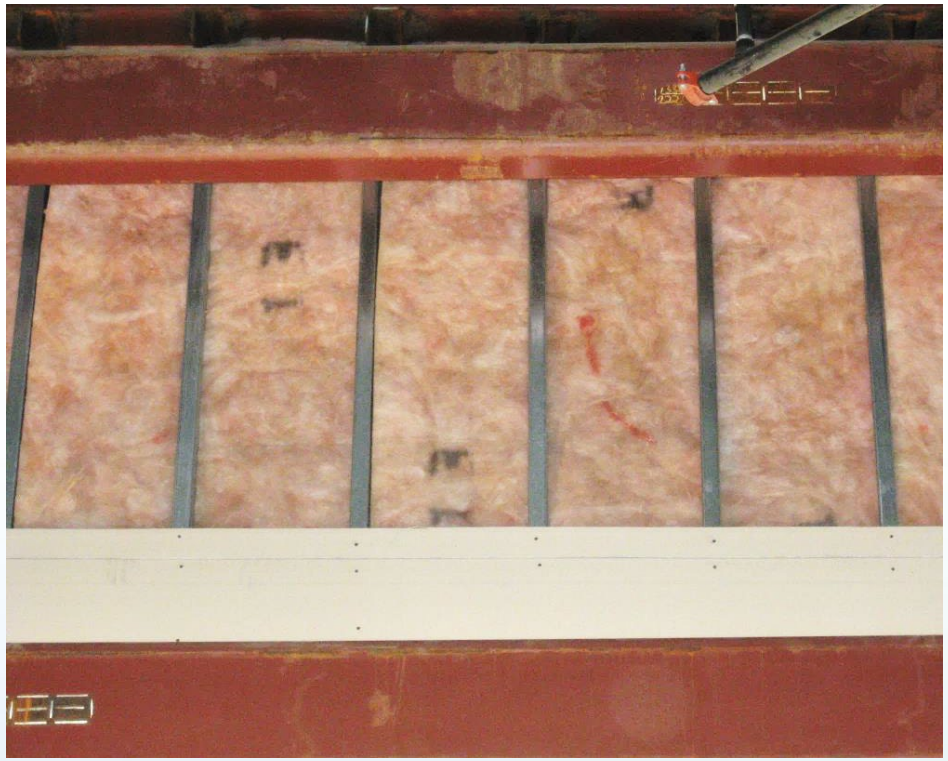
Nonresidential Alterations § 141.0(b)1B,C

Walls, floors, and soffits

	Assembly Type	Minimum R-value	Maximum U-factor
Walls	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
Floors and Soffits	Raised framed floors	R-11	0.071
	Raised mass floors in high-rise res, hotel and motel	R-6	0.111

Test Your Knowledge

Nonresidential



Do metal-framed demising walls need insulation?

Yes, they need to meet mandatory requirements in § 120.7

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

Roof Requirements
Nonresidential

Administrative § 10-113

Mandatory § 110.8(i)

Prescriptive § 140.3(a)1

Additions and Alterations § 140.1(a), § 140.1(b)

