2019 Energy Code

Residential Updates

California Energy Commission

Efficiency Division

California Energy Commission

Our Responsibilities

Advancing State Energy Policy

Achieving Energy Efficiency

Investing in Energy Innovation

Developing Renewable Energy

Transforming Transportation

Overseeing Energy Infrastructure

Preparing for Energy Emergencies

EXPLORE OUR CORE RESPONSIBILITIES >

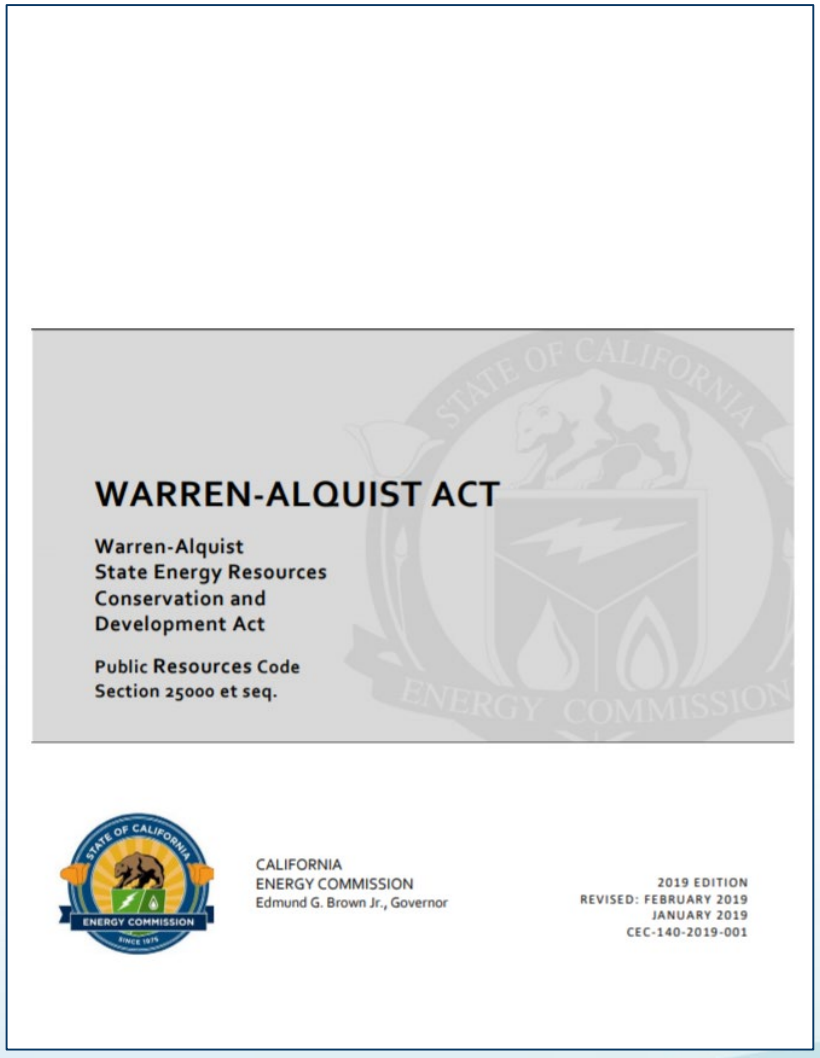
Goals for this Training

2019 Energy Code

- Identify and clarify major changes for residential
  - Newly constructed buildings
  - Additions and alterations
- Simplify compliance and enforcement
  - Plan review
  - Field inspection

Energy Code Basics

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

Low-Rise Residential Buildings

- Single family - any number of stories
- Duplexes - any number of stories
- Townhouses - no more than three habitable stories
- Multifamily - no more than three habitable stories

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

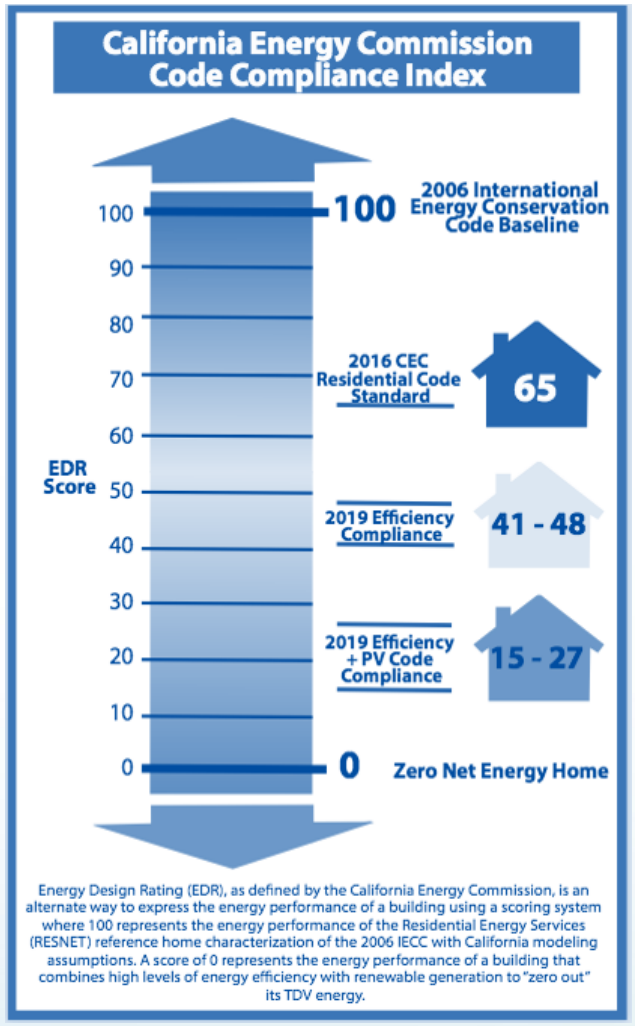
Prescriptive Approach

- 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
- Efficiency EDR proposed ≤ standard efficiency EDR
- Total EDR (including PV) ≤ standard total EDR
- Mostly used for newly constructed homes and additions

Energy Design Rating (EDR)



EDR score based on total estimated energy use

- 100 represents a home built to 2006 IECC
- 0 represents a zero net energy home
- Two types of EDR must be met individually
  - **Efficiency EDR**: Includes energy savings for space heating, cooling, ventilation, water heating measures, plus limited credit for battery
  - **Total EDR**: Includes efficiency EDR minus compliance credit for PV, battery, and other demand flexibility measures

Demonstrating Compliance

Compliance forms confirm Energy Code is met

- Completed by designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification
  - Certificate of Compliance
  - Certificate of Installation
  - Certificate of Acceptance
  - Certificate of Verification

