2022 Energy Code

Nonresidential Envelope

California Energy Commission

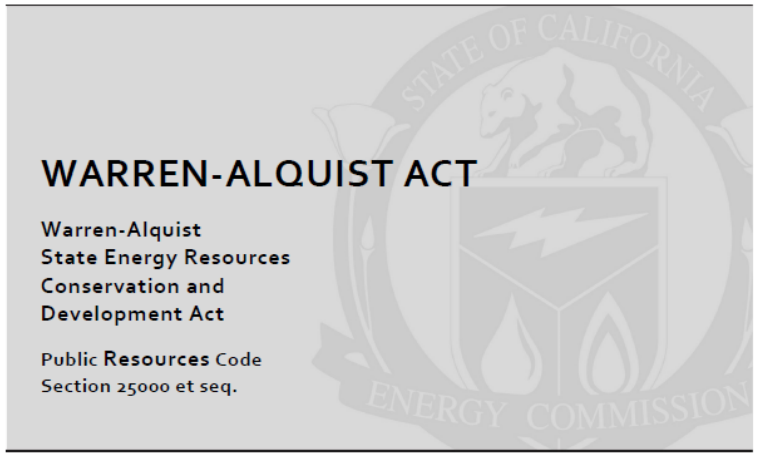
March 2024

Agenda

- Energy Code basics
- Navigating Energy Code
- Fenestration and exterior doors
- Air sealing
- Insulation
- Roofing products
- Resources

Energy Code Basics

Energy Code History

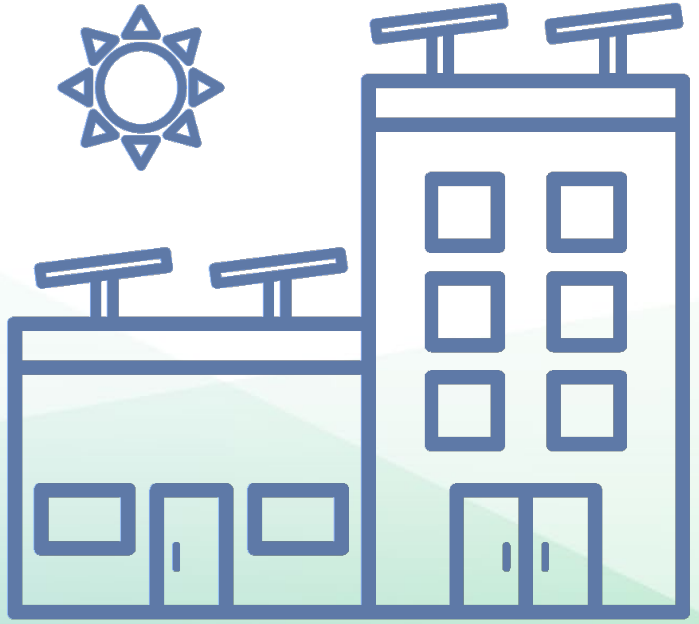


Warren-Alquist Act established California Energy Commission (CEC) in 1974

- Authority to develop and maintain Building Energy Efficiency Standards (Energy Code)
- Requires CEC to update periodically, usually every 3 years
- Requires Energy Code to be cost-effective over economic life of building

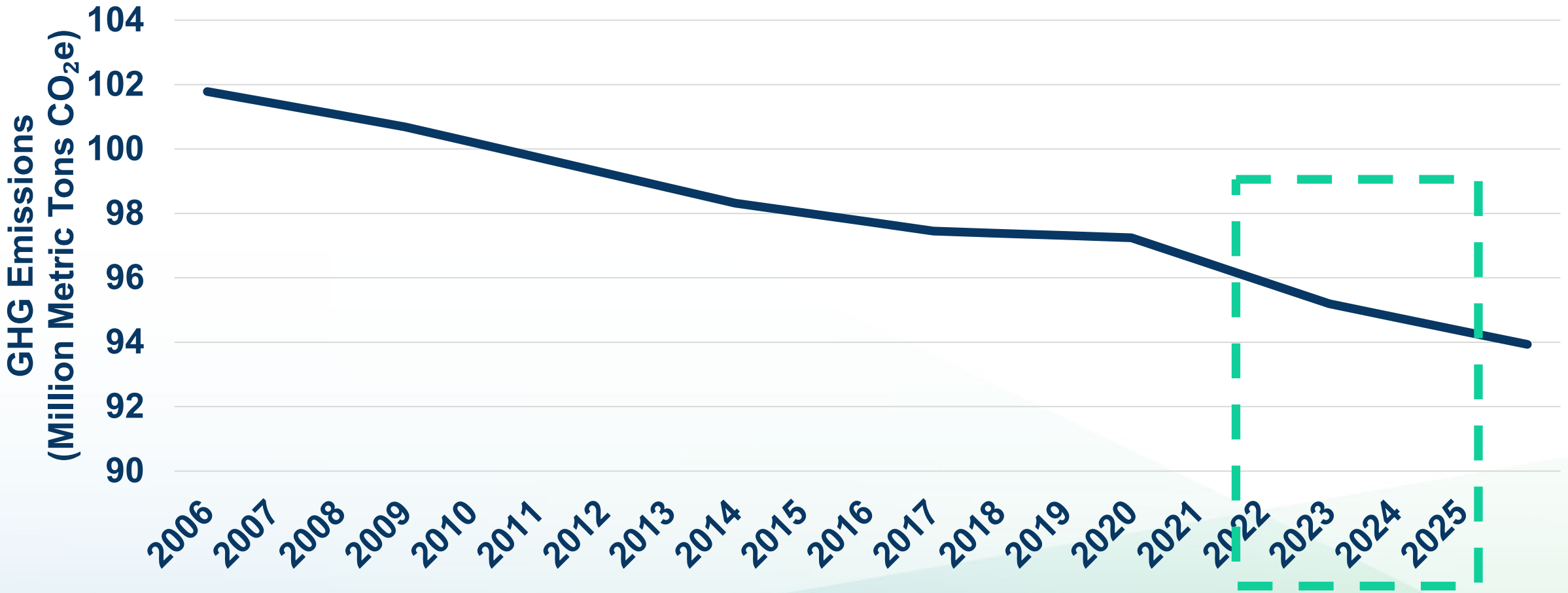
2022 Energy Code Goals

- Increase building energy efficiency cost-effectively
- Contribute to California's greenhouse gas (GHG) reduction goals
- Enable pathways for all-electric buildings
- Reduce residential building impacts on the electricity grid
- Promote demand flexibility and self-utilization of photovoltaic (PV)
- Provide tools for local government reach codes



Energy Code Environmental Benefit

Reduced Statewide Emissions

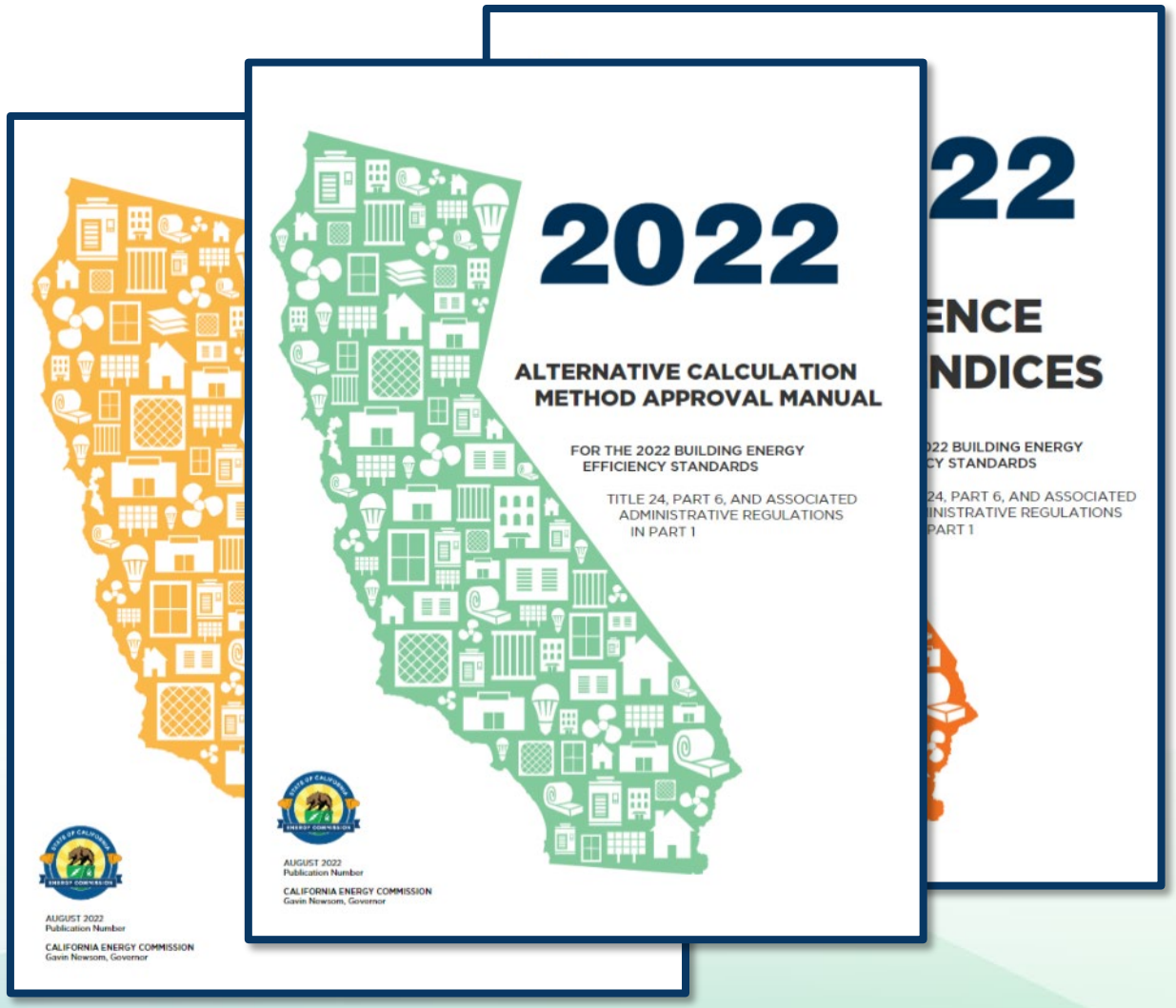


Source: CEC Impact Analysis 2005, 2008, 2013, 2016, 2019, 2022

2022 Energy Code

Effective January 1, 2023

- Building permit applications submitted on or after effective date
- Must use approved versions
  - Software
  - Forms



2022 Documents Online

- Energy Code
- Reference Appendices
- Compliance Manuals
- Software
- Forms

Energy Code Requirements

Mandatory requirements

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

Prescriptive requirements

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

Compliance Approaches

Prescriptive approach

- Simple approach, no trade-offs
- Defines the standard building design
- 2022 heat pump baselines

Performance approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC-approved software
- Proposed building design meets or exceeds standard building design

2022 Performance Metrics

New for 2022

Energy performance calculations

- Nonresidential
  - Hourly source energy
  - Time dependent valuation (TDV)
    - TDV Efficiency
    - TDV Total
      - ❑ Efficiency, PV + battery

2022 Compliance Software

Performance approach must use approved compliance software versions

- Nonresidential and multifamily
  - CBECC 2022.3.0 or CBECC 2022.3.0 SP1
  - EnergyPro 9.2
  - IES 1.1

Demonstrating Compliance

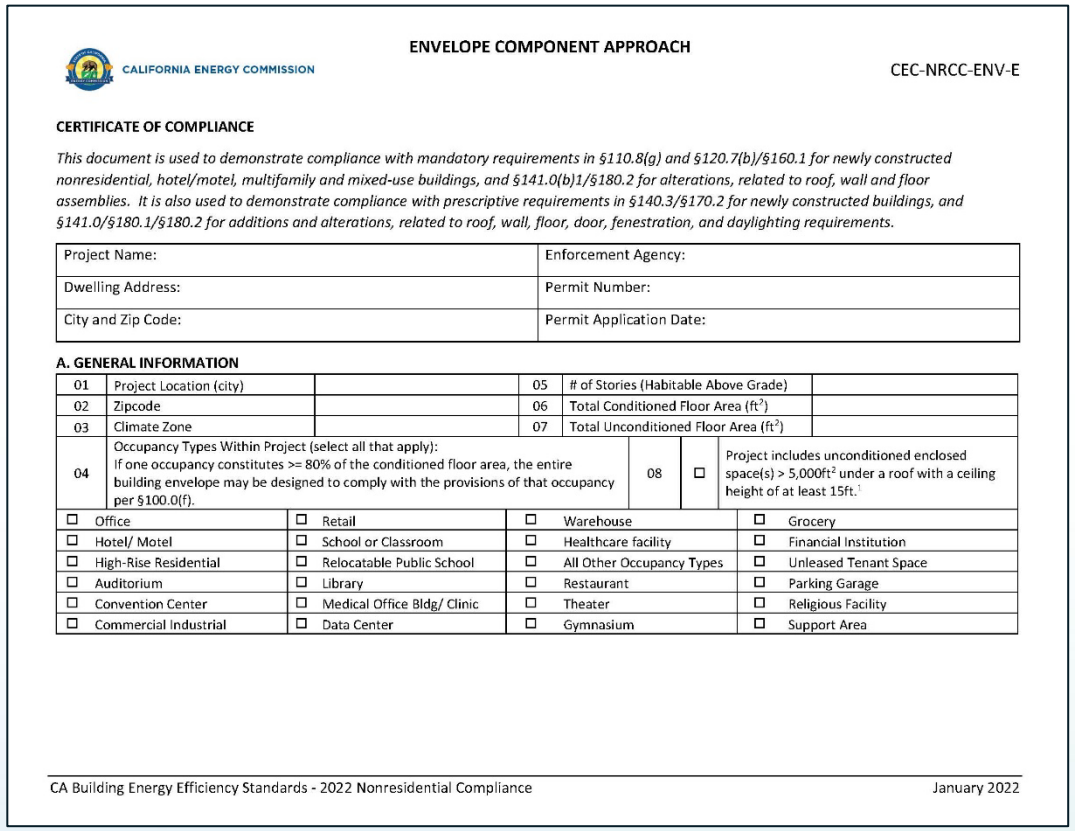
Compliance forms confirm Energy Code is met

Updated for 2022

- Completed by responsible party
  - Designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification

Type of form	Nonresidential
Certificate of compliance	NRCC
Certificate of installation	NRCI
Certificate of verification	NRCV
Certificate of acceptance	NRCA

Certificate of Compliance



ENVELOPE COMPONENT APPROACH

CALIFORNIA ENERGY COMMISSION

CEC-NRCC-ENV-E

CERTIFICATE OF COMPLIANCE

This document is used to demonstrate compliance with mandatory requirements in §110.8(g) and §120.7(b)/§160.1 for newly constructed nonresidential, hotel/motel, multifamily and mixed-use buildings, and §141.0(b)1/§180.2 for alterations, related to roof, wall and floor assemblies. It is also used to demonstrate compliance with prescriptive requirements in §140.3/§170.2 for newly constructed buildings, and §141.0/§180.1/§180.2 for additions and alterations, related to roof, wall, floor, door, fenestration, and daylighting requirements.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

A. GENERAL INFORMATION

01	Project Location (city)		05	# of Stories (Habitable Above Grade)	
02	Zipcode		06	Total Conditioned Floor Area (ft^2)	
03	Climate Zone		07	Total Unconditioned Floor Area (ft^2)	
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) > 5,000ft^2 under a roof with a ceiling height of at least 15ft.[1]