Roofing Definitions

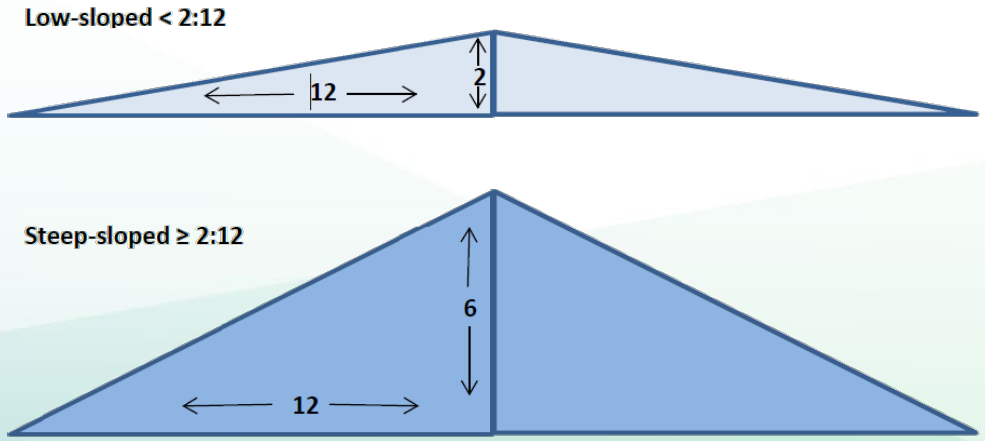
Low-sloped - rise to run less than 2:12

Steep-sloped - rise to run of 2:12 or greater

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

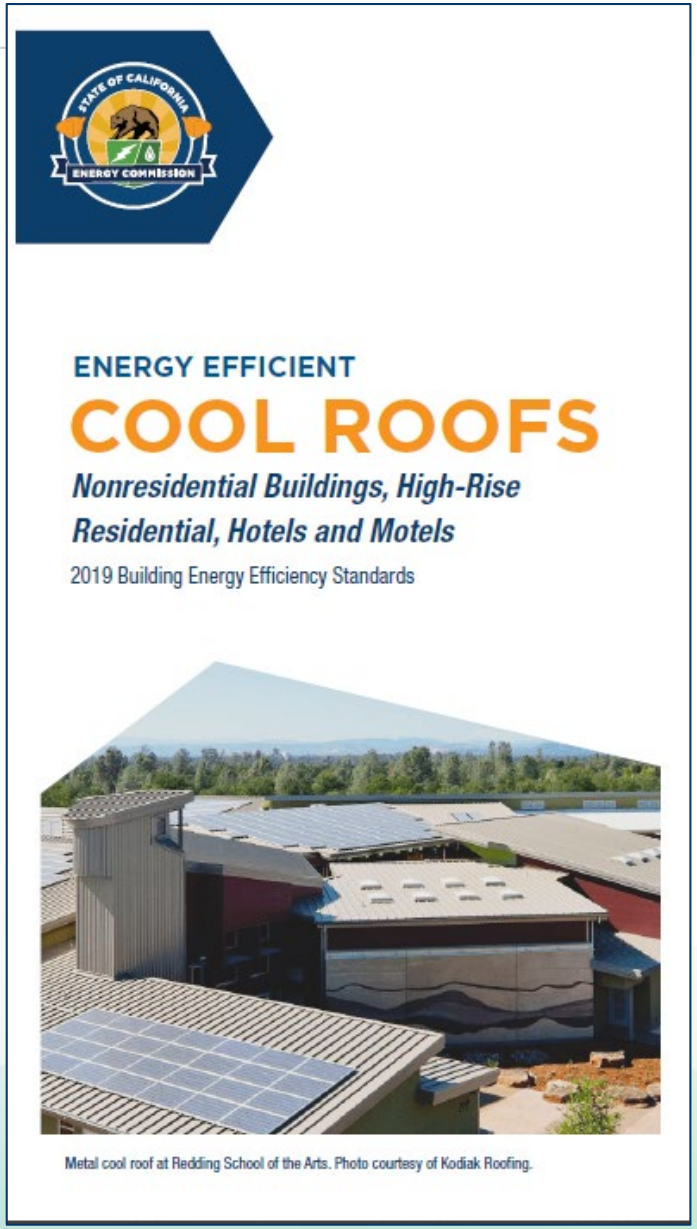
Solar Reflectance Index (SRI) - combines SR three-year aged value and TE in an equation



The higher the number, the cooler the roof.

Nonresidential Cool Roof Brochure

- A cool roof will reflect more sunlight and absorb less heat than a standard roof
- The roofing product must meet minimum solar reflectance and thermal emittance values for Energy Code compliance



Roofing Administrative Regulations

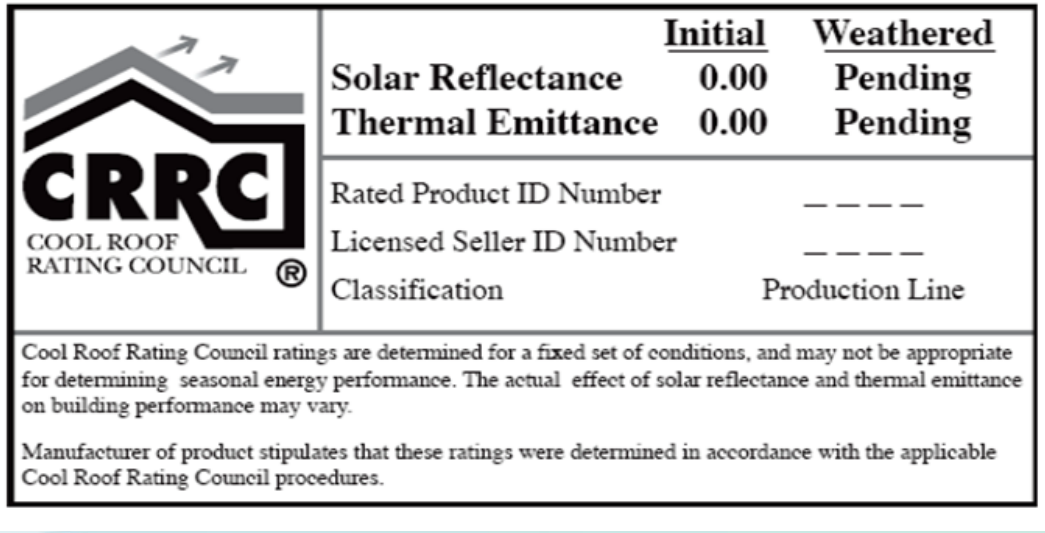
All Buildings § 10-113

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 residential, 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[1]	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