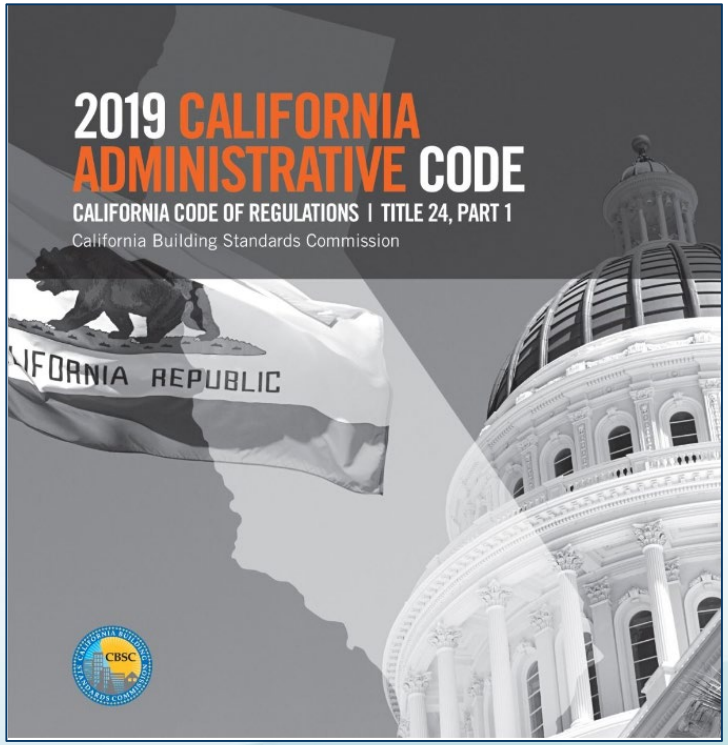
2019 Energy Code

Navigating Title 24 - Part 1 and Part 6

Title 24 – California Building Code

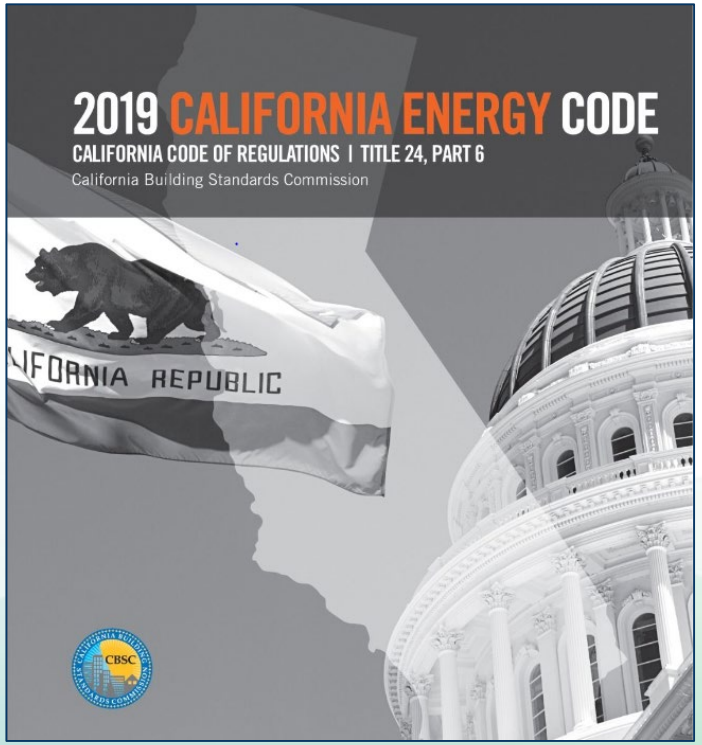
Part 1 - Administrative Code

- 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

§ 10-109 – Photovoltaic requirements

§ 10-111 – Fenestration and door labels

§ 10-115 – Community solar

Part 6 Energy Code

All Buildings § 100.0 - Table 100.0-A

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Low-Rise Residential	General	150.0	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g), 150.0(q)			
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)			
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)			
	Outdoor Lighting	110.9, 130.0,150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N. A.	N.A.	150.2(a), 150.2(b)
	Solar Ready Buildings	110.10	N. A.	N.A.	N.A.

Residential relevant sections

§ 100.1 Definitions

§ 110.0 – § 110.12 All buildings

§ 150.0 Mandatory measures

§ 150.1 Prescriptive requirements

§ 150.2 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

§ 110.2 – HVAC
§ 110.3 – Water heating
§ 110.5 – Pilot lights
§ 110.6 – Envelope
§ 110.9 – Lighting
§ 110.12 – Demand response

Mandatory Requirements

New Residential § 150.0

Covers requirements for design and installation of building envelopes, ventilation, space conditioning, water systems and lighting

Relevant sections

§ 150.0(c) – Envelope
§ 150.0(j,n) – Water heating
§ 150.0(k) – Lighting
§ 150.0(m,o) – HVAC

Performance and Prescriptive Requirements

Residential § 150.1

Performance and prescriptive compliance approaches

Relevant sections
§ 150.1(b) – Performance
§ 150.1(c) – Prescriptive
Table 150.1-A – Single Family Buildings
Table 150.1-B – Multifamily Buildings

Performance and Prescriptive Requirements

Additions and Alterations § 150.2

Performance and prescriptive compliance approaches

Relevant sections

§ 150.2(a) – Additions

§ 150.2(b) – Alterations

2019 Energy Code

Summary of Changes

2019 Energy Code

2019 Building Energy Efficiency Standards

The 2019 Building Energy Efficiency Standards take effect January 1, 2020. Find compliance manuals, forms, software, and supporting content.

LEARN MORE ABOUT THE 2019 STANDARDS ›

2019 Energy Code

Effective January 1, 2020

- All building permit applications submitted on or after effective date
- Must use 2019 software and forms

2019 Documents Online

- Energy Code
- Reference Appendices
- Compliance Manuals
- Forms

2019 Energy Code

Easy navigation features and updates

Energy Code

- Table of contents links
- Section and table links
- Table 100.0-A links
- Index

Compliance Manuals

- Table of contents links
- Future errata with clarifications will be published

2019 Compliance Forms and Tools

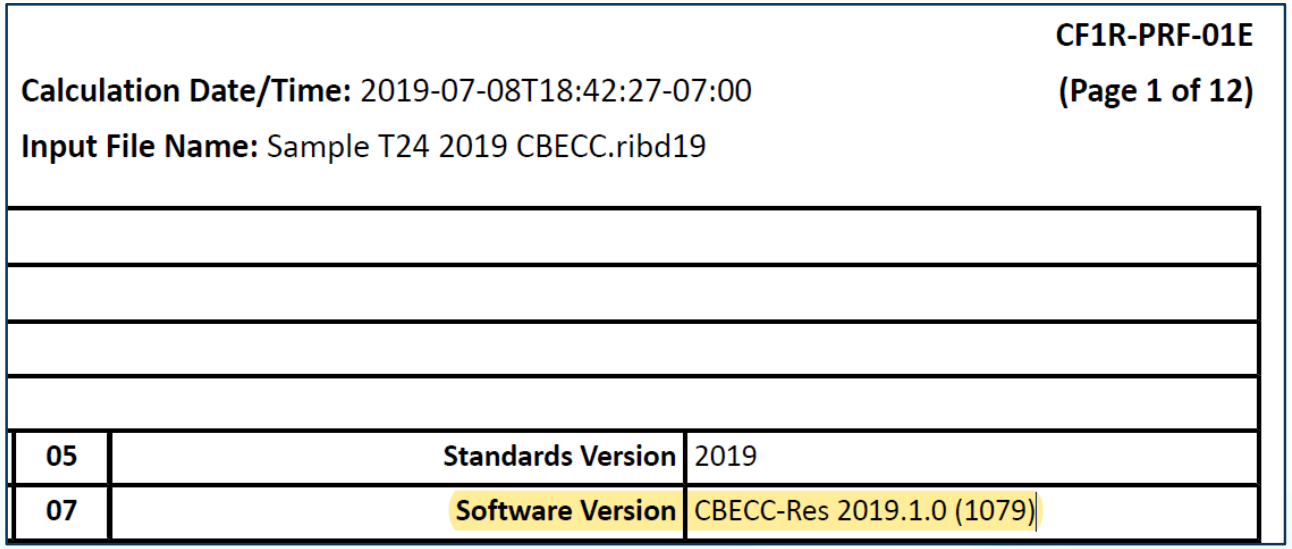
- Reduced overall number of forms
- Prescriptive forms online
- Sample performance compliance forms available with CBECC software
- New EZ building climate zone search tool

2019 Compliance Software

To demonstrate Energy Code compliance with the performance approach

Approved versions

- Residential
  - CBECC-Res 2019.1.2
  - EnergyPro 8.1 Residential
  - Right-Energy 2019.1.1
- Nonresidential
  - CBECC-Com 2019.1.2
  - EnergyPro 8.1 Commercial



CF1R-PRF-01E

Calculation Date/Time: 2019-07-08T18:42:27-07:00 (Page 1 of 12)

Input File Name: Sample T24 2019 CBECC.ribd19

05	**Standards Version**	2019
07	**Software Version**	CBECC-Res 2019.1.0 (1079)

2019 Energy Savings

Low-rise residential

- 7% more efficient than 2016 Standards
- Energy consumption reduced by an average 53% with photovoltaic
- Monthly lifecycle cost is $40 with savings of $80 for typical home
- GHG emission reduction of 700k metric tons over 3 years

Residential Changes Summary

Performance

- New energy design rating (EDR)
- PV and QII part of the standard design

Water heaters

- Prescriptive options for heat pump

Solar photovoltaic prescriptive requirement

- Several exceptions to reduce PV size

HVAC - Indoor air quality

- MERV 13 filtration
- ASHRAE 62.2-2016 applied with modifications
- HERS verification for kitchen range hoods

Increased efficiency for envelope

- New U-factor for doors
- Wall and ceiling insulation
- QII - quality insulation installation prescriptive requirement

CALIFORNIA'S 2019 RESIDENTIAL

BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in lower electricity and natural gas bills. The 2019 Building Energy Efficiency Standards for residential buildings includes a first-in-the-nation requirement to install solar photovoltaic systems. Other features enable homes to reduce the electricity demand from the grid, helping to reduce energy bills and the carbon footprint.