☐ Office	☐ Retail	☐ Warehouse	☐ Grocery
☐ Hotel/ Motel	☐ School or Classroom	☐ Healthcare facility	☐ Financial Institution
☐ High-Rise Residential	☐ Relocatable Public School	☐ All Other Occupancy Types	☐ Unleased Tenant Space
☐ Auditorium	☐ Library	☐ Restaurant	☐ Parking Garage
☐ Convention Center	☐ Medical Office Bldg/ Clinic	☐ Theater	☐ Religious Facility
☐ Commercial Industrial	☐ Data Center	☐ Gymnasium	☐ Support Area

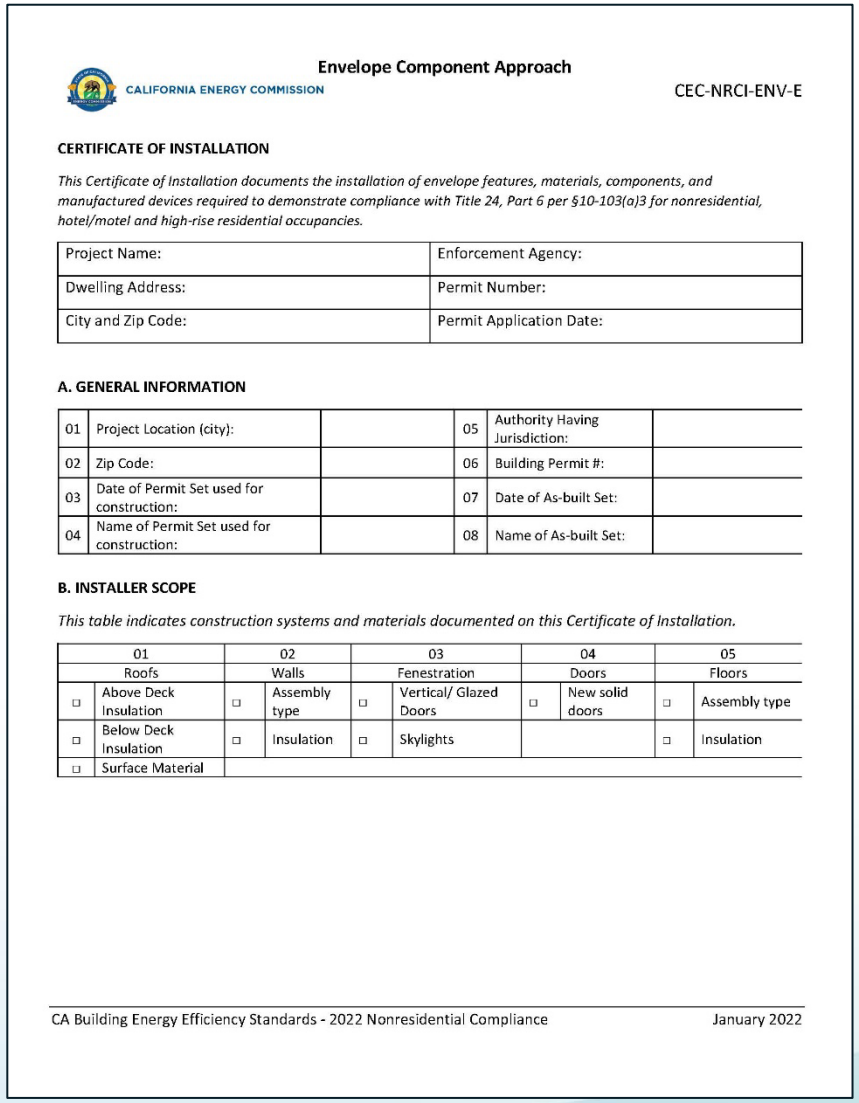
CA Building Energy Efficiency Standards - 2022 Nonresidential Compliance — January 2022

Nonresidential envelope

Certificate of compliance - NRCC

- 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

Certificate of Installation



Envelope Component Approach

CALIFORNIA ENERGY COMMISSION

CEC-NRCI-ENV-E

CERTIFICATE OF INSTALLATION

This Certificate of Installation documents the installation of envelope features, materials, components, and manufactured devices required to demonstrate compliance with Title 24, Part 6 per §10-103(a)3 for nonresidential, hotel/motel and high-rise residential occupancies.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

A. GENERAL INFORMATION

01	Project Location (city):		05	Authority Having Jurisdiction:	
02	Zip Code:		06	Building Permit #:	
03	Date of Permit Set used for construction:		07	Date of As-built Set:	
04	Name of Permit Set used for construction:		08	Name of As-built Set:	

B. INSTALLER SCOPE

This table indicates construction systems and materials documented on this Certificate of Installation.

01 Roofs		02 Walls		03 Fenestration		04 Doors		05 Floors	
□	Above Deck Insulation	□	Assembly type	□	Vertical/ Glazed Doors	□	New solid doors	□	Assembly type
□	Below Deck Insulation	□	Insulation	□	Skylights			□	Insulation
□	Surface Material								

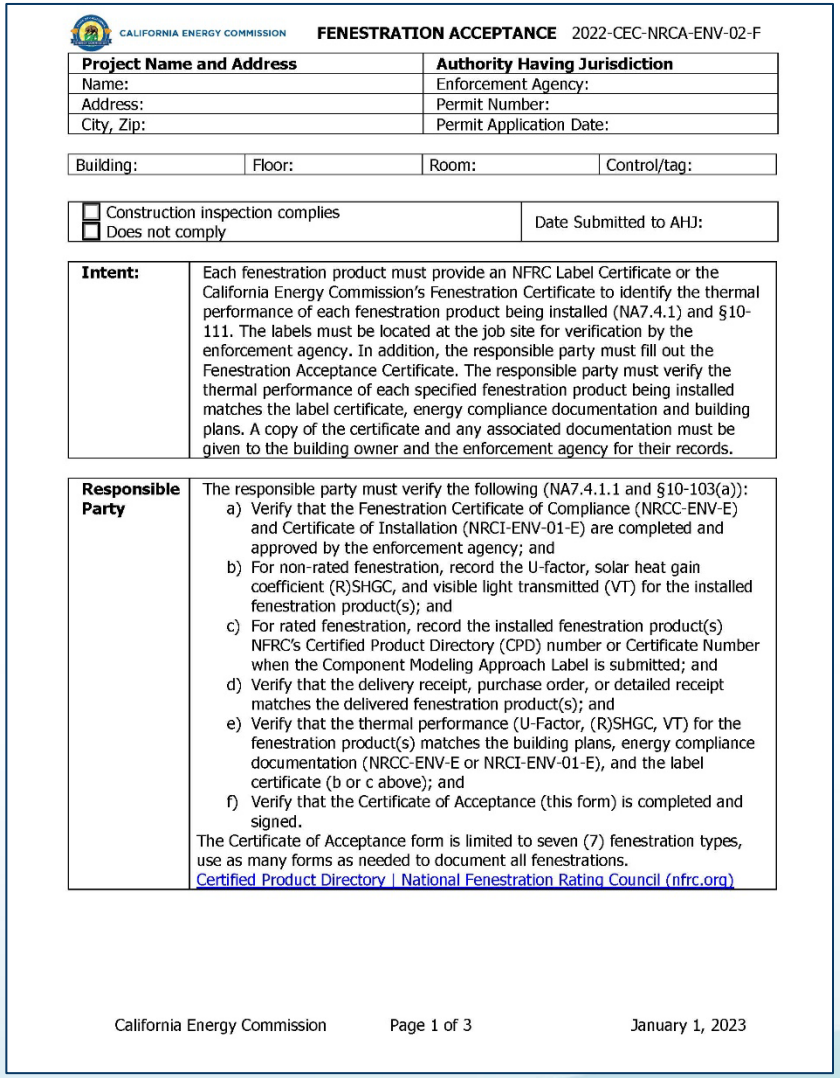
CA Building Energy Efficiency Standards - 2022 Nonresidential Compliance January 2022

Nonresidential envelope

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



CALIFORNIA ENERGY COMMISSION **FENESTRATION ACCEPTANCE** 2022-CEC-NRCA-ENV-02-F

Project Name and Address	Authority Having Jurisdiction
Name:	Enforcement Agency:
Address:	Permit Number:
City, Zip:	Permit Application Date:

Building:	Floor:	Room:	Control/tag:

☐ Construction inspection complies ☐ Does not comply	Date Submitted to AHJ:

Intent:	Each fenestration product must provide an NFRC Label Certificate or the California Energy Commission's Fenestration Certificate to identify the thermal performance of each fenestration product being installed (NA7.4.1) and §10-111. The labels must be located at the job site for verification by the enforcement agency. In addition, the responsible party must fill out the Fenestration Acceptance Certificate. The responsible party must verify the thermal performance of each specified fenestration product being installed matches the label certificate, energy compliance documentation and building plans. A copy of the certificate and any associated documentation must be given to the building owner and the enforcement agency for their records.
Responsible Party	The responsible party must verify the following (NA7.4.1.1 and §10-103(a)): a) Verify that the Fenestration Certificate of Compliance (NRCC-ENV-E) and Certificate of Installation (NRCI-ENV-01-E) are completed and approved by the enforcement agency; and b) For non-rated fenestration, record the U-factor, solar heat gain coefficient (R)SHGC, and visible light transmitted (VT) for the installed fenestration product(s); and c) For rated fenestration, record the installed fenestration product(s) NFRC's Certified Product Directory (CPD) number or Certificate Number when the Component Modeling Approach Label is submitted; and d) Verify that the delivery receipt, purchase order, or detailed receipt matches the delivered fenestration product(s); and e) Verify that the thermal performance (U-Factor, (R)SHGC, VT) for the fenestration product(s) matches the building plans, energy compliance documentation (NRCC-ENV-E or NRCI-ENV-01-E), and the label certificate (b or c above); and f) Verify that the Certificate of Acceptance (this form) is completed and signed. The Certificate of Acceptance form is limited to seven (7) fenestration types, use as many forms as needed to document all fenestrations. Certified Product Directory | National Fenestration Rating Council (nfrc.org)

California Energy Commission Page 1 of 3 January 1, 2023

Nonresidential envelope

Certificate of acceptance - NRCAs

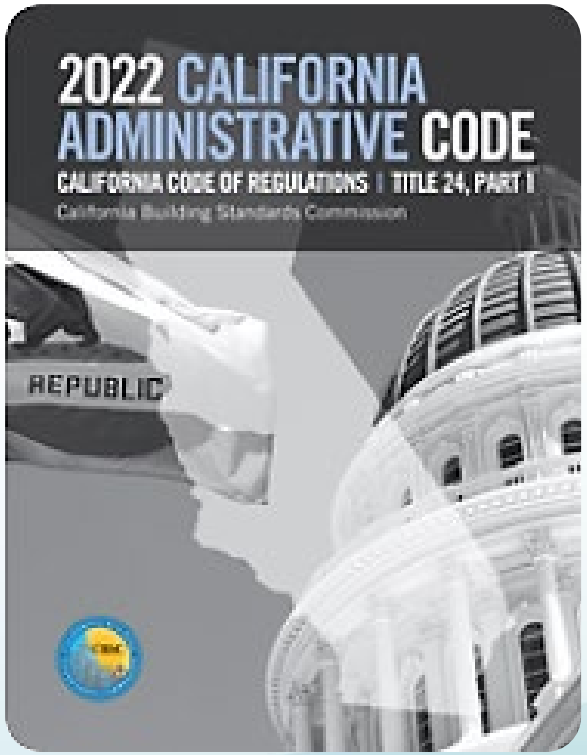
- Completed by field technician
- Confirms compliance with acceptance requirements in Reference Nonresidential Appendix NA7
- Left on-site for building inspector

Navigating Energy Code

Title 24 – California Building Code

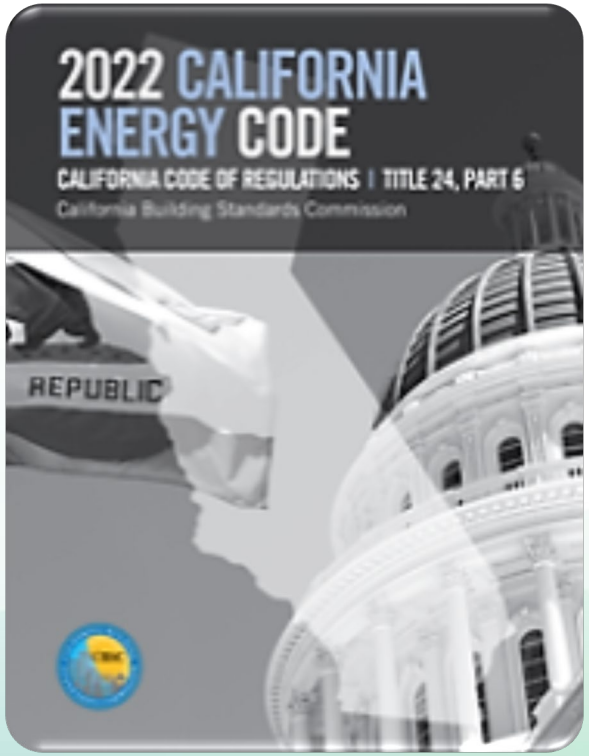
Part 1 - Administrative Code

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



Part 6 - Energy Code

- Subchapters 1 – 9
- §§ 100.0 – 180.4
- 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

2022 Energy Code Table 100.0-A

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
All Buildings	General	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0	100.0, 100.1, 100.2, 110.0
Nonresidential and Hotels/Motels	General	120.0	140.0, 140.2	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	Envelope (unconditioned process spaces)	N.A.	140.3 (c)	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3 120.4, 120.5, 120.8	140.4	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	Water Heating	110.3, 120.3, 120.8, 120.9	140.5	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	140.0, 140.1	141.0
Nonresidential and Hotels/Motels	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	141.0
Nonresidential and Hotels/Motels	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7	N.A.	141.0
Nonresidential and Hotels/Motels	Electrical Power Distribution	110.11, 130.5	N.A.	N.A.	141.0
Nonresidential and Hotels/Motels	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N. A.	N.A.	141.0
Nonresidential and Hotels/Motels	Solar Ready Buildings	110.10	N.A.	N.A.	141.0(a)
Nonresidential and Hotels/Motels	Solar PV and Battery Storage Systems	N.A.	140.1 0	140.0, 140.1	N.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 relevant sections

§ 100.1 Definitions

§ 110.0-110.12 All buildings

§ 120.0-130.5 Mandatory requirements

§ 140.0-140.10 Prescriptive requirements

§ 141.0-141.1 Additions and alterations

Nonresidential Defined

All buildings § 100.1

Nonresidential building

- All buildings in California Building Code (CBC) occupancies of group A, B, E, F, H, I, M, S, U
  - Not occupancy group I-3 or I-4
- No longer includes high-rise residential multifamily

- Assembly and conference areas
- Commercial or industrial storage
- Financial institutions
- Hotels and motels
- Healthcare facilities
- Industrial and manufacturing
- Museums
- Offices
- Retail and wholesale stores
- Restaurants
- Schools and churches
- Theaters