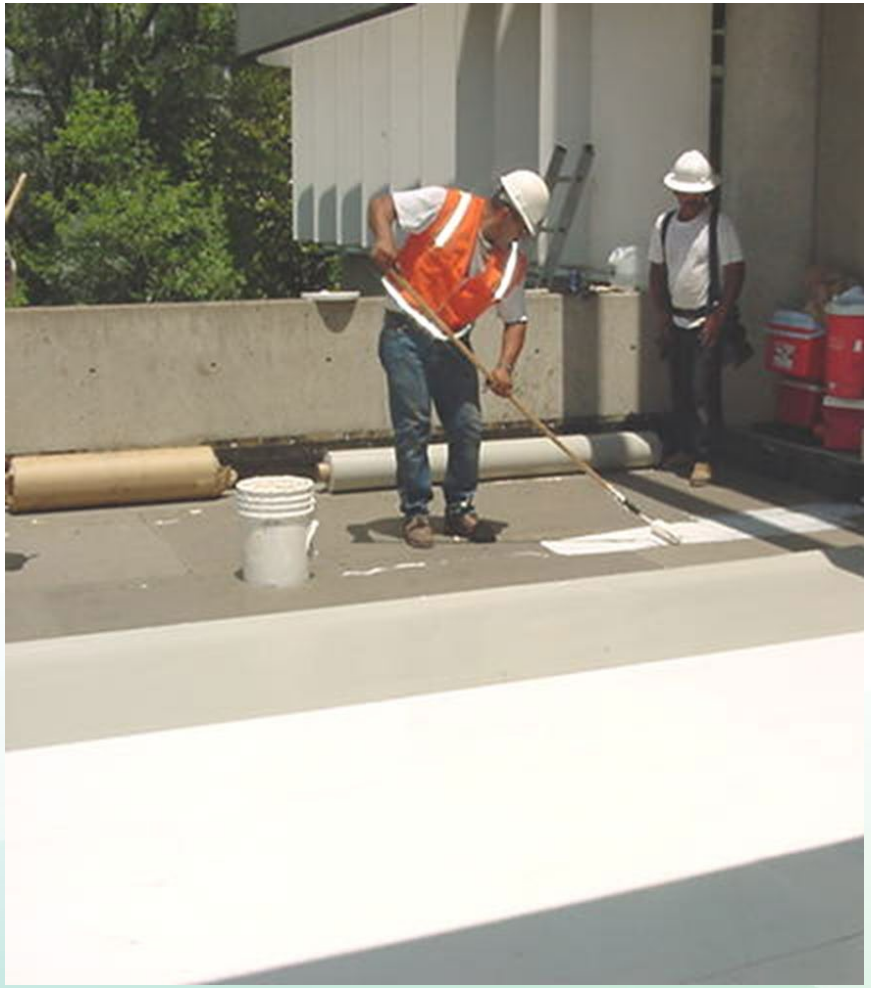
- Prescriptive
  - Added roof and ceiling assemblies must comply as new construction
- Performance
  - Addition alone complies
  - Option for existing, plus addition, plus alteration

Roofing Alterations Requirements

Nonresidential § 141.0(b)2B

Replacement, recoated, or recovered

- Greater than 50% of roofing or more than 2,000 square feet 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
  - Low-sloped exposed roof deck insulated per Table 141.0-C



Roofing Alterations Requirements

Nonresidential § 141.0(b)2B

Exception for low-sloped roof alterations

- Aged solar reflectance insulation trade-off per Table 141.0-B

Table 141.0-B Roof/Ceiling Insulation Tradeoff for Aged Solar Reflectance

Aged Solar Reflectance	Climate Zone 1, 3-9 U-factor	Climate Zone 2, 10-16 U-factor
0.62- 0.60	0.075	0.052
0.59-0.55	0.066	0.048
0.54-0.50	0.060	0.044
0.49-0.45	0.055	0.041
0.44-0.40	0.051	0.039
0.39-0.35	0.047	0.037
0.34-0.30	0.044	0.035
0.29-0.25	0.042	0.034

Roofing Alterations Requirements

Nonresidential § 141.0(b)2B

Low-sloped exposed roof deck insulated 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