$19,000 SAVINGS OVER A 30 YR. MORTGAGE | INITIAL COST $9,500

SOLAR PHOTOVOLTAIC SYSTEM

Promote installing solar photovoltaic systems in newly constructed residential buildings. The systems include smart inverters with optional battery storage. This will increase the self-utilization of the electricity generated to power the home's electricity loads including plug-in appliances. California is the first state in the nation to require smart systems on homes.

DEMAND RESPONSE COMPLIANCE OPTIONS

Encourage battery storage and heat pump water heaters that shift the energy use of the house from peak periods to off-peak periods. Utilities moving to time-of-use pricing assists the grid to meet the state's climate change goals and helps homes reduce energy bills.

HEALTHY INDOOR AIR QUALITY

Enable using highly efficient filters that trap hazardous particulates from both outdoor air and cooking and improve kitchen ventilation systems. Moving air around and in and out of the home while filtering out allergens and other particles makes the home healthier.

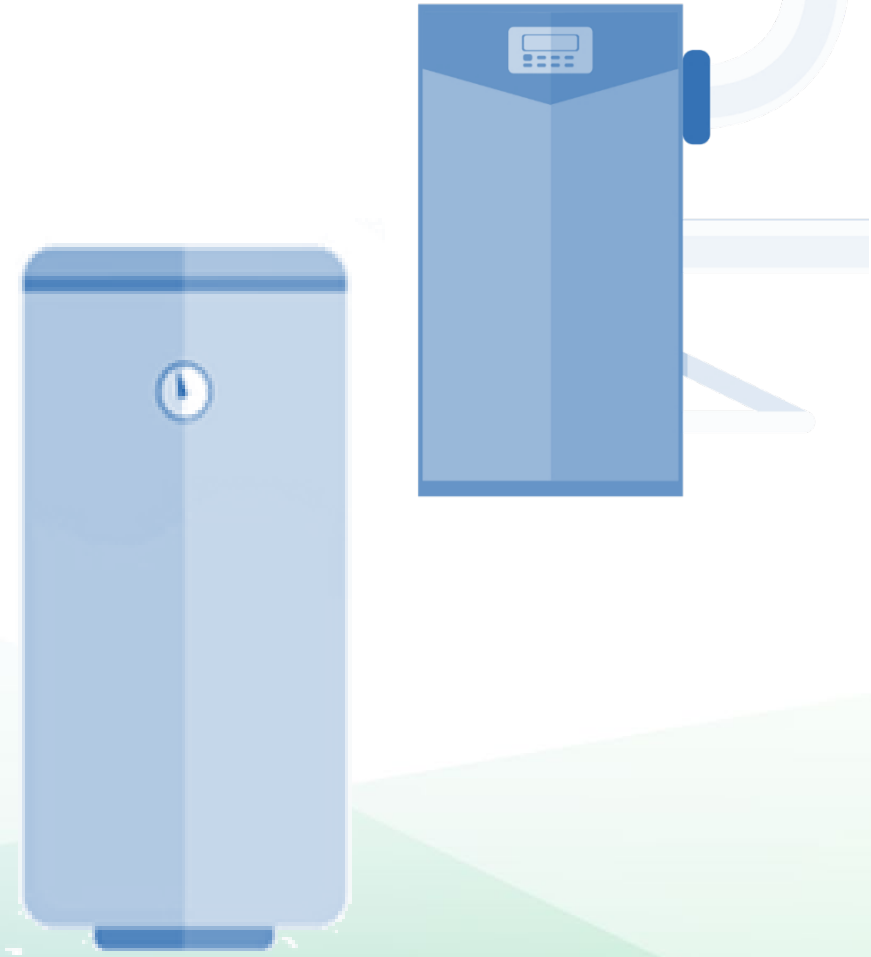
BUILDING ENVELOPE

Strengthen insulation in attics, walls and windows to improve comfort and energy savings. Keeping the heat out during the summer and warm air during the winter makes a home more resilient to climate change.

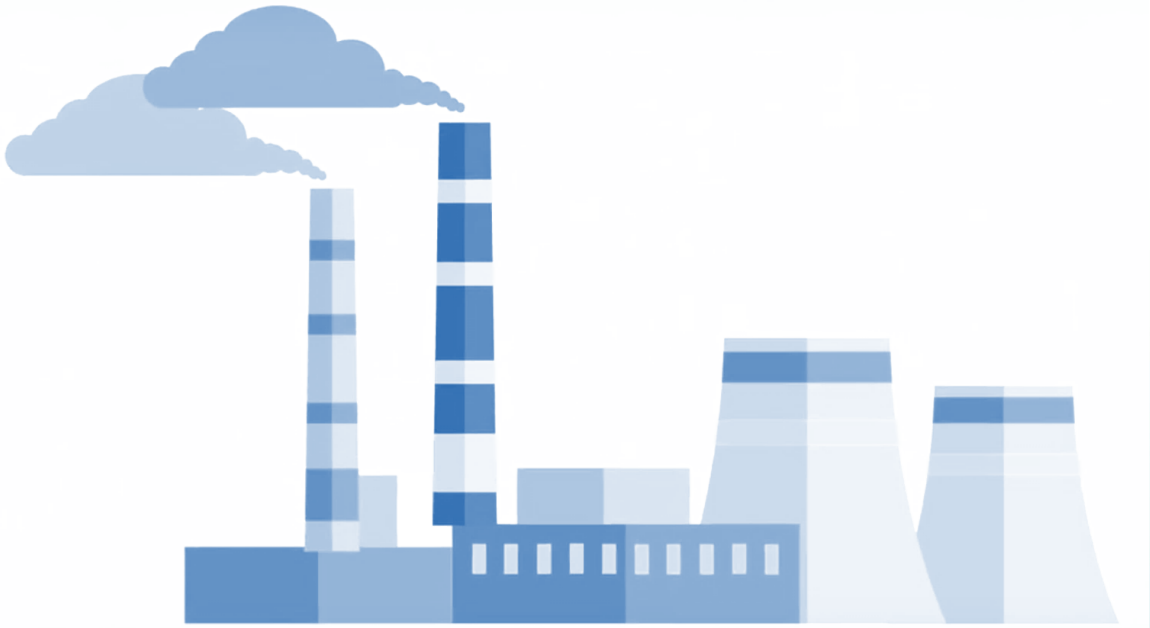
2019 Prescriptive Paths

Two parallel prescriptive paths for compliance

1. Mixed fuel homes
   - Gas water heater and furnace
2. All-electric homes
   - Heat pump space conditioners meet prescriptive compliance requirements
   - NEEA Tier 3 heat pump water heater models meet or exceed water heater baseline efficiencies



Future Energy Codes



- First priority is energy efficiency
- Transitioning to greenhouse gas based metric that promotes electrification
- Moving away from equal hourly netting to support grid flexibility
- Maintaining solar self-utilization and demand response measures