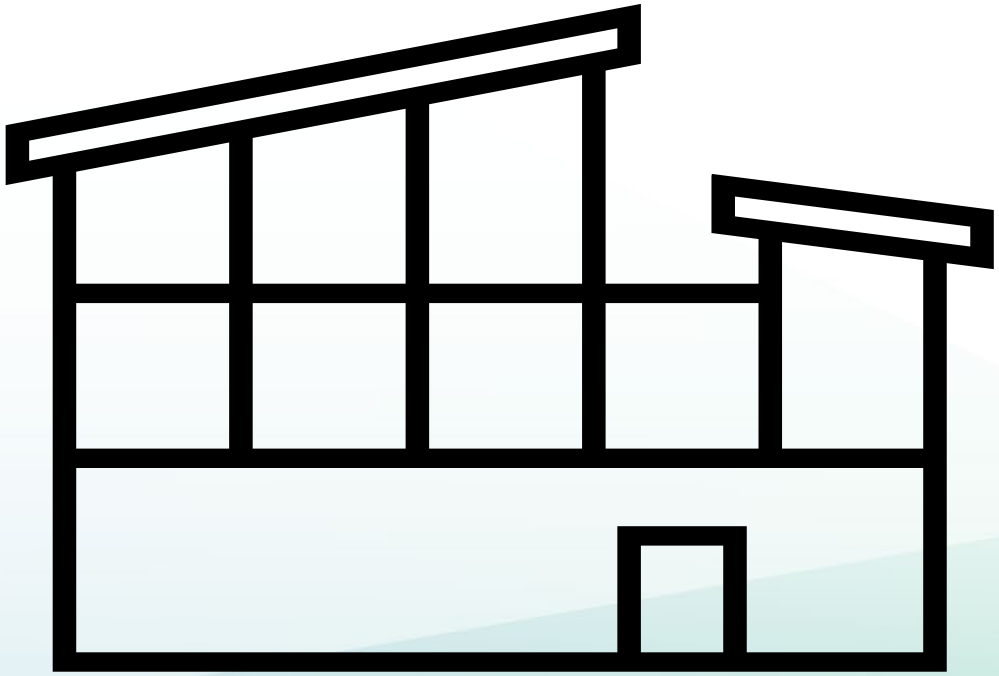
Envelope Defined

All buildings § 100.1

Building envelope - ensemble of exterior and demising partitions of a building that enclose conditioned space

Roof

Windows



Walls

Floors

Envelope Definitions

All buildings § 100.1

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

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

All buildings § 100.1

- **Fenestration product** - a transparent or translucent material plus any sash, frame, mullions, and dividers in façade of a building
- **Glazed door** - an exterior door having a glazed area of 25 percent or greater of the area of the door
- **U-factor** - overall coefficient of thermal transmission through the fenestration
- **Solar heat gain coefficient (SHGC)** - the ratio of solar heat gain entering the space through the fenestration which is released as heat into the space
- **Visible transmittance** - ratio of visible light transmitted through glazing, higher allows more light through window
- Additional updated definitions
  - *Clerestory, overhang projection, overhang rise*

Types of Fenestration

All buildings § 100.1

- Manufactured - pre-assembled glazing and frame
  - Commonly used in residential
- Site-built - field-assembled using factory products with the intent of being assembled on-site
  - Storefront or curtain wall system
- Field-fabricated - frame is made at the construction site of materials that were not pre-formed
  - Custom made at site for a specific application

Fenestration and Exterior Doors Administrative Regulations

All buildings §§ 10-111, 10-112

Labeling and certification requirements

- National Fenestration Rating Council (NFRC) is designated to administer certification program
- Temporary labels
  - NFRC manufactured window and door labels
  - CEC default table values
- Label certificates
  - NFRC Component Modeling Approach (CMA)
  - Reference Nonresidential Appendix NA6 alternate default procedure
- Permanent labels

Default tables

- CEC calculates, maintains, and revises

Fenestration Temporary Labels

NFRC

National Fenestration Rating Council®
CERTIFIED

World's Best Window Co.
Series "2000"
Casement
Vinyl-Clad Wood Frame
Double Glazing • Argon Fill • Low E
XYZ-X-1-00001-00001

ENERGY PERFORMANCE RATINGS

U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.22	0.23

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Leakage (U.S./I-P)
0.51	≤ 0.3

Manufacturer stipulates that these ratings conform the applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for 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 default

2022 California Energy Commission Default Label
XYZ Manufacturing Co.

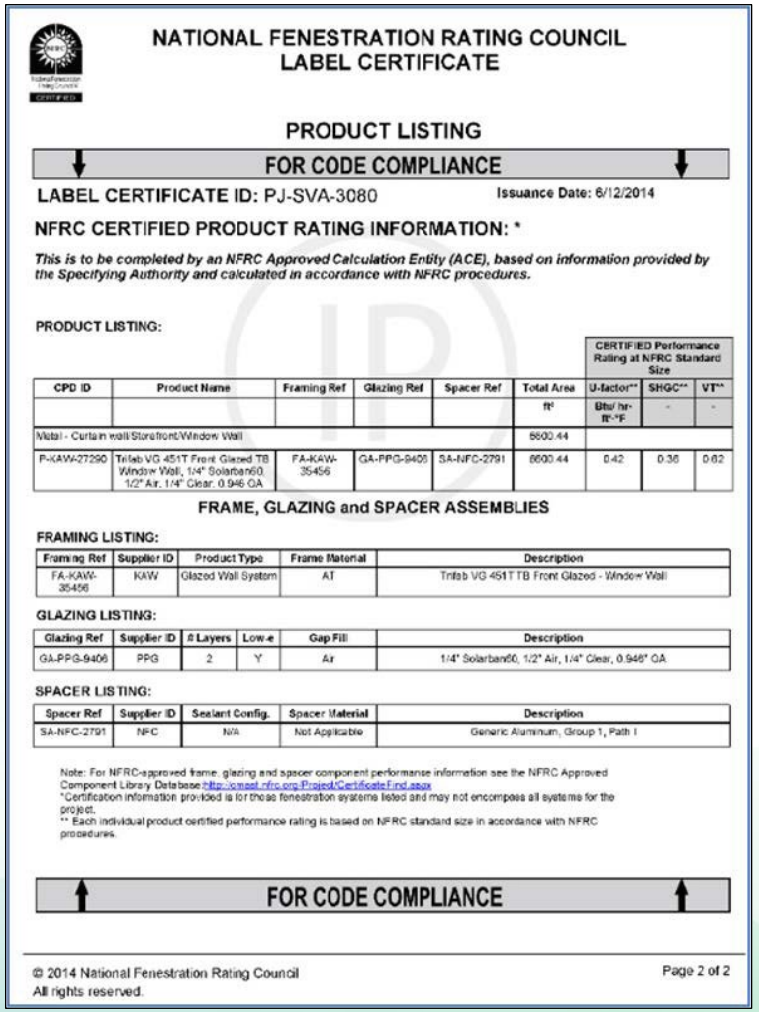
Key Features:	☐ Doors	☐ Double-Pane
	☐ Skylight	☐ Glass Block
Frame Type	**Product Type:**	**Product Glazing Type:**
☐ Metal	☐ Operable	☐ Clear
☐ Non-Metal	☐ Fixed	☐ Tinted
☐ Metal, Thermal Break	☐ Greenhouse/Garden Window	☐ Single-Pane
☐ Air space 7/16 in. or greater ☐ With built-in curb ☐ Meets Thermal-Break 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 2022 Energy Standards for Residential and Nonresidential Buildings.

NFRC CMA Label Certificate

Nonresidential Compliance Manual Section 3.3.5 C

- NFRC-approved components online libraries
  - Glazing, frame, spacer
- Ratings for various configurations
- Design windows, curtain wall systems, and skylights
- Determine if product meets energy code
- Compare energy performance of different designs



NATIONAL FENESTRATION RATING COUNCIL
LABEL CERTIFICATE

PRODUCT LISTING

FOR CODE COMPLIANCE

LABEL CERTIFICATE ID: PJ-SVA-3080 Issuance Date: 6/12/2014

NFRC CERTIFIED PRODUCT RATING INFORMATION: *

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.

PRODUCT LISTING:

CPD ID	Product Name	Framing Ref	Glazing Ref	Spacer Ref	Total Area	CERTIFIED Performance Rating at NFRC Standard Size U-factor**	SHGC**	VT**
					ft²	Btu/ hr-ft²-°F	-	-
Metal - Curtain wall/Storefront/Window Wall					8600.44			
P-KAW-27290	Trifab VG 451T Front Glazed TB Window Wall, 1/4" Solarban60, 1/2" Air, 1/4" Clear, 0.946 OA	FA-KAW-35456	GA-PPG-9406	SA-NFC-2791	8600.44	0.42	0.36	0.62

FRAME, GLAZING and SPACER ASSEMBLIES

FRAMING LISTING:

Framing Ref	Supplier ID	Product Type	Frame Material	Description
FA-KAW-35456	KAW	Glazed Wall System	Al	Trifab VG 451TTB Front Glazed - Window Wall

GLAZING LISTING:

Glazing Ref	Supplier ID	# Layers	Low-e	Gap Fill	Description
GA-PPG-9406	PPG	2	Y	Air	1/4" Solarban60, 1/2" Air, 1/4" Clear, 0.946" OA

SPACER LISTING:

Spacer Ref	Supplier ID	Sealant Config.	Spacer Material	Description
SA-NFC-2791	NFC	N/A	Not Applicable	Generic Aluminum, Group 1, Path I

Note: For NFRC-approved frame, glazing and spacer component performance information see the NFRC Approved Component Library Database (http://cmast.nfrc.org/Project/CertificateFind.aspx)
* Certification information provided is for those fenestration systems listed and may not encompass all systems for the project.
** Each individual product certified performance rating is based on NFRC standard size in accordance with NFRC procedures.

FOR CODE COMPLIANCE

Fenestration and Exterior Door Mandatory Requirements

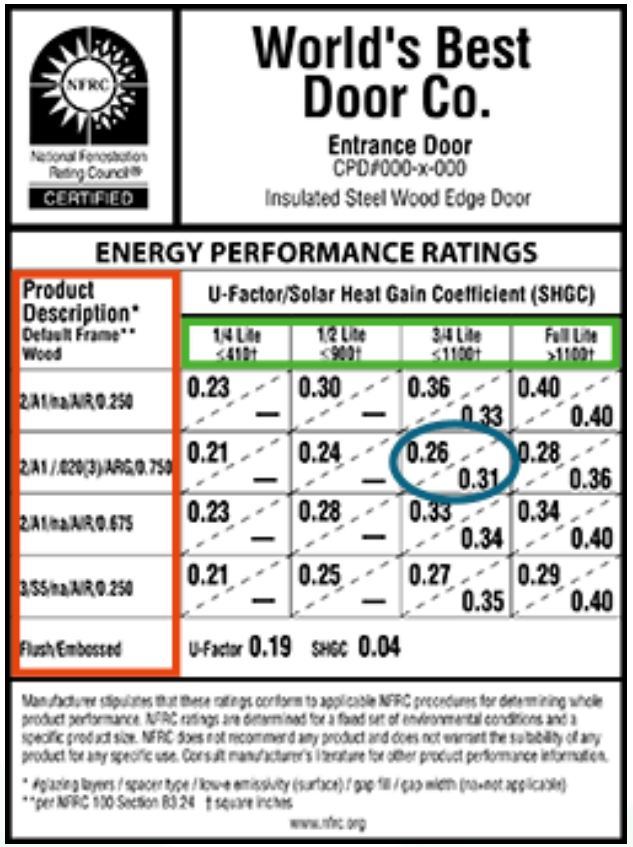
All buildings § 110.6(a)

Manufactured and site-built

- Certified by NFRC
  - Air leakage (0.3 cfm)
  - U-factor
  - SHGC
  - Visual transmittance
- Exterior doors only require air leakage and U-factor
- No NFRC rating - use CEC default values

Site-built

- NA6 alternate default fenestration procedure
  - Single-family and low-rise multifamily
    - Up to 250 square feet
  - Nonresidential and high-rise multifamily
    - Only skylights up to 200 square feet
- Nonresidential and multifamily meet acceptance requirements in NA7.4



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 ≤410†	1/2 Lite ≤900†	3/4 Lite ≤1100†	Full Lite >1100†
2/A1/na/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/na/AIR/0.675	0.23 —	0.28 —	0.33 0.34	0.34 0.40
3/SS/na/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(b)

Field-fabricated

- Must use CEC default values
  - U-factor in Table 110.6-A
  - SHGC in Table 110.6-B
- Exterior doors less than 25% glazing use CEC default values
  - U-factor in JA4.5 Table 4.5.1
- Must be caulked and weather-stripped

Fenestration and Exterior Door Mandatory Requirements

All buildings § 110.6

Methods for determining U-factor and SHGC

- *NA6 only allowed for nonresidential skylights up to 200 ft^2

	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*	n/a	n/a	n/a	✓	n/a	n/a

Fenestration Default U-factor

All buildings Table 110.6-A

FRAME	PRODUCT TYPE	SINGLE PANE U-FACTOR	DOUBLE PANE U-FACTOR	GLASS BLOCK U-FACTOR
Metal	Operable	1.28	0.79	0.87
Metal	Fixed	1.19	0.71	0.72
Metal	Greenhouse or garden window	2.26	1.40	N.A.
Metal	Glazed doors	1.25	0.77	N.A.
Metal	Skylight	1.98	1.30	N.A.
Metal, thermal break	Operable	N.A.	0.66	N.A.
Metal, thermal break	Fixed	N.A.	0.55	N.A.
Metal, thermal break	Greenhouse or garden window	N.A.	1.12	N.A.
Metal, thermal break	Glazed Doors	N.A.	0.59	N.A.
Metal, thermal break	Skylight	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
Nonmetal	Fixed	1.04	0.55	0.57
Nonmetal	Glazed Doors	0.99	0.53	N.A.
Nonmetal	Greenhouse or garden window	1.94	1.06	N.A.
Nonmetal	Skylight	1.47	0.84	N.A.

Fenestration Default SHGC

All buildings Table 110.6-B

FRAME TYPE	PRODUCT	GLAZING	Single Pane SHGC	Double Pane SHGC	Glass Block SHGC
Metal	Operable	Clear	0.80	0.70	0.70
Metal	Fixed	Clear	0.83	0.73	0.73
Metal	Operable	Tinted	0.67	0.59	N.A.
Metal	Fixed	Tinted	0.68	0.60	N.A.
Metal, thermal break	Operable	Clear	N.A.	0.63	N.A.
Metal, thermal break	Fixed	Clear	N.A.	0.69	N.A.
Metal, thermal break	Operable	Tinted	N.A.	0.53	N.A.
Metal, thermal break	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
Nonmetal	Fixed	Clear	0.76	0.67	0.67
Nonmetal	Operable	Tinted	0.60	0.53	N.A.
Nonmetal	Fixed	Tinted	0.63	0.55	N.A.