Roofing Alteration Requirements

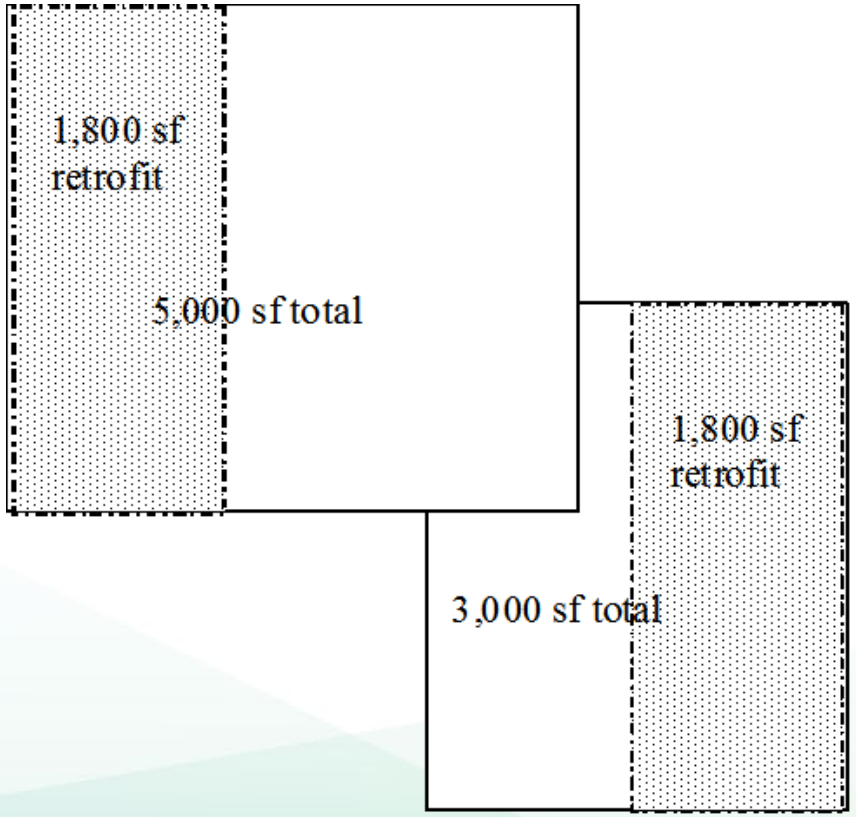
Nonresidential § 141.0(b)2B

Reroof example 1

- 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

Reroof example 2

- 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

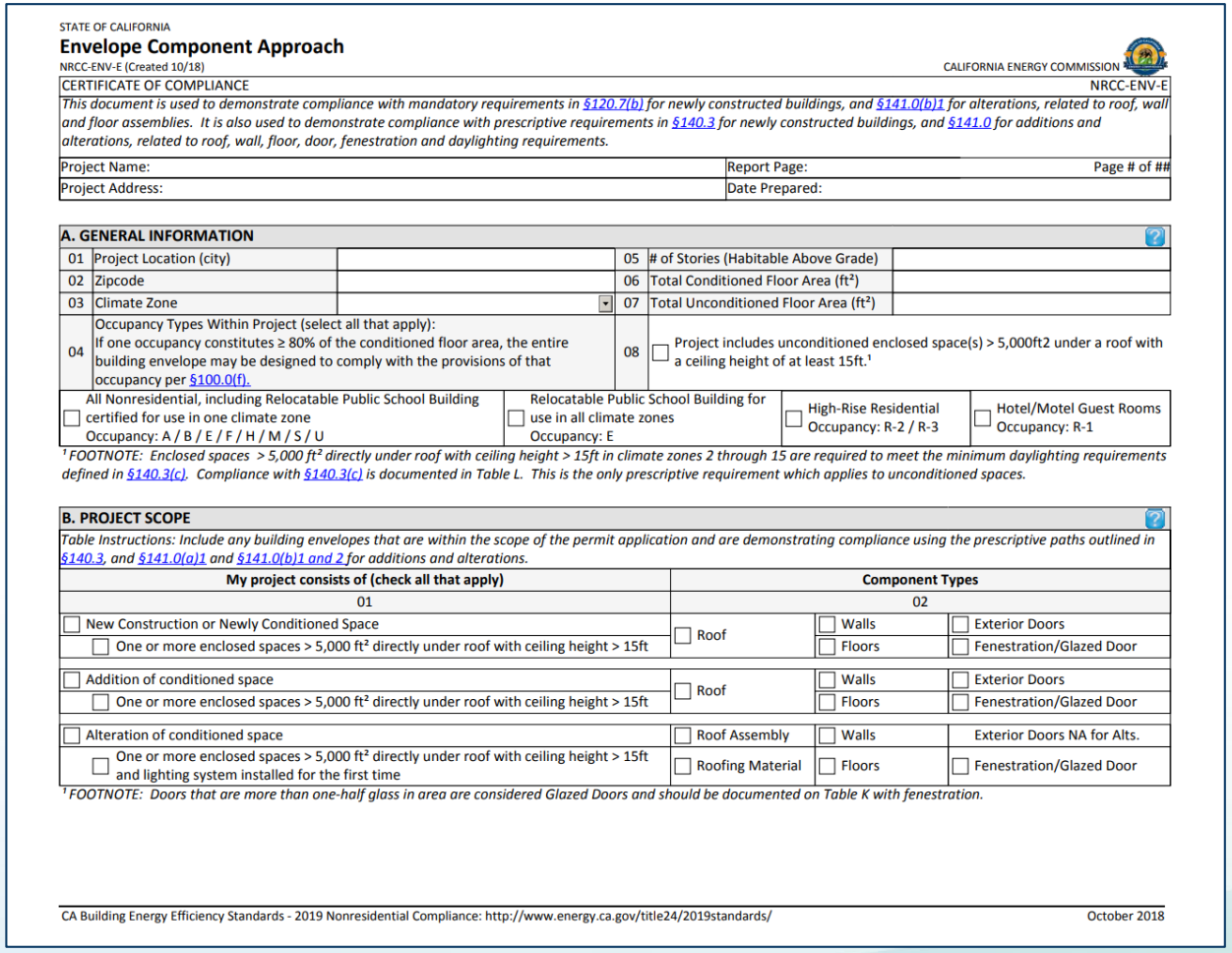
- Building envelope requirements usually do not apply to unconditioned buildings
- Daylighting requirements may apply