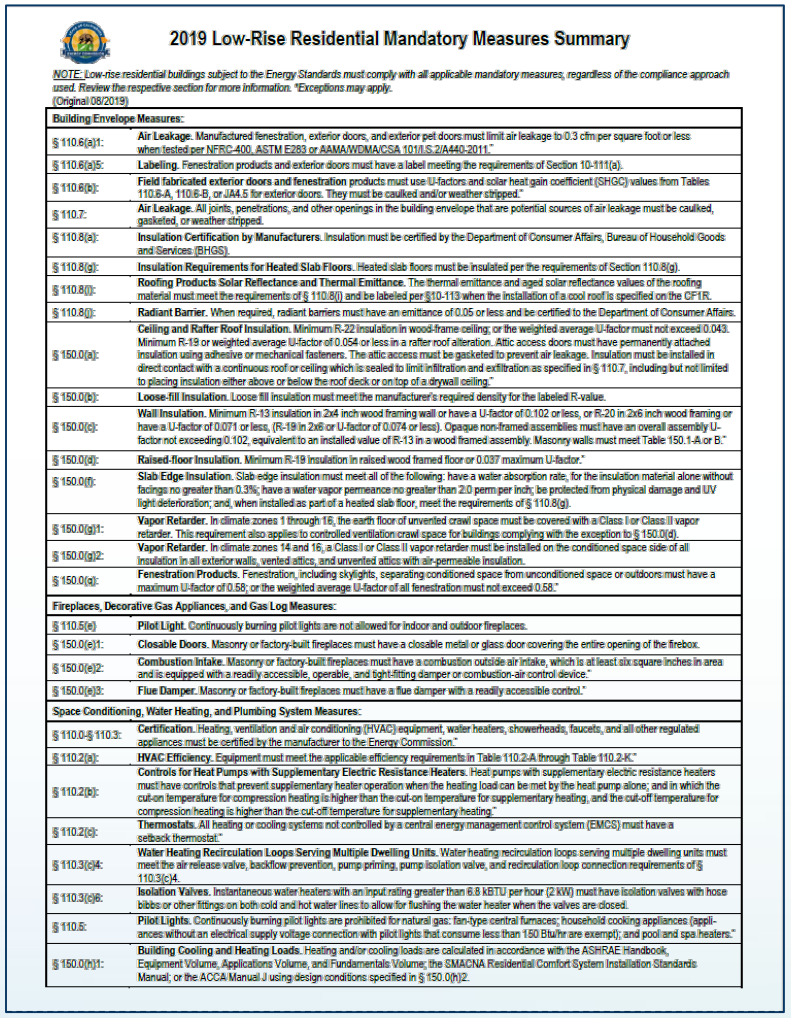
2019 Energy Code Changes Residential

Title 24, Part 1 and Part 6

2019 Residential Forms

- Prescriptive forms online
- 2019 Residential Compliance Manual - Appendix A
- Sample performance compliance forms available with CBECC-Res software
- Registered forms available through approved HERS provider data registries
- Dynamic versions of non-HERS additions and alterations
- Reduced overall number of forms

Mandatory Measures Summary



2019 Low-Rise Residential Mandatory Measures Summary

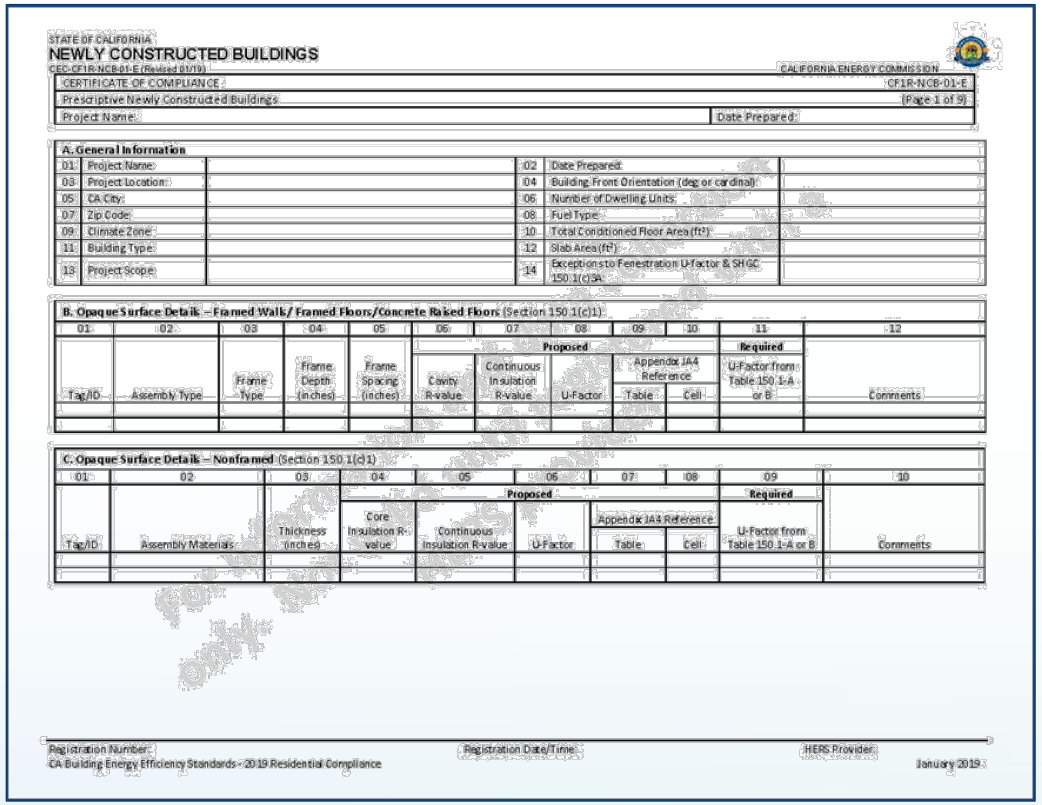
*NOTE: Low-rise residential buildings subject to the Energy Standards must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information. *Exceptions may apply.*

(Original 08/2019)