Exterior Door Default U-factor

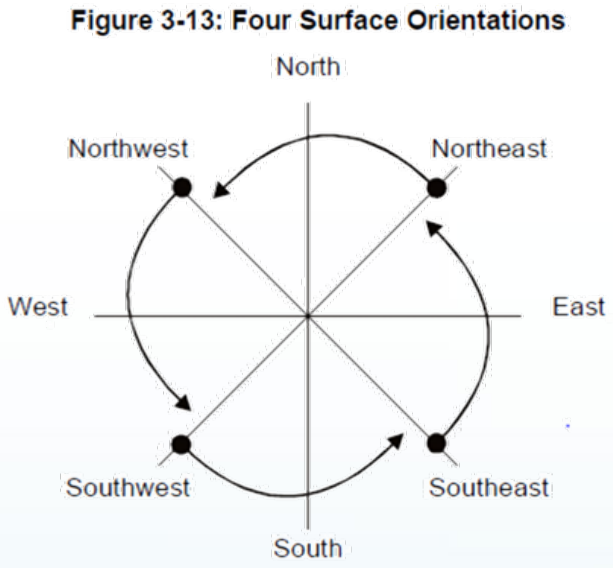
Reference Joint Appendix JA4.5

Table 4.5.1 – Doors

Description	U-factor
Uninsulated single-layer metal *swinging doors* or *non-swinging doors*, including single-layer uninsulated access hatches and uninsulated smoke vents:	1.45
Uninsulated double-layer metal *swinging doors* or *non-swinging doors*, including double-layer uninsulated access hatches and uninsulated smoke vents:	0.70
Insulated metal *swinging doors*, including fire-rated *doors*, insulated access hatches, and insulated smoke vents:	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*:	0.50
Any other wood *door*:	0.60
Uninsulated single layer metal *roll up doors* including fire rated *door*	1.45
Insulated single layer metal *sectional doors,* minimum insulation nominal thickness of 1-3/8 inch; expanded polystyrene (R-4 per inch).	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
- Window to wall ratios
  - 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)3, Tables 140.3-B, C, D

Windows in demising walls between conditioned and unconditioned spaces

- Meet maximum U-factors in Tables 140.3-B, C, or D
- No SHGC requirements
- No VT requirements

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5, Table 140.3-B

Updated for 2022

- Adds climate zones and updates efficiencies for vertical fenestration

TABLE 140.3-B Vertical Fenestration Area-weighted Performance Rating for Nonresidential Buildings

	Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Fixed Window	Max U-factor	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.34	0.36	0.34	0.34	0.34	0.34	0.34	0.36
Fixed Window	Max RSHGC	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.22	0.25	0.22	0.22	0.22	0.22	0.22	0.25
Fixed Window	Min VT	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Curtainwall or Storefront	Max U-factor	0.38	0.41	0.41	0.41	0.41	0.41	0.38	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
Curtainwall or Storefront	Max RSHGC	0.25	0.26	0.26	0.26	0.26	0.26	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Curtainwall or Storefront	Min VT	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable Window	Max U-factor	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Operable Window	Max RSHGC	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Operable Window	Min VT	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Glazed Doors	Max U-factor	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Glazed Doors	Max RSHGC	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Glazed Doors	Min VT	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Max WWR%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5, Table 140.3-C

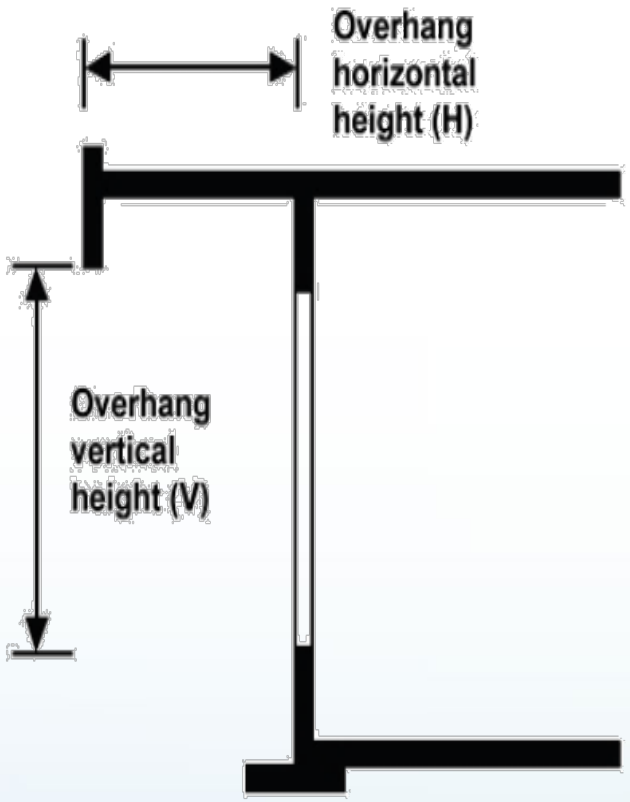
TABLE 140.3-C – Vertical Fenestration Area-Weighted Performance Rating For Guest Rooms Of Hotel or Motel Buildings

All Climate Zones	Fixed Window	Operable Window	Curtainwall or Storefront	Glazed Doors[2]
Max U-factor	0.36	0.46	0.41	0.45
Max RSHGC	0.25	0.22	0.26	0.23
Min VT	0.42	0.32	0.46	0.17
Maximum WWR%	40%	40%	40%	40%

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5C

Updated for 2022



Shading on exterior vertical windows

- Relative SHGC calculation
- Recognizes external shading
  - Overhangs
  - Horizontal slats
- Equation 140.3-A
  - RSHGC = SHGC × [1 + a × (2.72-PF – 1) × (sin(b × Az) + c)]

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)6

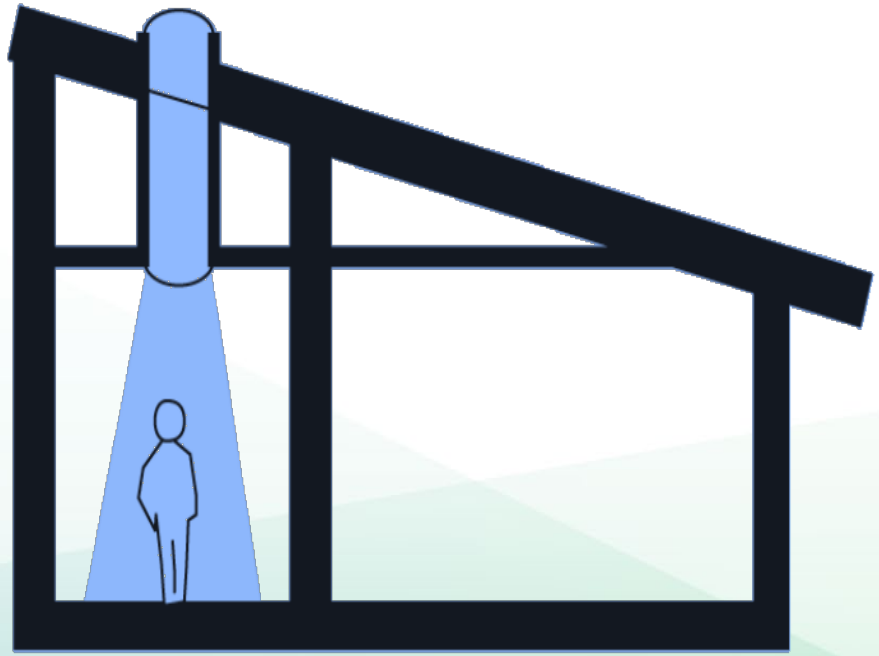
Skylights

- 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%

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

Nonresidential Table 140.3-B

TABLE 140.3-B Skylights Area-Weighted Performance Rating For Nonresidential Buildings

All Climate Zones	Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted	Tubular Daylighting Devices (TDDs)
Max U-factor	0.58	0.46	0.88	0.88
Max SHGC	0.25	0.25	NR	NR
Min VT (Min VT annual for TDDs)	0.49	0.49	0.64	0.38
Maximum SRR%	5%	5%	5%	5%

Fenestration Prescriptive Requirements

Nonresidential § 140.3(a)5, Table 140.3-C

TABLE 140.3-C – Skylights Area-Weighted Performance Rating For Guest Rooms of Hotel or Motel Buildings

All Climate Zones	Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted
Max U-factor	0.58	0.46	0.88
Max SHGC	0.25	0.25	NR
Min VT	0.49	0.49	0.64
Maximum SRR%	5%	5%	5%

Exterior Door Prescriptive Requirements

Nonresidential § 140.3(a)7, Table 140.3-B, C

Exterior doors

- Meet U-factor of Table 140.3-B, C
- Less than 25% glazing

TABLE 140.3-B, C Exterior Doors For Nonresidential Buildings and Hotel or Motel Buildings

	Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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
Maximum U-factor	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

Fenestration Prescriptive Requirements

Nonresidential Table 140.3-D

TABLE 140.3-D Relocatable public schools in all climate zones

Fenestration	Vertical Windows	Maximum U-factor	0.47
Fenestration	Vertical Windows	Maximum SHGC	0.26
Fenestration	Glazed Doors - Site-Built and Factory Assembled	Maximum U-factor	0.45
Fenestration	Glazed Doors - Site-Built and Factory Assembled	Maximum SHGC	0.23
Fenestration	Skylights - Glass with Curb	Maximum U-factor	0.99
Fenestration	Skylights - Glass without Curb	Maximum U-factor	0.57
Fenestration	Skylights - Plastic with Curb	Maximum U-factor	0.87
Fenestration	Skylights - Glass Type 0-2% SRR	Maximum SHGC	0.46
Fenestration	Skylights - Glass Type 2.1-5% SRR	Maximum SHGC	0.36
Fenestration	Skylights - Plastic Type 0-2% SRR	Maximum SHGC	0.69
Fenestration	Skylights - Plastic Type 2.1-5% SRR	Maximum SHGC	0.57
Exterior Doors	Non-Swinging doors	Maximum U-factor	0.50
Exterior Doors	Swinging doors	Maximum U-factor	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

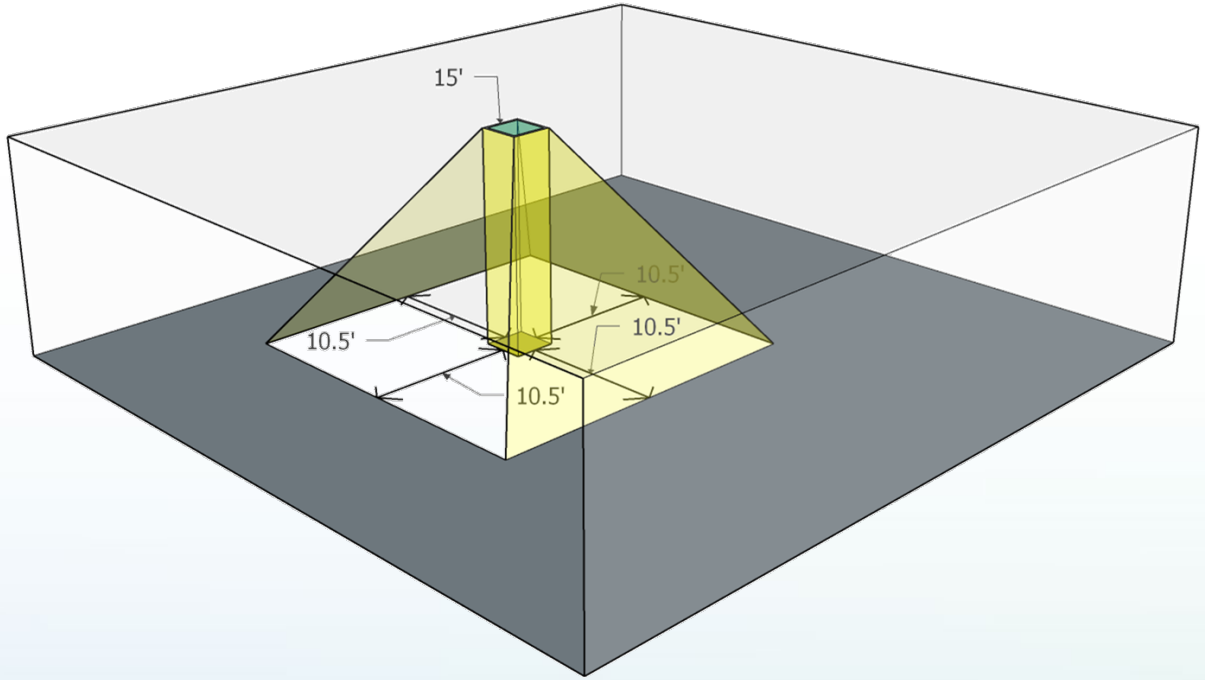
Requirements

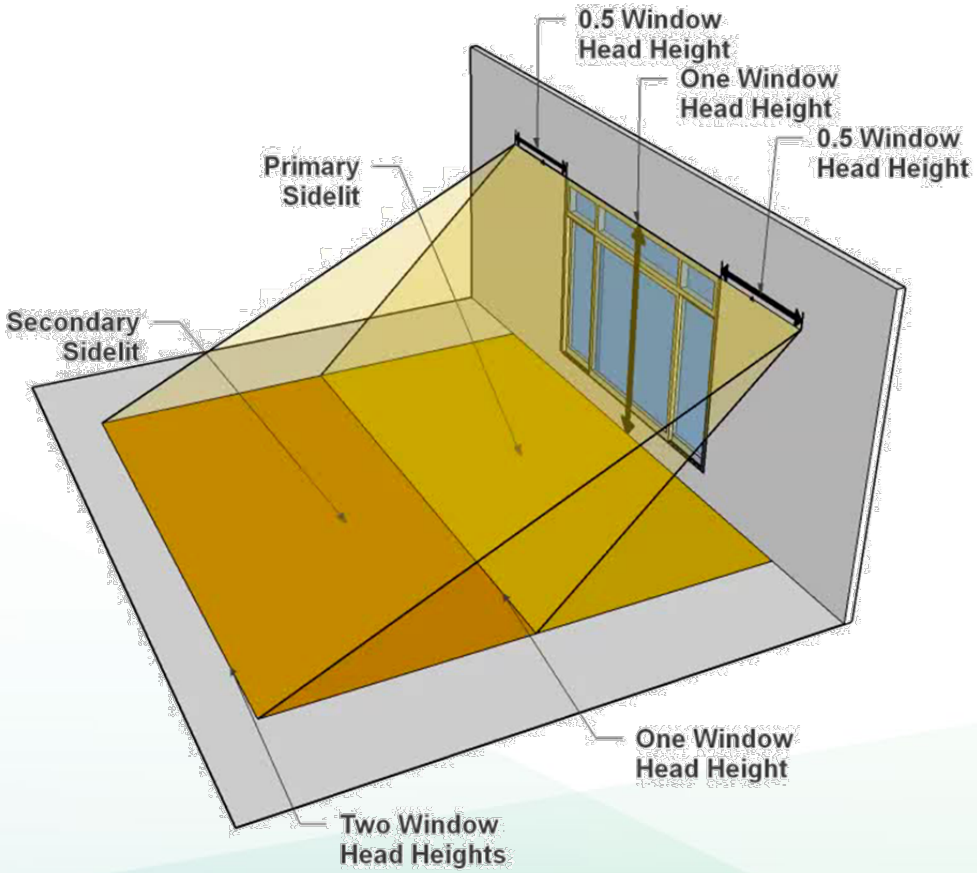
- At least 75% of floor area within skylit daylit zone or primary sidelit daylit zone
- Shown on plans
- Daylighting controls per § 130.1(d)
- Skylight area at least 3% of floor area or calculate with higher VT to install less skylight area (minimum 1.5%)
- Haze value greater than 90%
- VT requirements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

Daylighting Prescriptive Requirements

Nonresidential § 140.3(c)

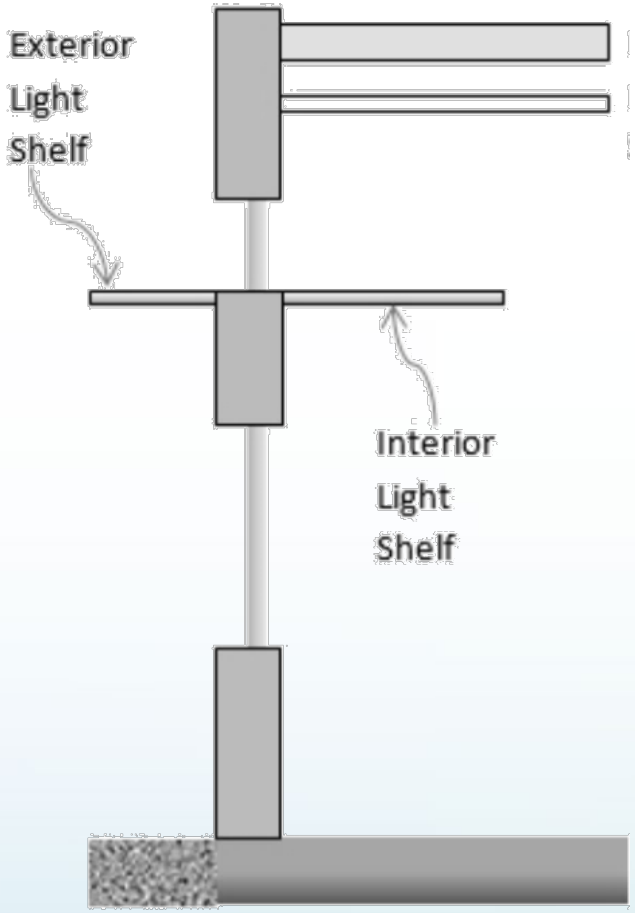
Skylit and sidelit areas





Daylighting Prescriptive Requirements

Nonresidential § 140.3(d)