Plan Check and Inspection

Summary of 2019 Changes Nonresidential Envelope

- Addition of exterior door labeling requirements
  - 25% or more glass is fenestration
- Reduced site-built fenestration from 1,000 to 200 square feet
  - NA6 calculation using center of glass
- Windows in demising walls meet exterior U-factors
- New requirements for tubular skylights
- New specifications for advanced daylighting design

Plans Examiners



STATE OF CALIFORNIA

Envelope Component Approach

NRCC-ENV-E (Created 10/18) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	NRCC-ENV-E

This document is used to demonstrate compliance with mandatory requirements in §120.7(b) for newly constructed buildings, and §141.0(b)1 for alterations, related to roof, wall and floor assemblies. It is also used to demonstrate compliance with prescriptive requirements in §140.3 for newly constructed buildings, and §141.0 for additions and alterations, related to roof, wall, floor, door, fenestration and daylighting requirements.

Project Name:	Report Page: Page # of ##
Project Address:	Date Prepared:

A. GENERAL INFORMATION

01	Project Location (city)		05	# of Stories (Habitable Above Grade)	
02	Zipcode		06	Total Conditioned Floor Area (ft²)	
03	Climate Zone		07	Total Unconditioned Floor Area (ft²)	
04	Occupancy Types Within Project (select all that apply): If one occupancy constitutes ≥ 80% of the conditioned floor area, the entire building envelope may be designed to comply with the provisions of that occupancy per §100.0(f).		08	☐ Project includes unconditioned enclosed space(s) > 5,000ft2 under a roof with a ceiling height of at least 15ft.[1]	

☐ All Nonresidential, including Relocatable Public School Building certified for use in one climate zone Occupancy: A / B / E / F / H / M / S / U	☐ Relocatable Public School Building for use in all climate zones Occupancy: E	☐ High-Rise Residential Occupancy: R-2 / R-3	☐ Hotel/Motel Guest Rooms Occupancy: R-1

[1] FOOTNOTE: Enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft in climate zones 2 through 15 are required to meet the minimum daylighting requirements defined in §140.3(c). Compliance with §140.3(c) is documented in Table L. This is the only prescriptive requirement which applies to unconditioned spaces.

B. PROJECT SCOPE

Table Instructions: Include any building envelopes that are within the scope of the permit application and are demonstrating compliance using the prescriptive paths outlined in §140.3, and §141.0(a)1 and §141.0(b)1 and 2 for additions and alterations.

My project consists of (check all that apply)	Component Types		
01	02		
☐ New Construction or Newly Conditioned Space	☐ Roof	☐ Walls	☐ Exterior Doors
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft		☐ Floors	☐ Fenestration/Glazed Door
☐ Addition of conditioned space	☐ Roof	☐ Walls	☐ Exterior Doors
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft		☐ Floors	☐ Fenestration/Glazed Door
☐ Alteration of conditioned space	☐ Roof Assembly	☐ Walls	Exterior Doors NA for Alts.
☐ One or more enclosed spaces > 5,000 ft² directly under roof with ceiling height > 15ft and lighting system installed for the first time	☐ Roofing Material	☐ Floors	☐ Fenestration/Glazed Door

[1] FOOTNOTE: Doors that are more than one-half glass in area are considered Glazed Doors and should be documented on Table K with fenestration.

CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: http://www.energy.ca.gov/title24/2019standards/ October 2018

- Prescriptive or performance approach
  - Performance mandatory requirements for insulation
- Verify NRCC values match plans
- Verify required values wall, roof assemblies
- Verify required values windows and skylights

Plans Examiners

Mandatory assembly U-factors must be met

I. ENVELOPE DETAILS §120.7 & §140.3

I1. OPAQUE SURFACE ASSEMBLY SUMMARY

1	2	3	4	5	6	7	8	9
Surface Name	**Surface Type**	**Description of Assembly Layers**	**Area (ft^2)**	**Framing Type**	**Cavity R-Value**	**Continuous R-Value**	**U-Factor / F-Factor / C-Factor**	**Status[1]**
Base_CZ12-SlabOnOrBelowGradeF073	UndergroundFloor	Slab Type = UnheatedSlabOnGrade Insulation Orientation = None Insulation R-Value = R0	5502	NA	0	NA	F-Factor: 0.730	N
Base_CZ12-NonresMetalFrameWallU062	ExteriorWall	Stucco - 7/8 in. Compliance Insulation R13.99 Air - Metal Wall Framing - 16 or 24 in. OC Gypsum Board - 1/2 in.	3030	Metal	0	14	U-Factor: 0.062	N
NACM_Interior Wall	InteriorWall	Gypsum Board - 5/8 in. Air - Metal Wall Framing - 16 or 24 in. OC Gypsum Board - 5/8 in.	2646	Metal	0	NA	U-Factor: 0.319	N
Base_CZ12-SteepNonresWoodFramingAndOtherRoofU034	Roof	Metal Standing Seam - 1/16 in. Compliance Insulation R28.63	6445	NA	0	29	U-Factor: 0.034	N

Project Name:	020012S-OffSml-CECStd19	NRCC-PRF-01-E	Page 4 of 19
Project Address:	95814	Calculation Date/Time:	18:22, Wed, Jul 10, 2019
Input File Name:	020012S-OffSml-CECStd.cibd19		

H. FENESTRATION ASSEMBLY SUMMARY §110.6

1.	2.	3.	4.	5.	6.	7.	8.	9.
Fenestration Assembly Name / Tag or I.D.	Fenestration Type / Product Type / Frame Type	Certification Method[1]	Assembly Method	Area ft^2	Overall U-factor	Overall SHGC	Overall VT	Status[2]
Base_AllCZ_FixedWindowU36	VerticalFenestration FixedWindow N/A	NFRC Rated	Manufactured	600	0.36	0.25	0.42	N
Glazed Door	VerticalFenestration GlazedDoor N/A	NFRC Rated	Manufactured	42	0.45	0.23	0.17	N

[1] *Newly installed fenestration shall have a certified NFRC Label Certificate or use the CEC default tables found in Table 110.6-A and Table 110.6-B. Center of Glass (COG) values are for the glass-only, determined by the manufacturer, and are shown for ease of verification. Site-built fenestration values are calculated per Nonresidential Appendix NA6 and are used in the analysis.*

[2] *Status: N - New, A – Altered, E – Existing*

Double-check window and wall sizes match plans

G. ENVELOPE GENERAL INFORMATION

1	2	3	4
Opaque Surfaces & Orientation	Total Gross Surface Area	Total Fenestration Area	Window to Wall Ratio
North-Facing[1]	909 ft^2	180 ft^2	19.8%
East-Facing[2]	606 ft^2	120 ft^2	19.8%
South-Facing[3]	909 ft^2	222 ft^2	24.4%
West-Facing[4]	606 ft^2	120 ft^2	19.8%
Total	**3,030 ft^2**	**642 ft^2**	**21.2%**
Roof	6,445 ft^2	0 ft^2	00.0%

Notes:

[1] *North-Facing is oriented to within 45 degrees of true north, including 45°00'00" east of north (NE), but excluding 45°00'00" west of north (NW).*

[2] *East-Facing is oriented to within 45 degrees of true east, including 45°00'00" south of east (SE), but excluding 45°00'00" north of east (NE).*

[3] *South-Facing is oriented to within 45 degrees of true south, including 45°00'00" west of south (SW), but excluding 45°00'00" east of south (SE).*

[4] *West-Facing is oriented to within 45 degrees of true west, including 45°00'00" north of due west (NW), but excluding 45°00'00" south of west (SW).*

Field Inspectors

At rough frame

- Air sealing
- Window and skylight values
- Daylighting features
- Cool roof (if applicable)

At insulation stage

- Wall insulation values
- Raised floor insulation values

At final

- Ceiling insulation values
- Air barrier
- NRCI forms
- NRCA forms

Resources

Online Resource Center

Online Resource Center

Educational documents and training information for building communities and enforcement agencies to assist with building energy standards compliance.