Building Envelope Measures:	
§ 110.6(a)1:	**Air Leakage.** Manufactured fenestration, exterior doors, and exterior pet doors must limit air leakage to 0.3 cfm per square foot or less when tested per NFRC-400, ASTM E283 or AAMA/WDMA/CSA 101/I.S.2/A440-2011."
§ 110.6(a)5:	**Labeling.** Fenestration products and exterior doors must have a label meeting the requirements of Section 10-111(a).
§ 110.6(b):	**Field fabricated exterior doors and fenestration** products must use U-factors and solar heat gain coefficient (SHGC) values from Tables 110.6-A, 110.6-B, or JA4.5 for exterior doors. They must be caulked and/or weather stripped."
§ 110.7:	**Air Leakage.** All joints, penetrations, and other openings in the building envelope that are potential sources of air leakage must be caulked, gasketed, or weather stripped.
§ 110.8(a):	**Insulation Certification by Manufacturers.** Insulation must be certified by the Department of Consumer Affairs, Bureau of Household Goods and Services (BHGS).
§ 110.8(g):	**Insulation Requirements for Heated Slab Floors.** Heated slab floors must be insulated per the requirements of Section 110.8(g).
§ 110.8(i):	**Roofing Products Solar Reflectance and Thermal Emittance.** The thermal emittance and aged solar reflectance values of the roofing material must meet the requirements of § 110.8(i) and be labeled per §10-113 when the installation of a cool roof is specified on the CF1R.
§ 110.8(j):	**Radiant Barrier.** When required, radiant barriers must have an emittance of 0.05 or less and be certified to the Department of Consumer Affairs.
§ 150.0(a):	**Ceiling and Rafter Roof Insulation.** Minimum R-22 insulation in wood-frame ceiling; or the weighted average U-factor must not exceed 0.043. Minimum R-19 or weighted average U-factor of 0.054 or less in a rafter roof alteration. Attic access doors must have permanently attached insulation using adhesive or mechanical fasteners. The attic access must be gasketed to prevent air leakage. Insulation must be installed in direct contact with a continuous roof or ceiling which is sealed to limit infiltration and exfiltration as specified in § 110.7, including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling."
§ 150.0(b):	**Loose-fill Insulation.** Loose fill insulation must meet the manufacturer's required density for the labeled R-value.
§ 150.0(c):	**Wall Insulation.** Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less, or R-20 in 2x6 inch wood framing or have a U-factor of 0.071 or less, (R-19 in 2x6 or U-factor of 0.074 or less). Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102, equivalent to an installed value of R-13 in a wood framed assembly. Masonry walls must meet Table 150.1-A or B."
§ 150.0(d):	**Raised-floor Insulation.** Minimum R-19 insulation in raised wood framed floor or 0.037 maximum U-factor."
§ 150.0(f):	**Slab Edge Insulation.** Slab edge insulation must meet all of the following: have a water absorption rate, for the insulation material alone without facings no greater than 0.3%; have a water vapor permeance no greater than 2.0 perm per inch; be protected from physical damage and UV light deterioration; and, when installed as part of a heated slab floor, meet the requirements of § 110.8(g).
§ 150.0(g)1:	**Vapor Retarder.** In climate zones 1 through 16, the earth floor of unvented crawl space must be covered with a Class I or Class II vapor retarder. This requirement also applies to controlled ventilation crawl space for buildings complying with the exception to § 150.0(d).
§ 150.0(g)2:	**Vapor Retarder.** In climate zones 14 and 16, a Class I or Class II vapor retarder must be installed on the conditioned space side of all insulation in all exterior walls, vented attics, and unvented attics with air-permeable insulation.
§ 150.0(q):	**Fenestration Products.** Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors must have a maximum U-factor of 0.58; or the weighted average U-factor of all fenestration must not exceed 0.58."
Fireplaces, Decorative Gas Appliances, and Gas Log Measures:	
§ 110.5(e)	**Pilot Light.** Continuously burning pilot lights are not allowed for indoor and outdoor fireplaces.
§ 150.0(e)1:	**Closable Doors.** Masonry or factory-built fireplaces must have a closable metal or glass door covering the entire opening of the firebox.
§ 150.0(e)2:	**Combustion Intake.** Masonry or factory-built fireplaces must have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper or combustion-air control device."
§ 150.0(e)3:	**Flue Damper.** Masonry or factory-built fireplaces must have a flue damper with a readily accessible control."
Space Conditioning, Water Heating, and Plumbing System Measures:	
§ 110.0-§ 110.3:	**Certification.** Heating, ventilation and air conditioning (HVAC) equipment, water heaters, showerheads, faucets, and all other regulated appliances must be certified by the manufacturer to the Energy Commission."
§ 110.2(a):	**HVAC Efficiency.** Equipment must meet the applicable efficiency requirements in Table 110.2-A through Table 110.2-K."
§ 110.2(b):	**Controls for Heat Pumps with Supplementary Electric Resistance Heaters.** Heat pumps with supplementary electric resistance heaters must have controls that prevent supplementary heater operation when the heating load can be met by the heat pump alone; and in which the cut-on temperature for compression heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for compression heating is higher than the cut-off temperature for supplementary heating."
§ 110.2(c):	**Thermostats.** All heating or cooling systems not controlled by a central energy management control system (EMCS) must have a setback thermostat."
§ 110.3(c)4:	**Water Heating Recirculation Loops Serving Multiple Dwelling Units.** Water heating recirculation loops serving multiple dwelling units must meet the air release valve, backflow prevention, pump priming, pump isolation valve, and recirculation loop connection requirements of § 110.3(c)4.
§ 110.3(c)6:	**Isolation Valves.** Instantaneous water heaters with an input rating greater than 6.8 kBTU per hour (2 kW) must have isolation valves with hose bibbs or other fittings on both cold and hot water lines to allow for flushing the water heater when the valves are closed.
§ 110.5:	**Pilot Lights.** Continuously burning pilot lights are prohibited for natural gas: fan-type central furnaces; household cooking appliances (appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu/hr are exempt); and pool and spa heaters."
§ 150.0(h)1:	**Building Cooling and Heating Loads.** Heating and/or cooling loads are calculated in accordance with the ASHRAE Handbook, Equipment Volume, Applications Volume, and Fundamentals Volume; the SMACNA Residential Comfort System Installation Standards Manual; or the ACCA Manual J using design conditions specified in § 150.0(h)2.

- 2019 update available
- Summary of residential mandatory measures
- Designers can chose to include on plans
- Enforcement agencies may require on plans

Certificate of Compliance



STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CEC-CF1R-NCB-01-E (Revised 01/19)
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE — CF1R-NCB-01-E
Prescriptive Newly Constructed Buildings — (Page 1 of 9)
Project Name: — Date Prepared:

A. General Information

01	Project Name		02	Date Prepared	
03	Project Location		04	Building Front Orientation (deg or cardinal)	
05	CA City		06	Number of Dwelling Units	
07	Zip Code		08	Fuel Type	
09	Climate Zone		10	Total Conditioned Floor Area (ft²)	
11	Building Type		12	Slab Area (ft²)	
13	Project Scope		14	Exceptions to Fenestration U-factor & SHGC 150.1(c)3A	

B. Opaque Surface Details – Framed Walls/ Framed Floors/Concrete Raised Floors (Section 150.1(c)1)

01	02	03	04	05	06	07	08	09	10	11	12
					Proposed					Required	
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	U-Factor	Appendix JA4 Reference: Table	Appendix JA4 Reference: Cell	U-Factor from Table 150.1-A or B	Comments

C. Opaque Surface Details – Nonframed (Section 150.1(c)1)

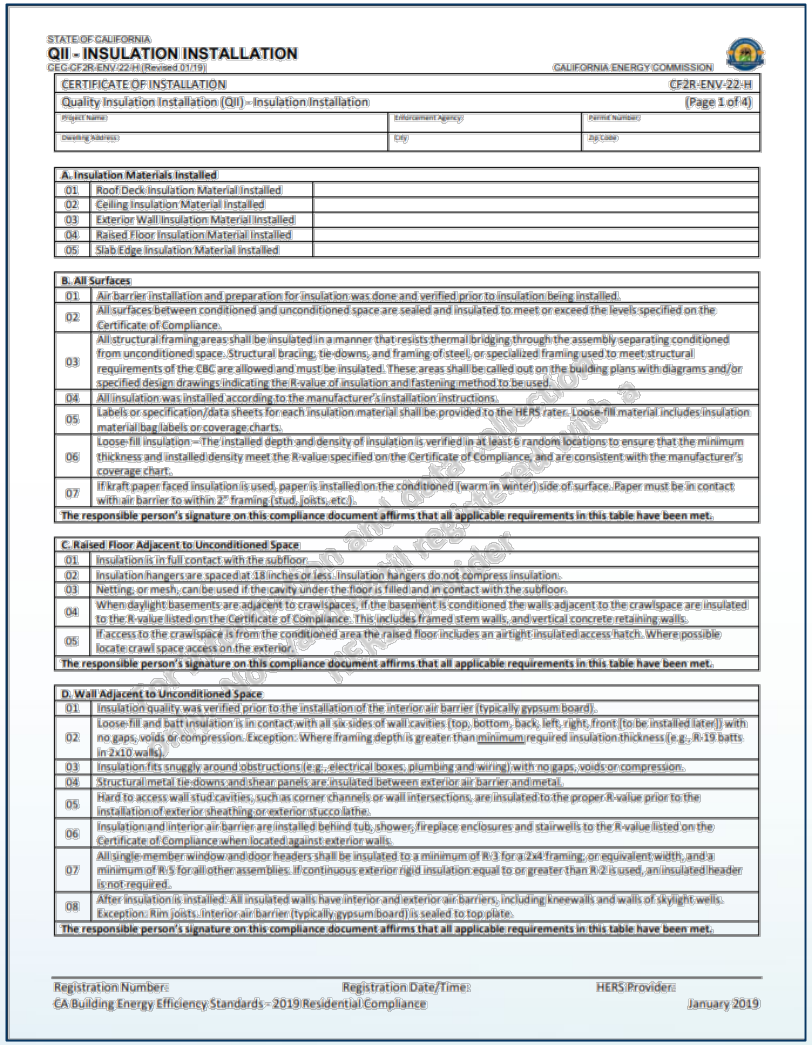
01	02	03	04	05	06	07	08	09	10
			Proposed					Required	
Tag/ID	Assembly Materials	Thickness (inches)	Core Insulation R-value	Continuous Insulation R-value	U-Factor	Appendix JA4 Reference: Table	Appendix JA4 Reference: Cell	U-Factor from Table 150.1-A or B	Comments