Power adjustment factors (PAF)

- Clerestory window
- Horizontal slats
- Light shelves

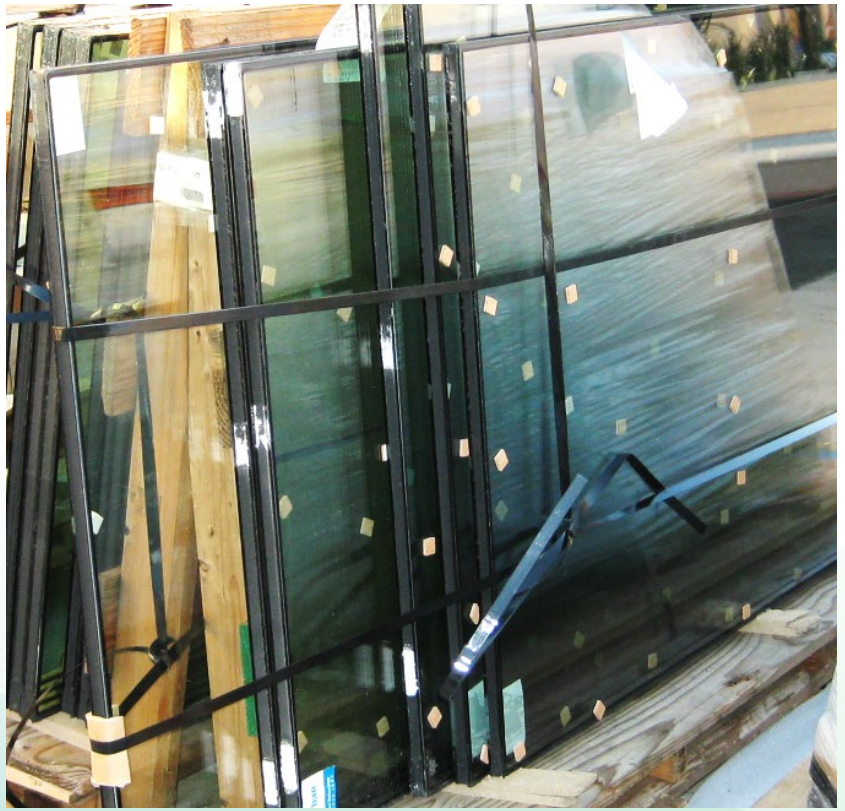
Meet orientation and installation requirements in §140.3(d) to qualify

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															

Check Your Understanding

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

Plans Examiners

- Verify required window and skylight values
- Verify window and skylight total areas
- Verify required door values
- Verify daylighting devices if required
- Verify NRCC values 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 ft²	180 ft²	19.8%
East-Facing[2]	606 ft²	120 ft²	19.8%
South-Facing[3]	909 ft²	222 ft²	24.4%
West-Facing[4]	606 ft²	120 ft²	19.8%
Total	**3,030 ft²**	**642 ft²**	**21.2%**
Roof	6,445 ft²	0 ft²	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).

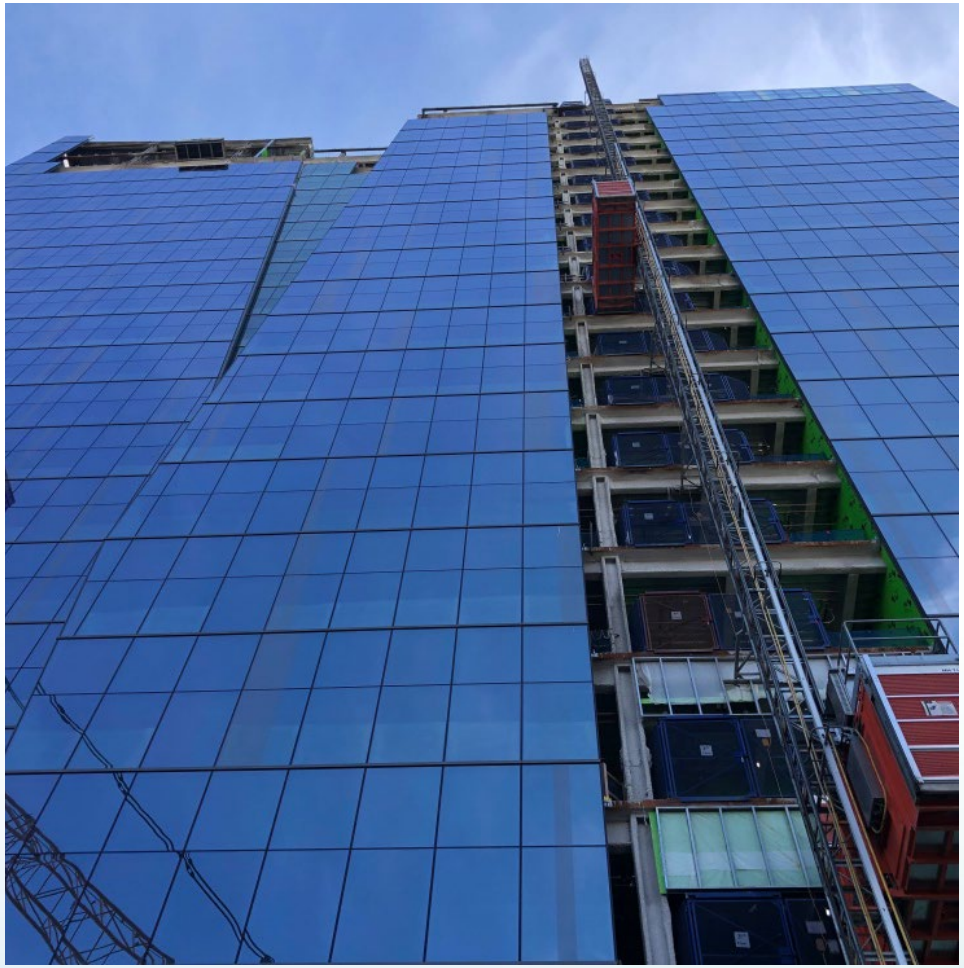
H. FENESTRATION ASSEMBLY SUMMARY §110.6

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 ft²**	**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

Field Inspectors



At rough frame verify

- Window and skylight values
- Total areas for fenestration
- Daylighting features

At final verify

- NRCI installation forms
- NRCA acceptance forms

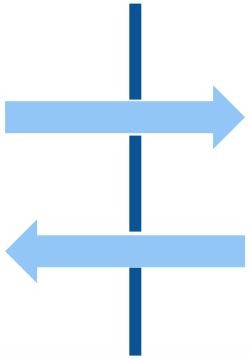
Air Sealing
Nonresidential

Mandatory § 110.7

Nonresidential § 140.3(a)9

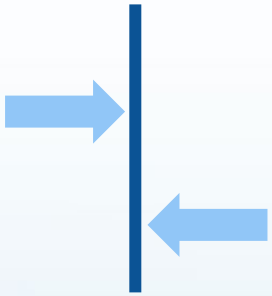
Air Sealing Definitions

All buildings § 100.1



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



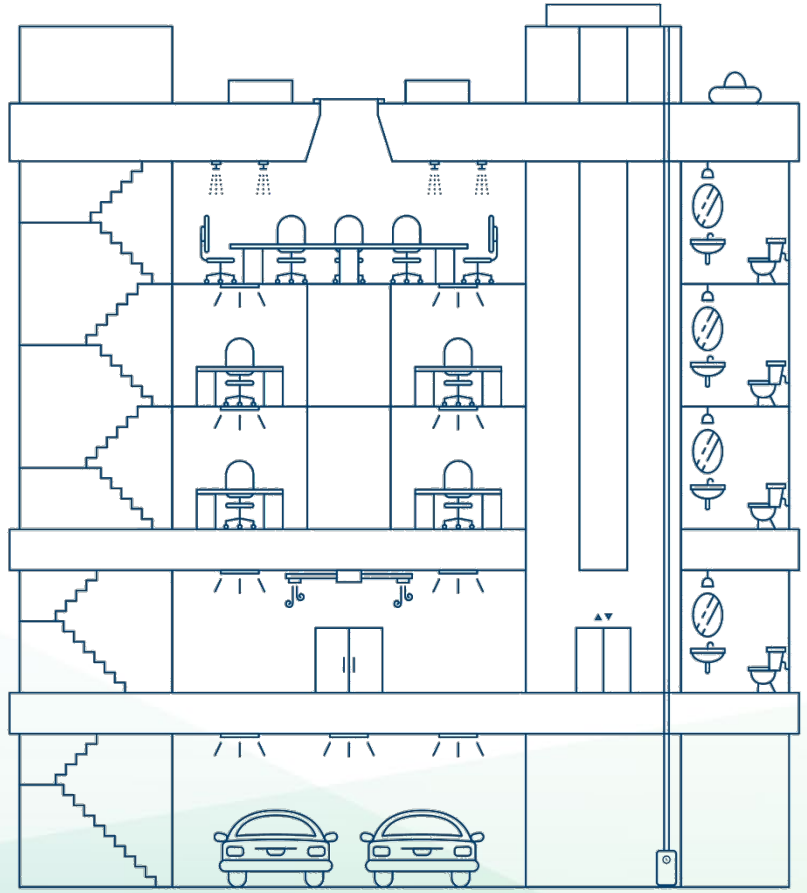
Air barrier - a system of materials joined and sealed together to control air flow through the building envelope that separates conditioned from unconditioned space, or that separates adjoining conditioned spaces of different occupancies or uses

Air Sealing Mandatory Requirements

All buildings § 110.7

Limit infiltration and exfiltration

- Must caulk, gasket, weather-strip, or seal all joints, penetrations, openings
- New air sealing fact sheet



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

Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9, Tables 140.3-B, C

Continuous air barrier

Updated for 2022

- Expands to all climate zones
    - Except hotels or motels in climate zone 7 and relocatable public schools
- Design construction documents include air barrier boundaries, interconnections, penetrations, and calculations for all sides of air barrier
- 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”

Air Barrier Prescriptive Requirements

Nonresidential Table 140.3-A

Updated for 2022

Materials	Minimum Thickness
Plywood	Minimum 3/8 inches thickness
Oriented strand board	Minimum 3/8 inches thickness
Extruded polystyrene insulation board	Minimum 1/2 inches thickness
Foil-backed polyisocyanurate insulation board	Minimum 1/2 inches thickness
Closed cell spray foam: minimum density of 2.0 pcf	Minimum 2 inches thickness
Open cell spray foam: density between 0.4 pcf and 1.5 pcf	Minimum 5-1/2 inches thickness
Exterior and interior gypsum board	Minimum 1/2 inches thickness
Cement board	Minimum 1/2 inches thickness
Built up roofing membrane	No minimum thickness
Modified bituminous roof membrane	No minimum thickness
Fully adhered single-ply roof membrane	No minimum thickness
Portland cement or Portland sand parge, or gypsum plaster	Each with Minimum 5/8 inches thickness
Cast-in-place concrete, or precast concrete	No minimum thickness
Fully grouted concrete block masonry	No minimum thickness
Sheet steel or sheet aluminum	No minimum thickness

Air Barrier Prescriptive Requirements

Nonresidential § 140.3(a)9C

New for 2022

If air barrier verification performed meet either

- Air leakage rate not exceeding 0.40 cfm per ft^2 when entire building is tested per NA5
- Buildings more than 50,000 ft^2 of CFA sectional test method of co-pressurizing representative test floors per NA5.2 to NA5.7
    - Representative test floors conditions
        - Entire floor area of all stories with any spaces directly under roof
        - Entire floor area of all stories with building entrance or loading dock
        - Representative above-grade wall sections totaling at least 25% wall area enclosing remaining conditioned space, floor areas above not included
- If air leakage not met
    - Visual inspection and diagnostic evaluation per NA5.7
        - All observed leaks sealed where possible
        - Buildings re-tested to confirm leakage is below 0.6 cfm per ft^2

Insulation Requirements
Nonresidential

Mandatory § 110.8, § 120.7

Prescriptive § 140.3(a)

Alterations § 140.1(b)

Insulation Definitions

All buildings § 100.1

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)

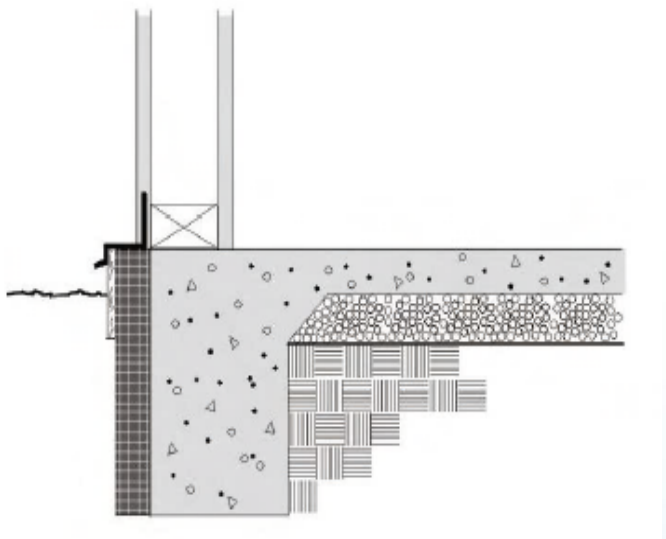
All materials

- Certified Standards for Insulation Materials (Title 24, Part 12) by the California Department of Consumer Affairs, Bureau of Household Goods and Services
- 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)
- Water absorption rate maximum 0.3%
- Vapor permeable maximum 2.0 perm per inch
- 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

Wet insulation systems above roofs waterproof membrane

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

Insulation Mandatory Requirements

Nonresidential § 120.7

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

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

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-B, C

- Maximum U-factor for roofs and ceilings
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Roof and Ceiling Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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

TABLE 140.3-C Roof and Ceiling Insulation Maximum U-Factors for Guest Rooms of Hotel or Motel Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-B

Updated for 2022

- Wall maximum U-factors for nonresidential buildings
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Wall Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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	0.060	0.055	0.071	0.055	0.055	0.060	0.060	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
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

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-C

- Wall maximum U-factors for guest room of hotels or motels
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-C Wall Insulation Maximum U-Factors for Guest Rooms of Hotel or Motel Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Tables 140.3-B, C

- Maximum U-factor for floors and soffits
  - Varies by climate zone
  - R-values in Reference Joint Appendix JA4 Tables

TABLE 140.3-B Floors/soffits Insulation Maximum U-Factors for Nonresidential Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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

TABLE 140.3-C Floors/soffits Insulation Maximum U-Factors for Guest Rooms of Hotel and Motel Buildings

Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)2, Table 140.3-D

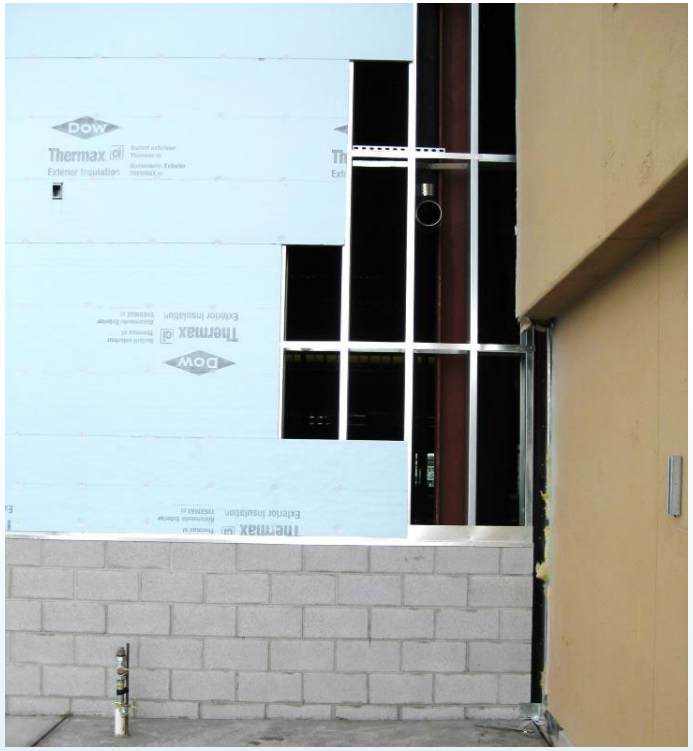
- Maximum U-factors for relocatable public schools