LEARN MORE >

2019 ATTCP Program

Acceptance Test Technician Certification Provider Program - ATTCP

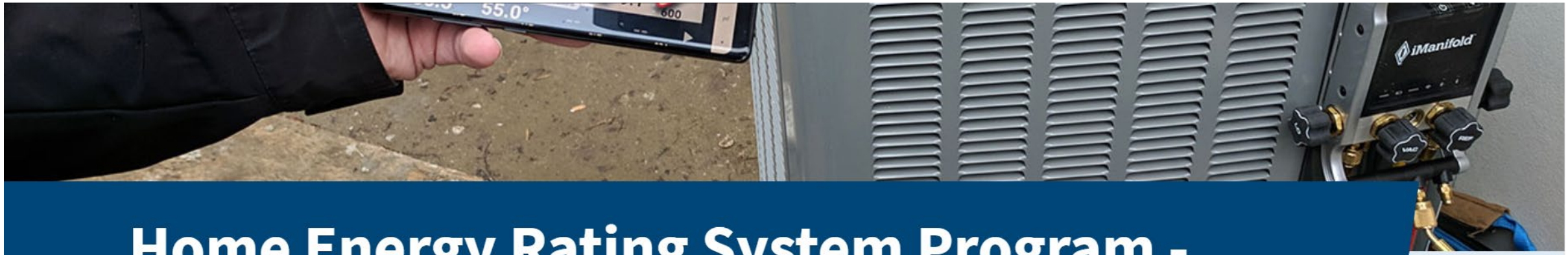
Acceptance Test Technicians perform required tests for lighting controls and mechanical systems in nonresidential buildings. The California Energy Commission's approved Acceptance Test Technician Certification Providers (ATTCP) train, certify, and oversee the technicians and their employers.

CONTACT

Joe Loyer

916-654-4811

2019 HERS Providers



Home Energy Rating System Program - HERS

The Home Energy Rating System (HERS) Program tests and rates the energy performance of a home. The California Energy Commission's HERS Program addresses construction defects and poor equipment installation, including HVAC systems and insulation. The Energy Commission has a list of approved HERS providers who train and certify raters.

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Building Energy Efficiency Standards

First Name *

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Blueprint Newsletter

Blueprint is the California Energy Commission's quarterly e-newsletter that delves into the Building Energy Efficiency Standards and provides examples of projects. The newsletter provides updates, answers to frequently asked questions, clarifications to requirements, announcements, and educational resources and training.

NEWSROOM

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Highlights

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  - Blueprint
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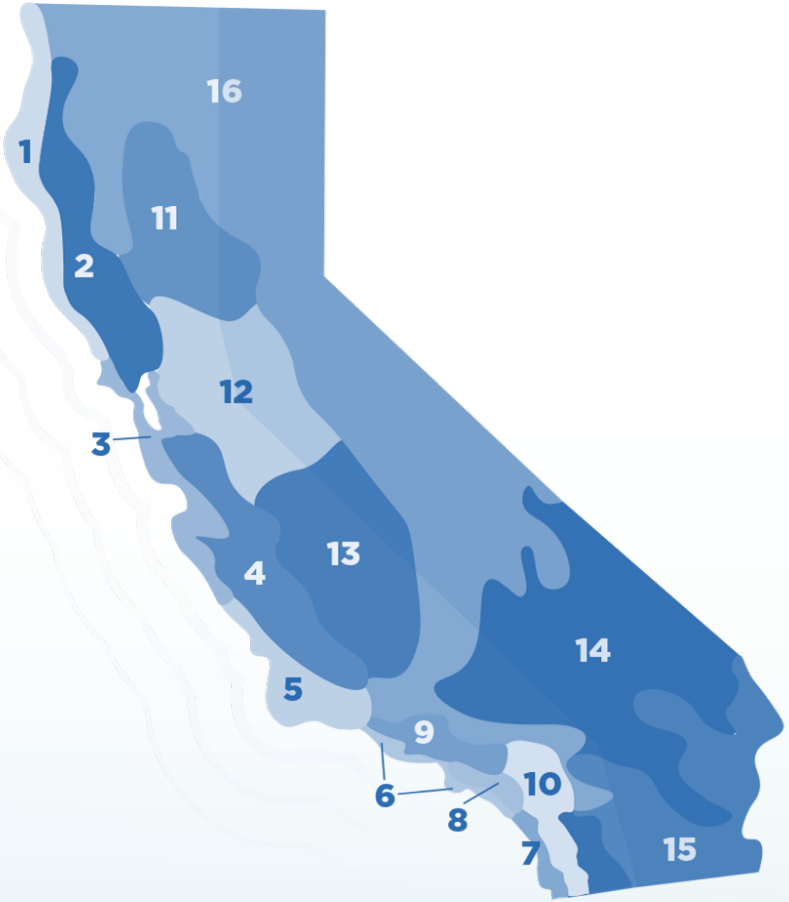
Energy Code Hotline



Monday through Friday

8:00 a.m. to 12:00 p.m.