Registration Number — Registration Date/Time — HERS Provider
CA Building Energy Efficiency Standards - 2019 Residential Compliance — January 2019

Certificate of Compliance – CF1Rs

- Demonstrates compliance at design phase
- Completed by designer, architect, energy consultant, engineer, etc.
- Submit with permit application, include with plans
- Plans examiner verifies CF1R matches specs on plans

Certificate of Installation



STATE OF CALIFORNIA

QII - INSULATION INSTALLATION

CEC-CF2R-ENV-22-H (Revised 01/19) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION CF2R-ENV-22-H

Quality Insulation Installation (QII) – Insulation Installation (Page 1 of 4)

Project Name	Enforcement Agency	Permit Number
Dwelling Address	City	Zip Code

A. Insulation Materials Installed		
01	Roof Deck Insulation Material Installed	
02	Ceiling Insulation Material Installed	
03	Exterior Wall Insulation Material Installed	
04	Raised Floor Insulation Material Installed	
05	Slab Edge Insulation Material Installed	

B. All Surfaces	
01	Air barrier installation and preparation for insulation was done and verified prior to insulation being installed.
02	All surfaces between conditioned and unconditioned space are sealed and insulated to meet or exceed the levels specified on the Certificate of Compliance.
03	All structural framing areas shall be insulated in a manner that resists thermal bridging through the assembly separating conditioned from unconditioned space. Structural bracing, tie-downs, and framing of steel, or specialized framing used to meet structural requirements of the CBC are allowed and must be insulated. These areas shall be called out on the building plans with diagrams and/or specified design drawings indicating the R-value of insulation and fastening method to be used.
04	All insulation was installed according to the manufacturer's installation instructions.
05	Labels or specification/data sheets for each insulation material shall be provided to the HERS rater. Loose-fill material includes insulation material bag labels or coverage charts.
06	Loose-fill insulation – The installed depth and density of insulation is verified in at least 6 random locations to ensure that the minimum thickness and installed density meet the R-value specified on the Certificate of Compliance, and are consistent with the manufacturer's coverage chart.
07	If kraft paper faced insulation is used, paper is installed on the conditioned (warm in winter) side of surface. Paper must be in contact with air barrier to within 2" framing (stud, joists, etc.).
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Raised Floor Adjacent to Unconditioned Space	
01	Insulation is in full contact with the subfloor.
02	Insulation hangers are spaced at 18 inches or less. Insulation hangers do not compress insulation.
03	Netting, or mesh, can be used if the cavity under the floor is filled and in contact with the subfloor.
04	When daylight basements are adjacent to crawlspaces, if the basement is conditioned the walls adjacent to the crawlspace are insulated to the R-value listed on the Certificate of Compliance. This includes framed stem walls, and vertical concrete retaining walls.
05	If access to the crawlspace is from the conditioned area the raised floor includes an airtight insulated access hatch. Where possible locate crawl space access on the exterior.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. Wall Adjacent to Unconditioned Space	
01	Insulation quality was verified prior to the installation of the interior air barrier (typically gypsum board).
02	Loose-fill and batt insulation is in contact with all six sides of wall cavities (top, bottom, back, left, right, front [to be installed later]) with no gaps, voids or compression. Exception: Where framing depth is greater than minimum required insulation thickness (e.g., R-19 batts in 2x10 walls).
03	Insulation fits snuggly around obstructions (e.g., electrical boxes, plumbing and wiring) with no gaps, voids or compression.
04	Structural metal tie-downs and shear panels are insulated between exterior air barrier and metal.
05	Hard to access wall stud cavities, such as corner channels or wall intersections, are insulated to the proper R-value prior to the installation of exterior sheathing or exterior stucco lathe.
06	Insulation and interior air barrier are installed behind tub, shower, fireplace enclosures and stairwells to the R-value listed on the Certificate of Compliance when located against exterior walls.
07	All single-member window and door headers shall be insulated to a minimum of R-3 for a 2x4 framing, or equivalent width, and a minimum of R-5 for all other assemblies. If continuous exterior rigid insulation equal to or greater than R-2 is used, an insulated header is not required.
08	After insulation is installed: All insulated walls have interior and exterior air barriers, including kneewalls and walls of skylight wells. Exception: Rim joists. Interior air barrier (typically gypsum board) is sealed to top plate.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

Registration Number: Registration Date/Time: HERS Provider:

CA Building Energy Efficiency Standards - 2019 Residential Compliance January 2019

Certificate of Installation – CF2Rs

- Completed by builder, installing contractor or HERS rater
- Confirms compliance at installation
- Identifies energy efficiency measures installed per the CF1R and mandatory measures
- Left on-site for building inspector
- Inspector verifies documented efficiency and components match installed equipment and systems

Certificate of Verification

STATE OF CALIFORNIA
DUCT LEAKAGE DIAGNOSTIC TEST
CEC-CF3R-MCH-20-H (Revised 01/19) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF VERIFICATION	CF3R-MCH-20-H
Duct Leakage Diagnostic Test	(Page 1 of 3)

Project Name	Enforcement Agency	Permit Number
Dwelling Address	City	Zip Code

A. System Information		
01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Indoor Unit Name	
04	Building Type from CF1R	
05	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	
06	Verified Low Leakage Air-handling Unit Credit from CF1R?	
07	Duct System Compliance Category	
08	Any portions of Duct Located in Garage?	

MCH-20a - Completely New Duct System

B. Duct Leakage Diagnostic Test		
01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	
02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	
04	Heating Capacity (kBtu/h)	
05	Conditioned Floor Area Served by this HVAC System (ft²)	
06	Measured AHU Airflow (cfm)	
07	Duct Leakage Test Conditions	
08	Duct Leakage Test Method	
09	Leakage Factor	
10	Calculated Target Allowable Duct Leakage Rate (cfm)	
11	Actual Duct Leakage Rate from Leakage Test Measurement (cfm)	
12	Compliance Statement	
13	Notes	

For information and data collection only. Not valid until registered with a HERS provider

Registration Number: Registration Date/Time: HERS Provider:
CA Building Energy Efficiency Standards - 2019 Residential Compliance — January 2019

Certificate of Verification – CF3Rs

- Completed by HERS rater
- Registered with approved HERS provider
- Confirms compliance with HERS testing requirements (QII, duct leakage, airflow, refrigeration charge)
- Required for final inspection
- Inspector verifies tests and forms are complete, signed and registered