TABLE 140.3-D Insulation U-factors For Relocatable Public Schools in All Climate Zones

Roofs/Ceilings	Metal Buildings	Maximum U-factor	0.041
Roofs/Ceilings	Non-Metal Buildings	Maximum U-factor	0.034
Walls	Wood frame buildings	Maximum U-factor	0.042
Walls	Metal frame buildings	Maximum U-factor	0.057
Walls	Metal buildings	Maximum U-factor	0.057
Walls	Mass/7.0≤ HC	Maximum U-factor	0.170
Walls	All Other Walls	Maximum U-factor	0.059
Floors and Soffits	Floors and Soffits	Maximum U-factor	0.048

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 Alterations Mandatory Requirements

Nonresidential § 141.0(b)1A

Roof and ceiling insulation

- Meet prescriptive requirements of 141.0(b)2Bii for roof recover or roof replacement insulated per Table 141.0-C

TABLE 141.0-C Insulation Requirements For Roof Alterations

Climate Zone	Continuous Insulation R-value	U-factor
1-5, 9-16	R-23	0.037, with at least R-10 above deck
6-8	R-17	0.047, with at least R-10 above deck

Insulation Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2Bii

Roof recovers or replacements

- Must be insulated per Table 141.0-C
- Exceptions
  - Roof recovers with new R-10 insulation added above deck
  - When existing mechanical equipment will not be disconnected and lifted
    - Insulation added is greater of R-10 or maximum installed thickness that will allow distance between height of roof membrane surface to top of base flashing per manufacturer's instructions
  - At drains and other low points
    - Tapered insulation less than Table 141.0-C may be used when average thermal resistance meets Table 141.0-C
  - Area of the roof recoat is not required to be insulated

Insulation Alterations Mandatory Requirements

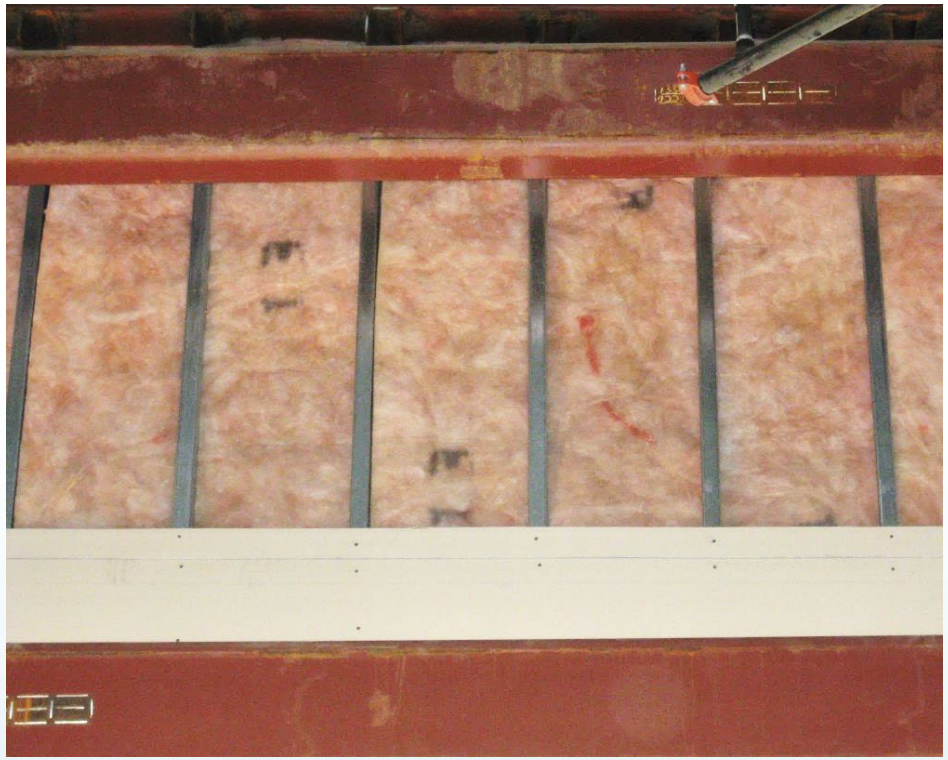
Nonresidential § 141.0(b)1B,C

Walls, floors and soffits

	Assembly Type	Minimum R-value	Maximum U-factor
Walls	Metal buildings	R-13	0.113
Walls	Metal-framed walls	R-13	0.217
Walls	Wood-framed walls and others	R-11	0.110
Walls	Spandrel panel and curtain walls	R-4	0.280
Floors and Soffits	Raised framed floors	R-11	0.071
Floors and Soffits	Raised mass floors in hotel and motel	R-6	0.111

Test Your Knowledge

Nonresidential

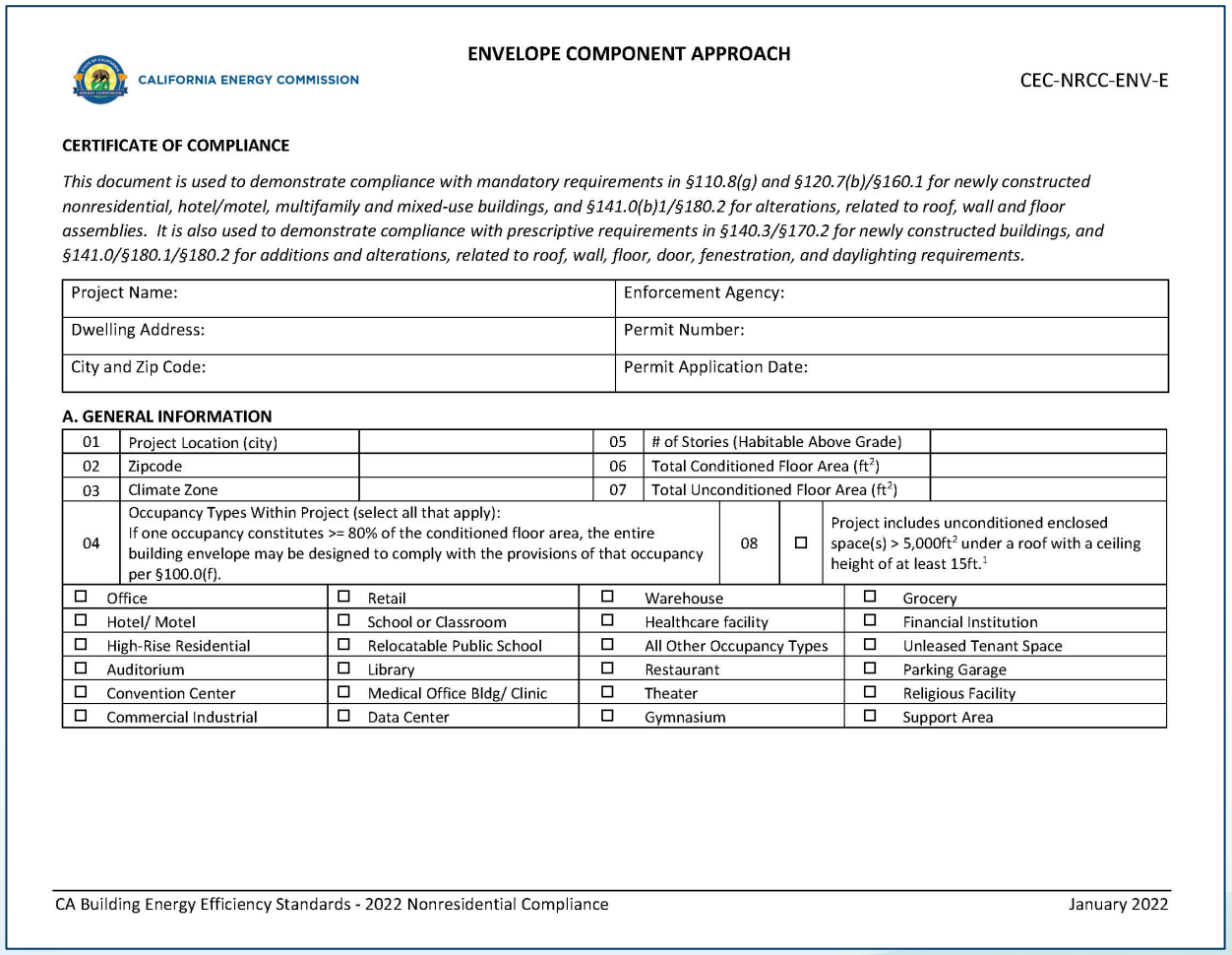


Do metal-framed demising walls need to be insulated?

Yes, they need to meet mandatory requirements in § 120.7

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

Plans Examiners



CALIFORNIA ENERGY COMMISSION

ENVELOPE COMPONENT APPROACH

CEC-NRCC-ENV-E

CERTIFICATE OF COMPLIANCE

This document is used to demonstrate compliance with mandatory requirements in §110.8(g) and §120.7(b)/§160.1 for newly constructed nonresidential, hotel/motel, multifamily and mixed-use buildings, and §141.0(b)1/§180.2 for alterations, related to roof, wall and floor assemblies. It is also used to demonstrate compliance with prescriptive requirements in §140.3/§170.2 for newly constructed buildings, and §141.0/§180.1/§180.2 for additions and alterations, related to roof, wall, floor, door, fenestration, and daylighting requirements.

Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

A. GENERAL INFORMATION

01	Project Location (city)		05	# of Stories (Habitable Above Grade)	
02	Zipcode		06	Total Conditioned Floor Area (ft^2)	
03	Climate Zone		07	Total Unconditioned Floor Area (ft^2)	
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) > 5,000ft^2 under a roof with a ceiling height of at least 15ft.[1]

☐ Office	☐ Retail	☐ Warehouse	☐ Grocery
☐ Hotel/ Motel	☐ School or Classroom	☐ Healthcare facility	☐ Financial Institution
☐ High-Rise Residential	☐ Relocatable Public School	☐ All Other Occupancy Types	☐ Unleased Tenant Space
☐ Auditorium	☐ Library	☐ Restaurant	☐ Parking Garage
☐ Convention Center	☐ Medical Office Bldg/ Clinic	☐ Theater	☐ Religious Facility
☐ Commercial Industrial	☐ Data Center	☐ Gymnasium	☐ Support Area

CA Building Energy Efficiency Standards - 2022 Nonresidential Compliance January 2022

- Prescriptive or performance approach
  - Performance mandatory requirements for insulation
- Verify NRCC values match plans
- Verify air barrier
- Verify required values wall, roof, floor assemblies

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

Field Inspectors

At rough frame

- Air sealing

At insulation stage

- Wall insulation values
- Raised floor insulation values

At final

- Ceiling insulation values
- Air barrier
- NRCI forms

Roof Requirements
Nonresidential

Administrative § 10-113

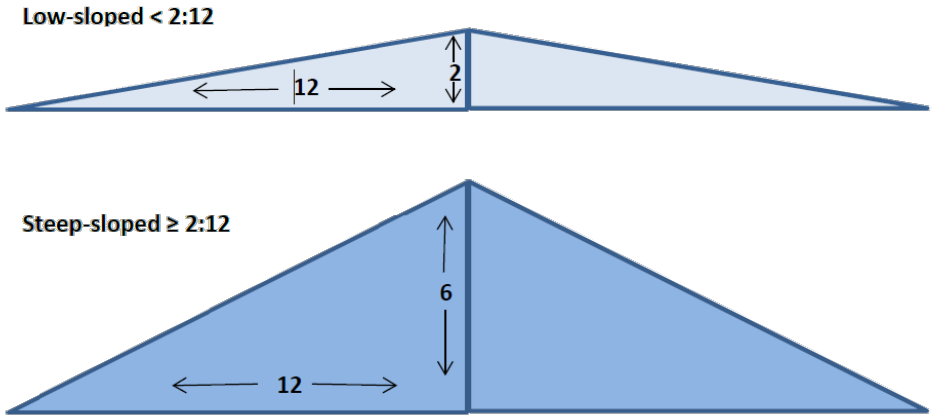
Mandatory § 110.8(i)

Prescriptive § 140.3(a)1

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

Roof Definitions

All buildings § 100.1



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

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

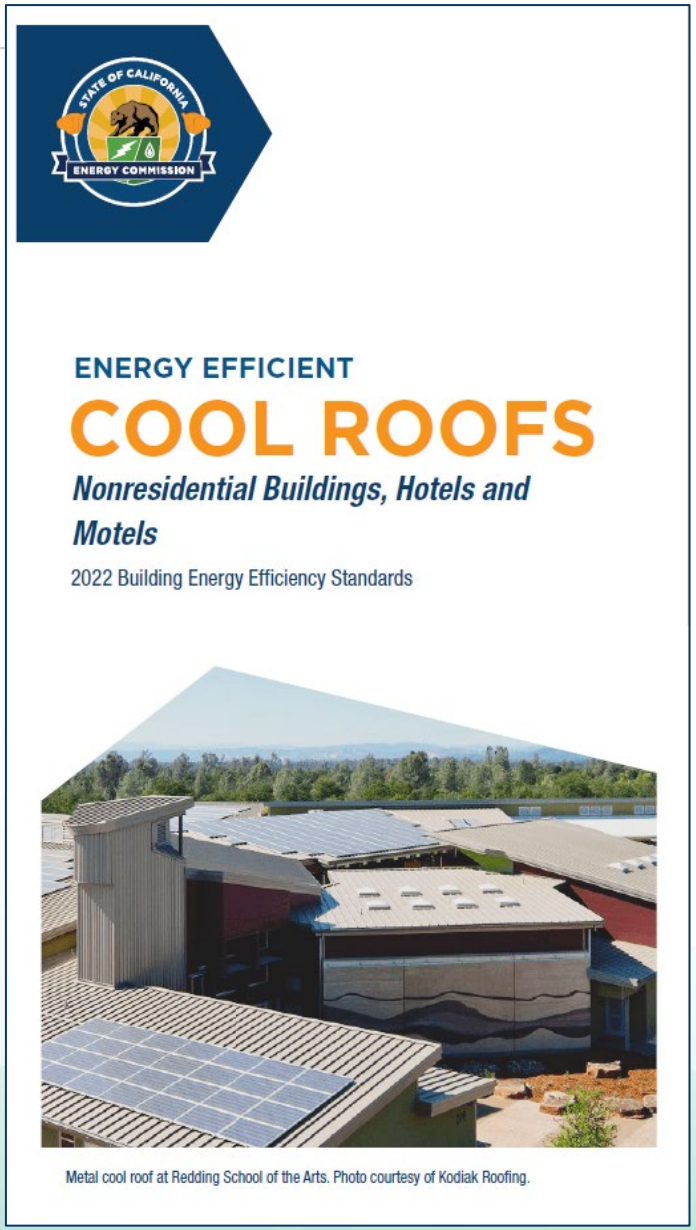
Solar reflectance (SR) - ability to reflect solar energy from the sun back into the atmosphere

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

Nonresidential Cool Roof Brochure

- Cool roofs reflect more sunlight and absorb less heat
- Roofing products must meet minimum solar reflectance and thermal emittance values for Energy Code compliance
- Higher values equal cooler roofs