1:00 p.m. to 4:30 p.m.

Call

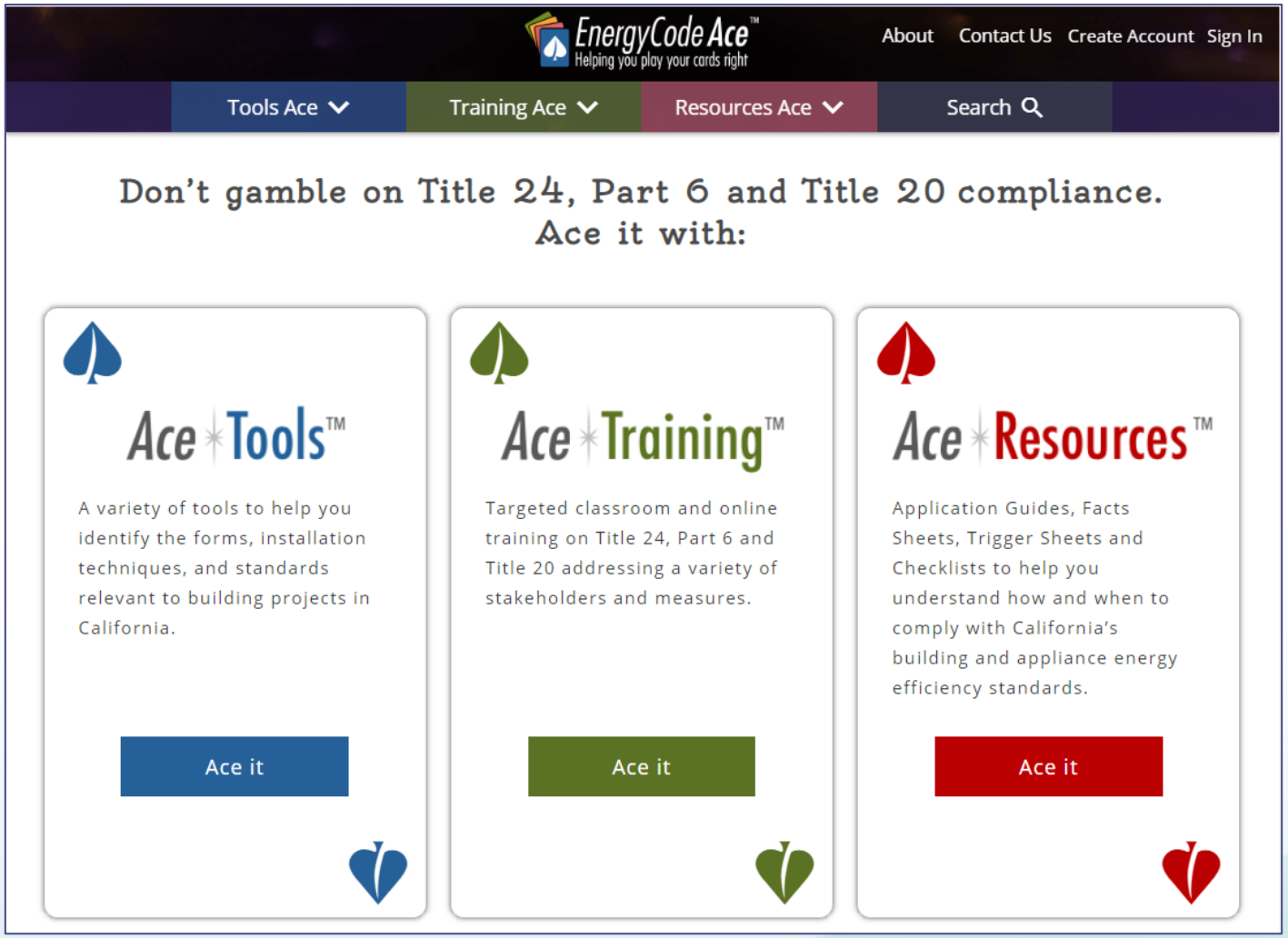
800-772-3300 in CA

916-654-5106 outside CA

Email

Title24@energy.ca.gov

Energy Code Ace



- Forms and resource tools
- Free training in person and online
- Checklists and trigger sheets for building departments

Thank you