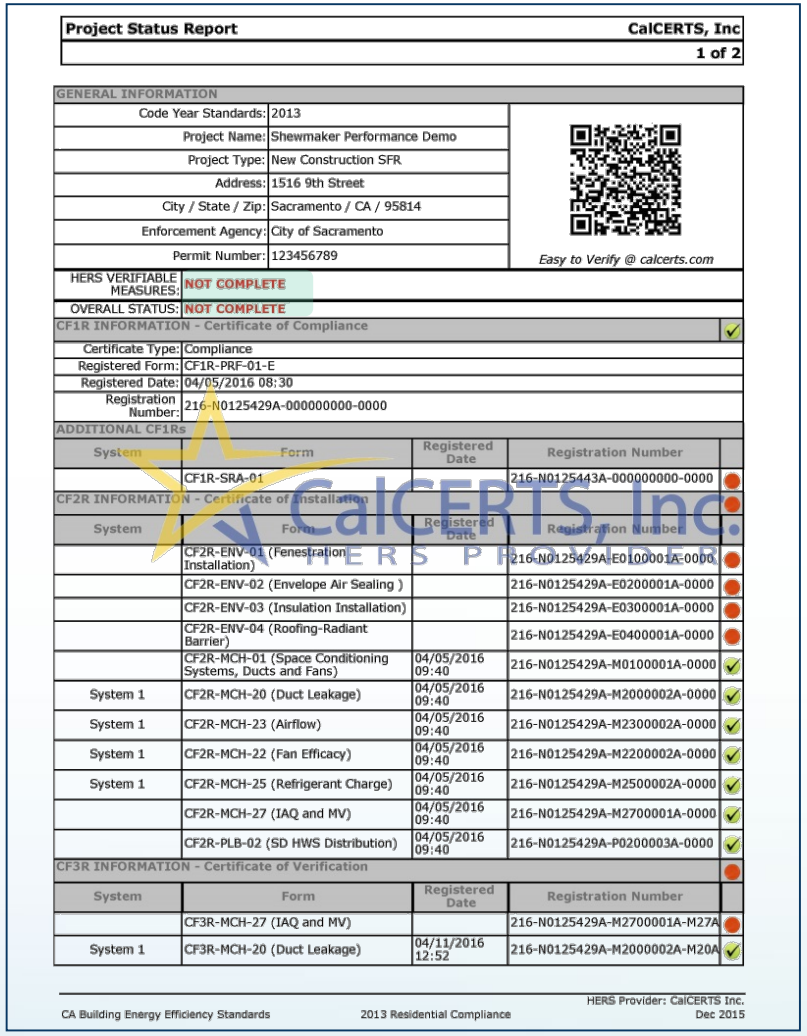
Alterations and Additions

Forms Exception §10-103

Low-rise residential non-HERS alterations, and additions under 300 ft^2

- CF1R and CF2R not required at building departments discretion
- May create simplified forms
- Include requirements on permit application
- Exempts forms only
- Project must comply with Energy Code

Project Status Report



Project Status Report — **CalCERTS, Inc** — 1 of 2

GENERAL INFORMATION

Code Year Standards:	2013
Project Name:	Shewmaker Performance Demo
Project Type:	New Construction SFR
Address:	1516 9th Street
City / State / Zip:	Sacramento / CA / 95814
Enforcement Agency:	City of Sacramento
Permit Number:	123456789

Easy to Verify @ calcerts.com

HERS VERIFIABLE MEASURES:	NOT COMPLETE
OVERALL STATUS:	NOT COMPLETE

CF1R INFORMATION - Certificate of Compliance ✓

Certificate Type:	Compliance
Registered Form:	CF1R-PRF-01-E
Registered Date:	04/05/2016 08:30
Registration Number:	216-N0125429A-000000000-0000

ADDITIONAL CF1Rs

System	Form	Registered Date	Registration Number	
	CF1R-SRA-01		216-N0125443A-000000000-0000	

CF2R INFORMATION - Certificate of Installation

System	Form	Registered Date	Registration Number	
	CF2R-ENV-01 (Fenestration Installation)		216-N0125429A-E0100001A-0000	
	CF2R-ENV-02 (Envelope Air Sealing)		216-N0125429A-E0200001A-0000	
	CF2R-ENV-03 (Insulation Installation)		216-N0125429A-E0300001A-0000	
	CF2R-ENV-04 (Roofing-Radiant Barrier)		216-N0125429A-E0400001A-0000	
	CF2R-MCH-01 (Space Conditioning Systems, Ducts and Fans)	04/05/2016 09:40	216-N0125429A-M0100001A-0000	✓
System 1	CF2R-MCH-20 (Duct Leakage)	04/05/2016 09:40	216-N0125429A-M2000002A-0000	✓
System 1	CF2R-MCH-23 (Airflow)	04/05/2016 09:40	216-N0125429A-M2300002A-0000	✓
System 1	CF2R-MCH-22 (Fan Efficacy)	04/05/2016 09:40	216-N0125429A-M2200002A-0000	✓
System 1	CF2R-MCH-25 (Refrigerant Charge)	04/05/2016 09:40	216-N0125429A-M2500002A-0000	✓
	CF2R-MCH-27 (IAQ and MV)	04/05/2016 09:40	216-N0125429A-M2700001A-0000	✓
	CF2R-PLB-02 (SD HWS Distribution)	04/05/2016 09:40	216-N0125429A-P0200003A-0000	✓

CF3R INFORMATION - Certificate of Verification

System	Form	Registered Date	Registration Number	
	CF3R-MCH-27 (IAQ and MV)		216-N0125429A-M2700001A-M27A	
System 1	CF3R-MCH-20 (Duct Leakage)	04/11/2016 12:52	216-N0125429A-M2000002A-M20A	✓

- Summarizes status of all required forms
- Available for any project in HERS registry
- Access directly in registry
- Request hard copy at final inspection to verify compliance
- HERS and Overall Status marked **Complete** to pass inspection

Water Heating Residential

Mandatory § 110.3(c), § 150.0(j, n)

Prescriptive § 150.1(c)8, § 150.2(b)1H

Water Heating Mandatory Requirements

All Buildings § 110.3(c)3

Requirements for temperature controls in public lavatories removed

- Aligns with plumbing code
- Reduces overlap and potential conflicts

Water Heating Mandatory Requirements

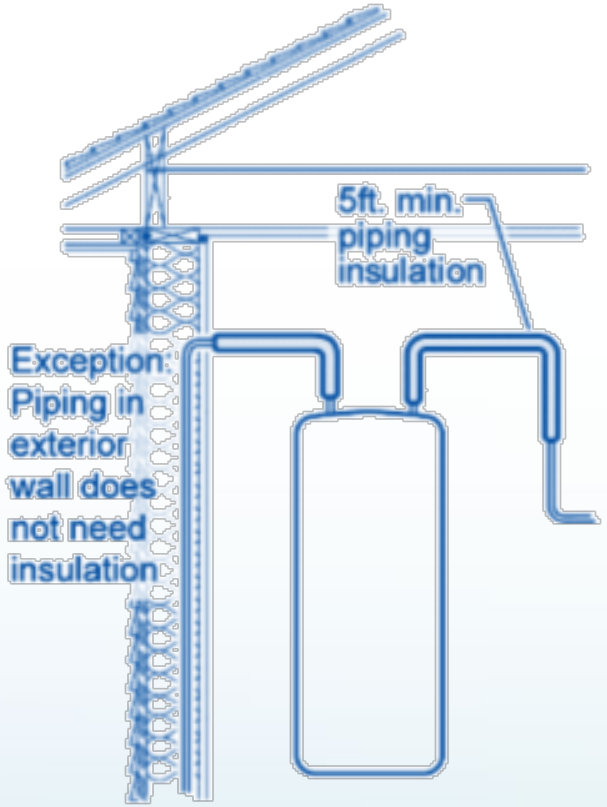
Residential § 150.0(j)2

Overlapping hot water pipe insulation requirements removed

- All **hot** water piping must be insulated as specified in 609.11 of CA Plumbing Code
  - Pipes with < 2” diameter must have insulation with minimum wall thickness of at least the diameter of the pipe (1” pipe diameter, 1” insulation wall thickness)
  - Pipes with ≥ 2” diameter, minimum 2” insulation
  - Exceptions for piping penetrating framing members, piping between fixture control valve or supply stop and fixture or appliance

Water Heating Mandatory Requirements

Residential § 150.0(j)2



One inch or R-7.7 pipe insulation is required

- First 5 feet of cold pipes from the storage tank
- All hot water piping with nominal diameter ≥ ¾" and < 1"
- Hot water piping with nominal diameter < ¾"
  - Associated with DHW recirculation system
  - From heating source to kitchen fixtures
  - From heating source to storage tanks or between storage tanks
  - Buried below grade

Water Heating Mandatory Requirements

Residential § 150.0(n)

High efficiency water heater ready requirements updated. Dwellings with gas or propane water heaters must have:

- Dedicated 125 volt, 20 amp receptacle connected to 3 conductor, 10 AWG copper branch circuit, within 3 feet of water heater
- Allows for easier and cost-effective installation of heat pump water heaters as a replacement

Water Heating Prescriptive Requirements

Residential § 150.1(c)8A

Options for gas or propane serving individual dwelling units

- Instantaneous water heater, no storage
- Storage water heater ≤ 75,000 Btu per hour and volume ≤ 55 gallons
  - Installed fenestration products must have maximum weighted average U-factor 0.24 and field verified compact distribution system or drain water heat recovery system
- Storage water heater ≤ 75,000 Btu per hour and volume > 55 gallons
  - US DOE has higher efficiency requirements over 55 gallons