Roofing Products Administrative Regulations

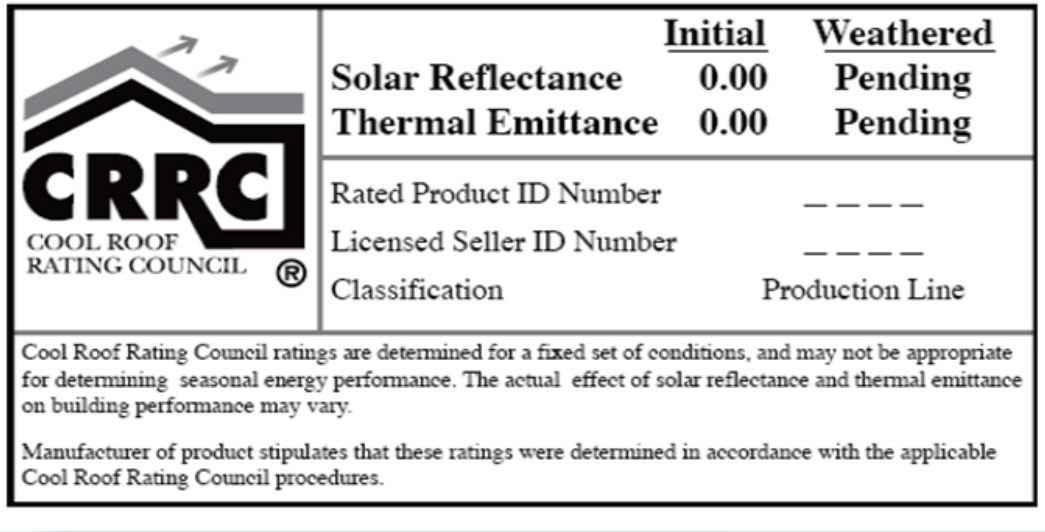
All buildings § 10-113

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 Products Mandatory Requirements

All buildings § 110.8(i)

Roofing products

- Meet aged solar reflectance and thermal emittance thresholds
- Certified and labeled per § 10-113
- CEC default values for non-certified products
- SRI may be used as alternative to aged SR and TE values
  - SRI worksheet
  - Allows for initial SR when aged SR is not available
- Liquid-applied roof coatings to meet Table 110.8-C for coverage and thickness requirements

Roofing Prescriptive Requirements

Nonresidential § 140.3(a)1A

Roofing products

- Meet requirements in § 110.8
- Varies by climate zone, roof slope, and building type per Tables 140.3-B, C, or D
  - Minimum aged solar reflectance
  - Minimum thermal emittance
  - Or minimum SRI
  - Exception: Roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels

Roofing Products Prescriptive Requirements

Nonresidential § 140.3(a)1Aib, Table 140.3-B

Updated for 2022

- Updates steep-sloped roof minimum efficiencies
  - Climate zones 2, 4-16
  - Minimum aged SR 0.25 and TE 0.80, or SRI 23

TABLE 140.3-B Roofing Products for Nonresidential Buildings

	Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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
Low-sloped	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	0.25	0.20	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Steep-sloped	Thermal Emittance	0.75	0.80	0.75	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

Roofing Products Prescriptive Requirements

Nonresidential § 140.3(a)1Aib, Table 140.3-C

- Hotel and motel guest rooms
  - Varies by climate zone and roof slope
  - Minimum aged SR and TE, or SRI

TABLE 140.3-C Roofing Products for Guest Rooms of Hotel or Motel Buildings

	Climate Zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
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
Low-sloped	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
Steep-sloped	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

Roofing Products Prescriptive Requirements

Nonresidential § 140.3(a)1Aib, Table 140.3-D

- Relocatable public schools
  - Minimum aged SR and TE

TABLE 140.3-D Roofing Products for Relocatable Public Schools In All Climate Zones

Low-Sloped	Aged Solar Reflectance	0.63
Low-Sloped	Thermal Emittance	0.75
Steep-Sloped	Aged Solar Reflectance	0.25
Steep-Sloped	Thermal Emittance	0.80

Roofing Prescriptive Requirements

Nonresidential § 140.3(a)1Aia

Exception for low-sloped roofs

- Minimum aged solar reflectance insulation trade-off per Table 140.3

TABLE 140.3 Roof/Ceiling Insulation Tradeoff For Aged Solar Reflectance – Nonresidential Buildings

Aged Solar Reflectance	Metal Building Climate Zones 1-16 U-factor	Wood framed and Other Climate Zones 6 - 8 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

Roof Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2Bi, Table 141.0-B

Updated for 2022

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

Aged Solar Reflectance	Climate Zones 6, 7, & 8 U-factor	All Other Climate Zones U-factor
0.62- 0.60	0.043	0.035
0.59-0.55	0.041	0.034
0.54-0.50	0.038	0.031
0.49-0.45	0.034	0.029
0.44-0.40	0.032	0.028
0.39-0.35	0.029	0.026
0.34-0.30	0.028	0.025
0.29-0.25	0.026	0.024

Roof alterations more than 50% or 2,000 ft² of roof area

- Meet updated prescriptive roof product efficiencies in § 140.3(a)1A
  - Updates U-factors for low-sloped insulation trade-off in Table 141.0-B
  - Updates exceptions

Roof Alterations Prescriptive Requirements

Nonresidential § 141.0(b)2Bii, Table 141.0-C

New for 2022

Roof alterations more than 50% or 2,000 ft² of roof area

- Adds continuous above roof deck insulation for low-sloped roofs
- Updates Table 141.0-C
- Adds exceptions

Table 141.0-C Insulation Requirements For Roof Alterations

Climate Zone	Continuous Insulation R-value	U-factor
1-5, 9-16	R-23	0.037, with at least R-10 above deck
6-8	R-17	0.047, with at least R-10 above deck

Roofing Alteration Requirements

Nonresidential § 141.0(b)2B

Reroof example 1

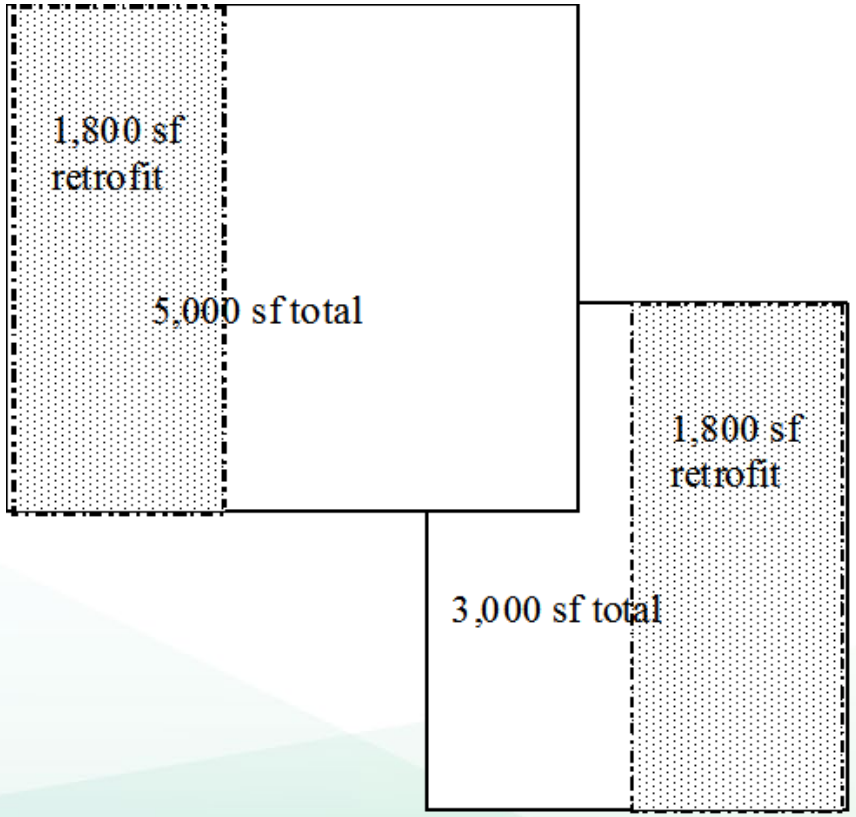
1,800 ft² of 5,000 ft² roof is replaced

- No insulation or cool roof required on that portion of roof since 1,800 ft² is 36% of 5,000 ft² which is less than 50% of 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 since 1,800 ft² is 60% of 3,000 ft²



Test Your Knowledge

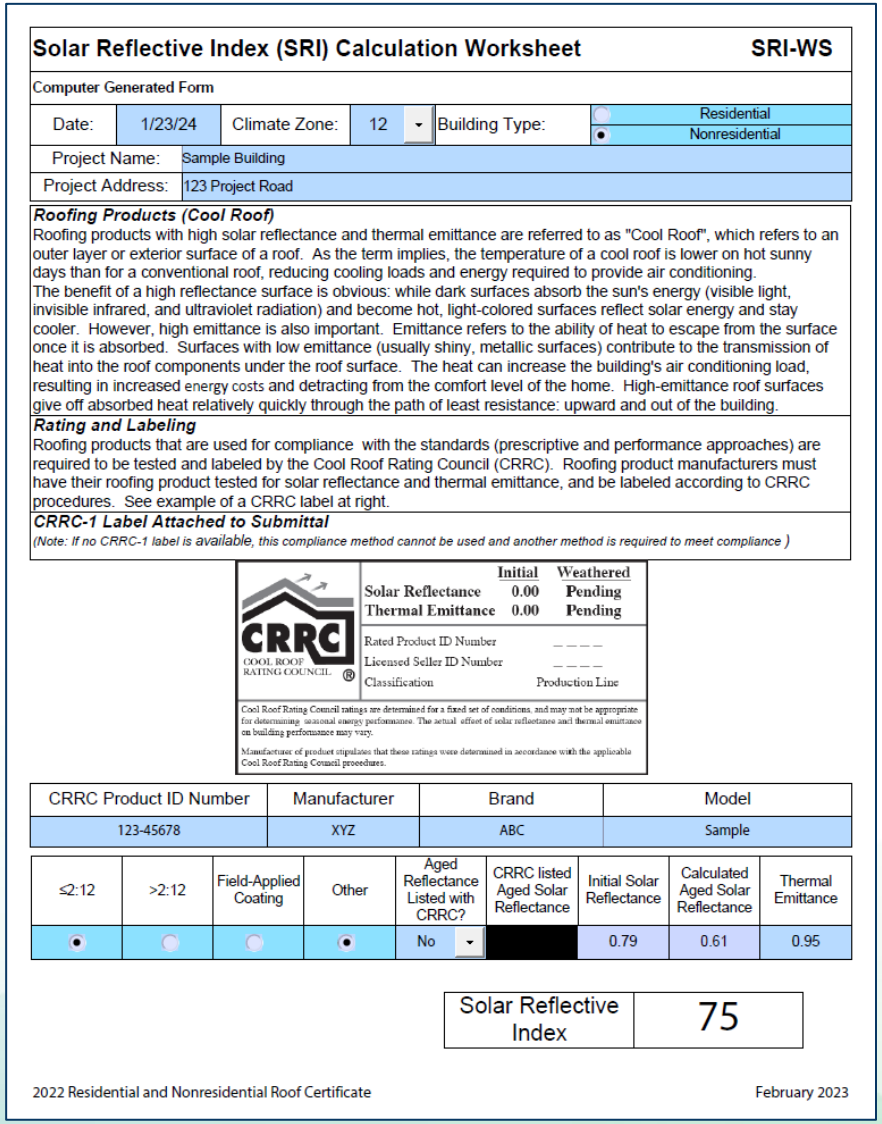
Does an alteration to the roof of an unconditioned building trigger cool roof requirements?

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

Plans Examiners

- Verify required roof product values
  - Certain climate zones
  - SRI worksheet
- Verify NRCC values match plans



Solar Reflective Index (SRI) Calculation Worksheet SRI-WS

Computer Generated Form

Date:	1/23/24	Climate Zone:	12	Building Type:	○ Residential ● Nonresidential
Project Name:	Sample Building				
Project Address:	123 Project Road				

Roofing Products (Cool Roof)

Roofing products with high solar reflectance and thermal emittance are referred to as "Cool Roof", which refers to an outer layer or exterior surface of a roof. As the term implies, the temperature of a cool roof is lower on hot sunny days than for a conventional roof, reducing cooling loads and energy required to provide air conditioning.
The benefit of a high reflectance surface is obvious: while dark surfaces absorb the sun's energy (visible light, invisible infrared, and ultraviolet radiation) and become hot, light-colored surfaces reflect solar energy and stay cooler. However, high emittance is also important. Emittance refers to the ability of heat to escape from the surface once it is absorbed. Surfaces with low emittance (usually shiny, metallic surfaces) contribute to the transmission of heat into the roof components under the roof surface. The heat can increase the building's air conditioning load, resulting in increased energy costs and detracting from the comfort level of the home. High-emittance roof surfaces give off absorbed heat relatively quickly through the path of least resistance: upward and out of the building.

Rating and Labeling

Roofing products that are used for compliance with the standards (prescriptive and performance approaches) are required to be tested and labeled by the Cool Roof Rating Council (CRRC). Roofing product manufacturers must have their roofing product tested for solar reflectance and thermal emittance, and be labeled according to CRRC procedures. See example of a CRRC label at right.

CRRC-1 Label Attached to Submittal

(Note: If no CRRC-1 label is available, this compliance method cannot be used and another method is required to meet compliance)

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.

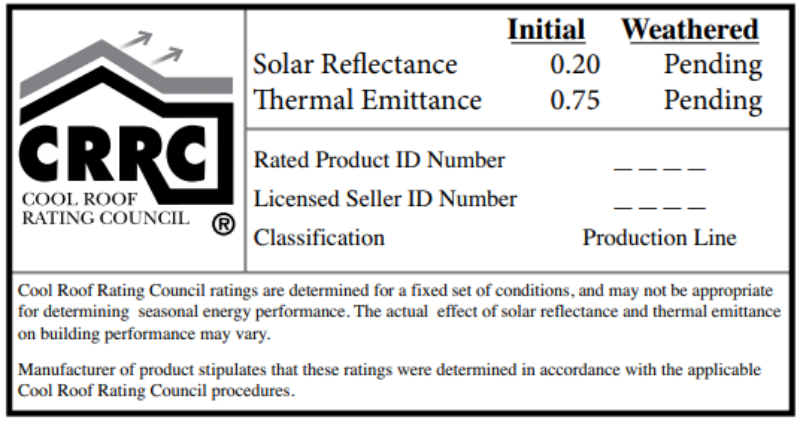
CRRC Product ID Number	Manufacturer	Brand	Model
123-45678	XYZ	ABC	Sample

≤2:12	>2:12	Field-Applied Coating	Other	Aged Reflectance Listed with CRRC?	CRRC listed Aged Solar Reflectance	Initial Solar Reflectance	Calculated Aged Solar Reflectance	Thermal Emittance
●	○	○	●	No		0.79	0.61	0.95

Solar Reflective Index	75

2022 Residential and Nonresidential Roof Certificate February 2023

Field Inspectors



CRRC
COOL ROOF RATING COUNCIL ®

	Initial	Weathered
Solar Reflectance	0.20	Pending
Thermal Emittance	0.75	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.

At rough frame verify

- Onsite roof product values

At final verify

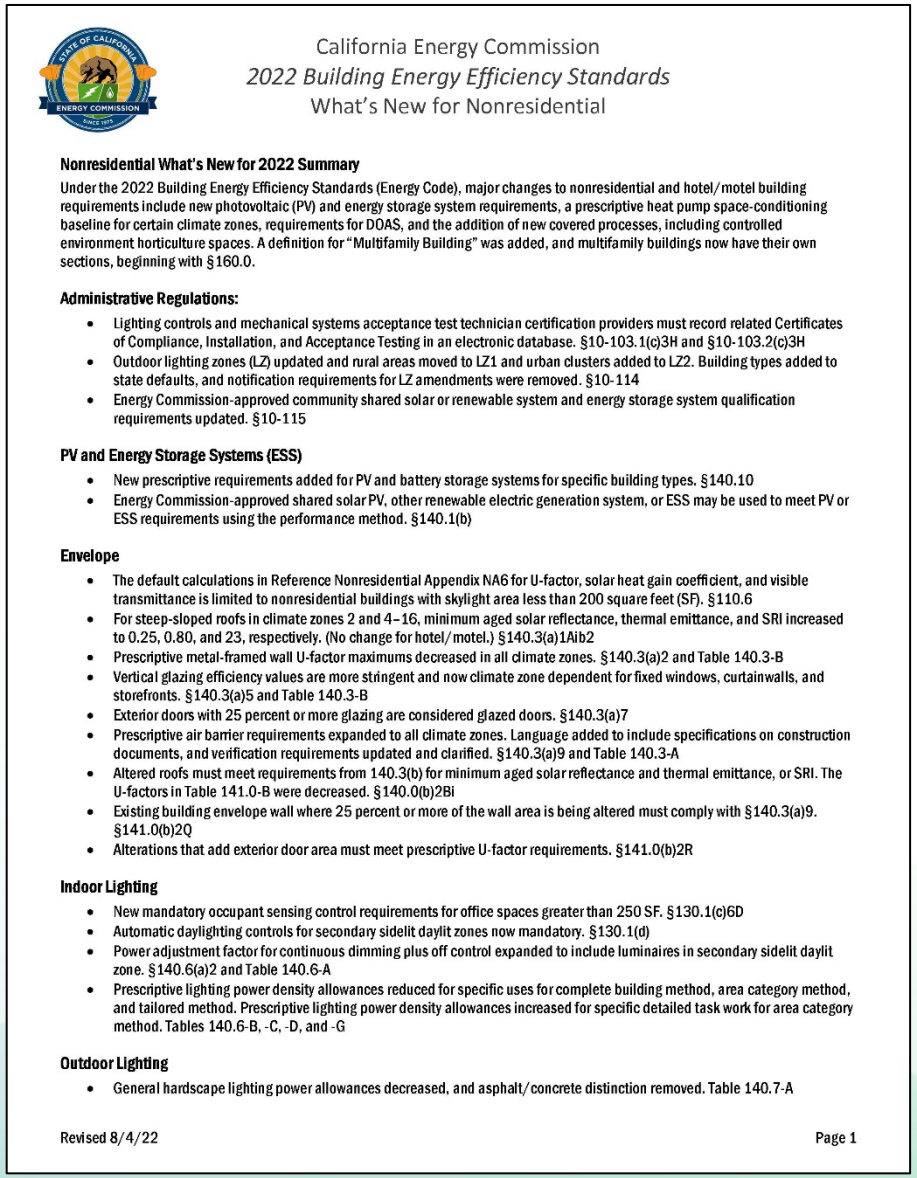
- NRCI installation forms

Resources

Nonresidential Summary

What's New for Nonresidential

- Summary of significant changes
- Code references
- Download from the Online Resource Center



California Energy Commission
2022 Building Energy Efficiency Standards
What's New for Nonresidential

Nonresidential What's New for 2022 Summary

Under the 2022 Building Energy Efficiency Standards (Energy Code), major changes to nonresidential and hotel/motel building requirements include new photovoltaic (PV) and energy storage system requirements, a prescriptive heat pump space-conditioning baseline for certain climate zones, requirements for DOAS, and the addition of new covered processes, including controlled environment horticulture spaces. A definition for "Multifamily Building" was added, and multifamily buildings now have their own sections, beginning with §160.0.

Administrative Regulations:

- Lighting controls and mechanical systems acceptance test technician certification providers must record related Certificates of Compliance, Installation, and Acceptance Testing in an electronic database. §10-103.1(c)3H and §10-103.2(c)3H
- Outdoor lighting zones (LZ) updated and rural areas moved to LZ1 and urban clusters added to LZ2. Building types added to state defaults, and notification requirements for LZ amendments were removed. §10-114
- Energy Commission-approved community shared solar or renewable system and energy storage system qualification requirements updated. §10-115

PV and Energy Storage Systems (ESS)

- New prescriptive requirements added for PV and battery storage systems for specific building types. §140.10
- Energy Commission-approved shared solar PV, other renewable electric generation system, or ESS may be used to meet PV or ESS requirements using the performance method. §140.1(b)

Envelope

- The default calculations in Reference Nonresidential Appendix NA6 for U-factor, solar heat gain coefficient, and visible transmittance is limited to nonresidential buildings with skylight area less than 200 square feet (SF). §110.6
- For steep-sloped roofs in climate zones 2 and 4–16, minimum aged solar reflectance, thermal emittance, and SRI increased to 0.25, 0.80, and 23, respectively. (No change for hotel/motel.) §140.3(a)1Aib2
- Prescriptive metal-framed wall U-factor maximums decreased in all climate zones. §140.3(a)2 and Table 140.3-B
- Vertical glazing efficiency values are more stringent and now climate zone dependent for fixed windows, curtainwalls, and storefronts. §140.3(a)5 and Table 140.3-B
- Exterior doors with 25 percent or more glazing are considered glazed doors. §140.3(a)7
- Prescriptive air barrier requirements expanded to all climate zones. Language added to include specifications on construction documents, and verification requirements updated and clarified. §140.3(a)9 and Table 140.3-A
- Altered roofs must meet requirements from 140.3(b) for minimum aged solar reflectance and thermal emittance, or SRI. The U-factors in Table 141.0-B were decreased. §140.0(b)2Bi
- Existing building envelope wall where 25 percent or more of the wall area is being altered must comply with §140.3(a)9. §141.0(b)2Q
- Alterations that add exterior door area must meet prescriptive U-factor requirements. §141.0(b)2R

Indoor Lighting

- New mandatory occupant sensing control requirements for office spaces greater than 250 SF. §130.1(c)6D
- Automatic daylighting controls for secondary sidelit daylit zones now mandatory. §130.1(d)
- Power adjustment factor for continuous dimming plus off control expanded to include luminaires in secondary sidelit daylit zone. §140.6(a)2 and Table 140.6-A
- Prescriptive lighting power density allowances reduced for specific uses for complete building method, area category method, and tailored method. Prescriptive lighting power density allowances increased for specific detailed task work for area category method. Tables 140.6-B, -C, -D, and -G

Outdoor Lighting

- General hardscape lighting power allowances decreased, and asphalt/concrete distinction removed. Table 140.7-A

Revised 8/4/22 Page 1

Online Resource Center

www.energy.ca.gov/orc

Handouts
- Fact sheets
- Guides

Tools
- Checklists
- Blueprint newsletter

Training
- Presentations
- Videos

Links
- Internal resources
- External resources

Blueprint Newsletter

Energy Code quarterly newsletter

- Updates
- Clarifications
- Frequently asked questions

Issue 138 | April - June 2022

BLUEPRINT

CALIFORNIA ENERGY COMMISSION

EFFICIENCY DIVISION

IN THIS ISSUE

For additional help with the Energy Code see Energy Code Ace's **online offerings** of trainings, tools, and resources.

2022 Energy Code: Multifamily Summary

The 2022 Building Energy Efficiency Standards (Energy Code) reorganizes low-rise (three or fewer habitable stories) and high-rise (four or more habitable stories) multifamily buildings into one building type, updates the multifamily buildings definition in § 100.1, and moves all requirements for multifamily buildings to §§ 160.0-180.4. This and other significant changes include:

Mandatory Requirements

- Updates minimum efficiencies for HVAC equipment; adds minimum efficiency requirements for dedicated outdoor air systems (DOAS), heat pump, and heat recovery chiller packages. § 110.2
- Changes demand responsive lighting controls trigger to 4,000 watts or more; adds requirements for controlled receptacles. §§ 110.12, 160.5(b)4E
- Unifies envelope insulation, vapor retarder, and fenestration requirements. § 160.1
- For dwelling units
  - Adds requirements for central fan integrated ventilation systems requiring a motorized controlled damper, damper controls, and variable ventilation. § 160.2(b)2Aii
  - Requires vented kitchen range hoods ventilation rates or capture efficiencies based on conditioned floor area and fuel type per Tables 160.2-E, F, G. § 160.2(b)2Avic2
  - Requires a HERS-verified maximum fan efficacy of 1.0 Watts per cfm for heat recovery ventilation (HRV) and energy recovery ventilation (ERV) systems. § 160.2(b)2Biii
  - Adds mechanical acceptance testing requirements. § 160.3(d)2
  - Adds electric-ready requirements when gas equipment is installed for space heating, cooking, and clothes dryers. § 160.9(a-c)

Stay Connected

Receive Energy Code updates

- Subscribe to Efficiency Division emails
  - Appliances
  - Blueprint
  - Building Standards
- Respond to confirmation email

Follow the California Energy Commission

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

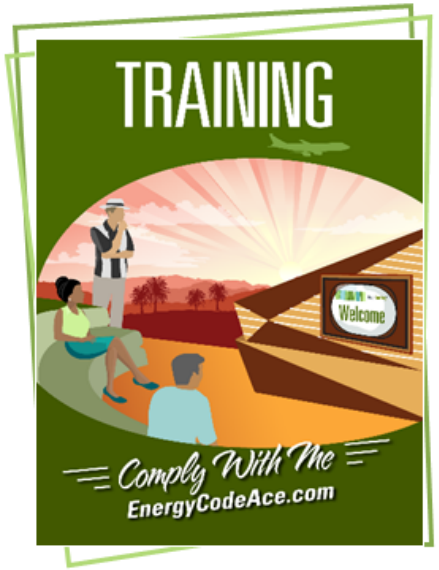
- Title24@energy.ca.gov

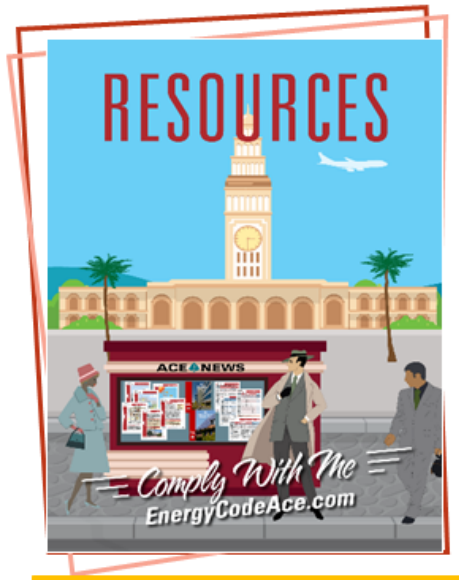
Compliance Software Support

Email

- Nonresidential and multifamily software
  - CBECC@energy.ca.gov
- Single-family residential software
  - CBECC.Res@energy.ca.gov

Energy Code Ace





Tools help automate tasks:

- Energy Code Product Finder
- Forms Ace
- Image Ace
- Navigator Ace
- Nonres. Indoor Lighting Wheel
- Q&Ace
- Reference Ace
- Timeline Ace
- Virtual Compliance Assistant

Training is activity based and delivered in a variety of formats:

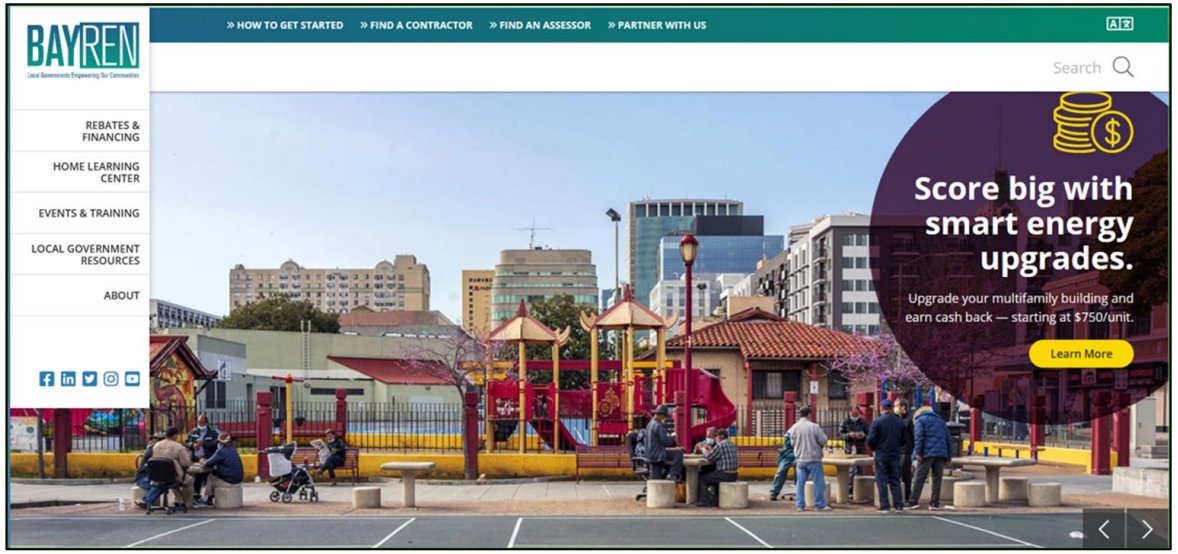
- Live Online instructor-led
- Online self-study
- Recorded webinars
- YouTube — live streaming & videos

Resources provide quick, useful guidance:

- Fact Sheets
- Checklists
- Application Guides
- Submit a Question
- Trigger Sheets
- Useful Links

Join us at EnergyCodeAce.com

Local RENs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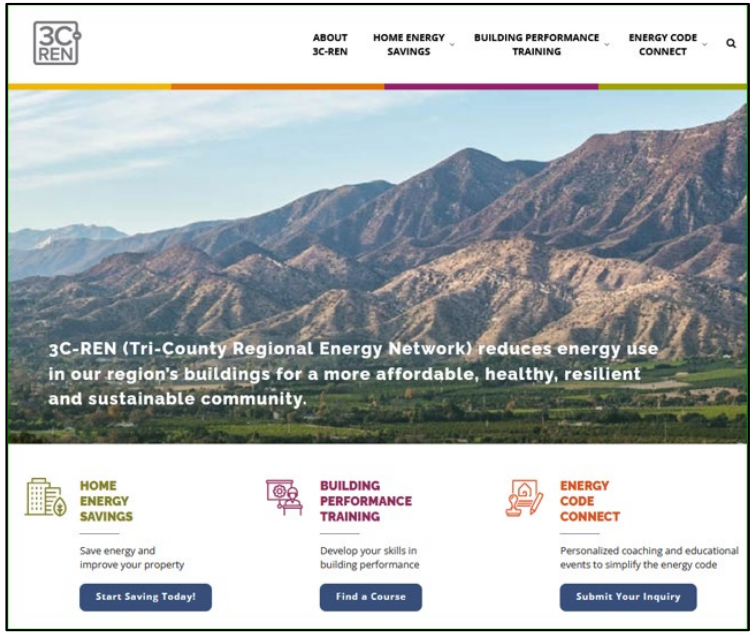
3C REN
ABOUT 3C-REN
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BUILDING PERFORMANCE TRAINING
ENERGY CODE CONNECT
3C-REN (Tri-County Regional Energy Network) reduces energy use in our region's buildings for a more affordable, healthy, resilient and sustainable community.
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Save energy and improve your property
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Develop your skills in building performance
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ENERGY CODE CONNECT
Personalized coaching and educational events to simplify the energy code
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The Inland Regional Energy Network (I-REN) connects local governments, the workforce, and other stakeholders to a wide range of energy efficiency resources.


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SoCalREN Programs
Whether you're a homeowner, multifamily property owner or manager, business owner, or public agency representative, the Southern California Regional Energy Network (SoCalREN), a service of the County of Los Angeles, can help you take advantage of a wide variety of energy efficiency opportunities that can help you save energy and money. Learn more by visiting the program of your choice below, and feel free to contact us with any questions.

New Resource Hub

Homeowners and renters

- Information about water and space heating, cooking, EV charging, incentives

Contractors

- Information about training, tools, incentives

Local government representatives

- Information about model policies, permitting, training, incentives

Links on the Building and Home Energy Resource Hub

Thank you