Water Heating Prescriptive Requirements

Residential § 150.1(c)8A

Heat pump systems serving individual dwelling units

- Added as prescriptive compliance option
- Must be located in garage or conditioned space
- Must comply with **one**
  1. Compact hot water distribution and drain water heat recovery
  2. Climate zones 2-15: increase PV system by 0.3 kWdc
  3. Climate zones 1, 16: increase PV system by 1.1 kWdc
  4. NEEA Advanced Water Heater Specification Tier 3 or higher
     - Plus in climate zones 1, 16: increase PV system by 0.3 kWdc or compact hot water distribution

Water Heating Prescriptive Requirements

Residential § 150.1(c)8B

Multifamily buildings with central water heating systems

- Field verified drain water heat recovery can be used to reduce solar savings fraction of solar thermal system

Table 5-13: Required Performance of Solar Systems Installed in Multifamily Buildings With Central Distribution Systems

Climate Zone	*Minimum Solar Fraction if no DWHR*	*Minimum Solar Fraction if Compliant DWHR Installed*
1-9	0.20	0.15
10-16	0.35	0.30

Water Heating Prescriptive Requirements

Residential § 150.1(c)8B

Multifamily buildings with central water heating systems

- Executive Director approved central heat pump systems for all-electric compliance
  - Letter dated December 19, 2019
  - Meet all water heater criteria plus additional requirements per climate zone

Climate Zone	Minimum Solar Fraction	Additional PV Capacity
1-9	0.20	0.1 kWdc per dwelling unit
10-15	0.35	0.1 kWdc per dwelling unit
16	0.35 plus 2” pipe insulation	0.1 kWdc per dwelling unit

Water Heating Prescriptive Requirements

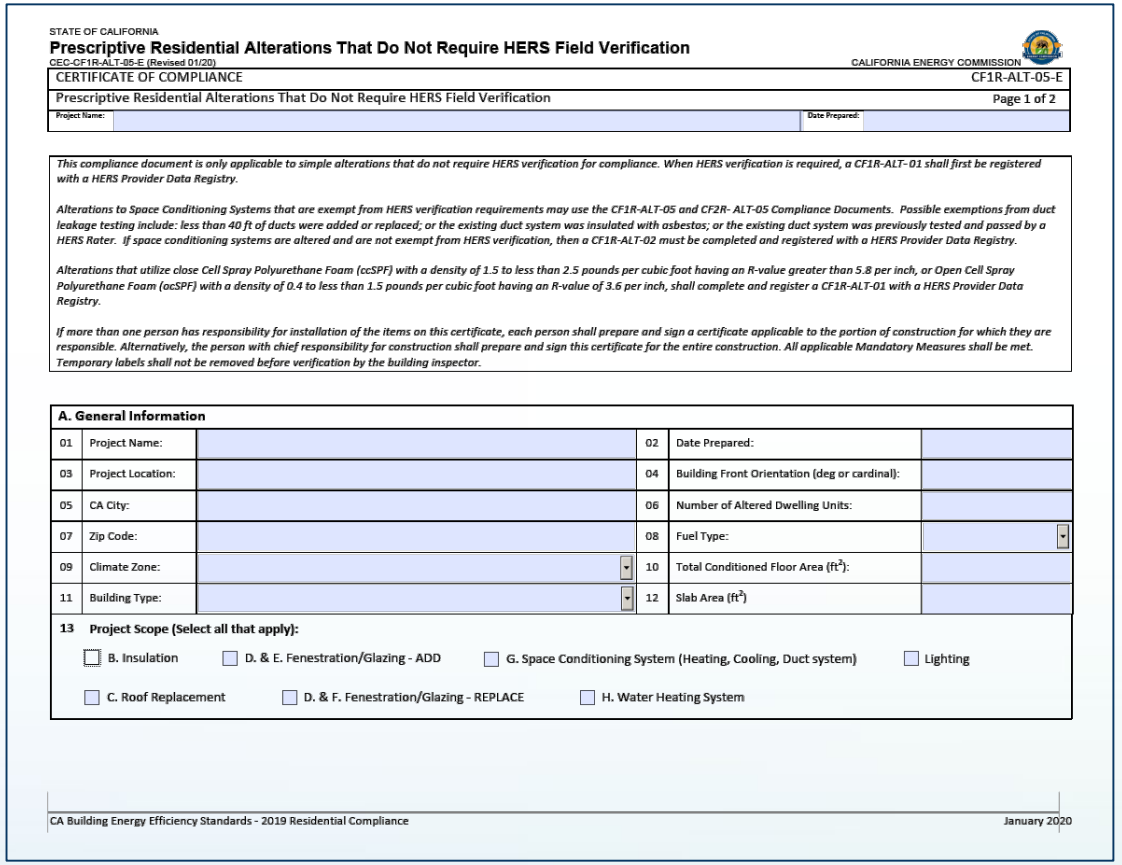
Alterations § 150.2(b)1H

Heat pump can be installed in climate zones 1-15

- The storage tank cannot be located outdoors
  - Must be placed on incompressible, rigid insulated surface with minimum thermal resistance of R-10, and be equipped with demand response controls; or
  - NEEA Advanced Water Heater Specification Tier 3 or higher

Note: Electric water heater can be installed if natural gas is not connected to the existing water heater location

Plans Examiners



STATE OF CALIFORNIA

Prescriptive Residential Alterations That Do Not Require HERS Field Verification

CEC-CF1R-ALT-05-E (Revised 01/20) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-ALT-05-E
Prescriptive Residential Alterations That Do Not Require HERS Field Verification	Page 1 of 2

Project Name: | Date Prepared:

This compliance document is only applicable to simple alterations that do not require HERS verification for compliance. When HERS verification is required, a CF1R-ALT-01 shall first be registered with a HERS Provider Data Registry.

Alterations to Space Conditioning Systems that are exempt from HERS verification requirements may use the CF1R-ALT-05 and CF2R- ALT-05 Compliance Documents. Possible exemptions from duct leakage testing include: less than 40 ft of ducts were added or replaced; or the existing duct system was insulated with asbestos; or the existing duct system was previously tested and passed by a HERS Rater. If space conditioning systems are altered and are not exempt from HERS verification, then a CF1R-ALT-02 must be completed and registered with a HERS Provider Data Registry.

Alterations that utilize close Cell Spray Polyurethane Foam (ccSPF) with a density of 1.5 to less than 2.5 pounds per cubic foot having an R-value greater than 5.8 per inch, or Open Cell Spray Polyurethane Foam (ocSPF) with a density of 0.4 to less than 1.5 pounds per cubic foot having an R-value of 3.6 per inch, shall complete and register a CF1R-ALT-01 with a HERS Provider Data Registry.

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. All applicable Mandatory Measures shall be met. Temporary labels shall not be removed before verification by the building inspector.

A. General Information

01	Project Name:		02	Date Prepared:	
03	Project Location:		04	Building Front Orientation (deg or cardinal):	
05	CA City:		06	Number of Altered Dwelling Units:	
07	Zip Code:		08	Fuel Type:	
09	Climate Zone:		10	Total Conditioned Floor Area (ft^2):	
11	Building Type:		12	Slab Area (ft^2)	

13 Project Scope (Select all that apply):

☐ B. Insulation ☐ D. & E. Fenestration/Glazing - ADD ☐ G. Space Conditioning System (Heating, Cooling, Duct system) ☐ Lighting

☐ C. Roof Replacement ☐ D. & F. Fenestration/Glazing - REPLACE ☐ H. Water Heating System

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

- ✓ Verify water heater type, volume, efficiency, etc.
- ✓ Heat pump storage tank can be in garage or conditioned space
- ✓ If gas or propane, verify heat pump ready requirements
- ✓ Verify if HERS required
- ✓ Can require a water heater schedule on building plans

WATER HEATERS

01	02	03	04	05	06	07	08	09	10	11	12
Name	Heating Element Type	Tank Type	# Units	Tank Vol. (gal)	Energy Factor or Efficiency	Input Rating or Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss or Recovery Eff.	1st Hr. Rating or Flow Rate	NEEA Heat Pump Brand or Model / Other	Tank Location or Ambient Condition
DHW Heater 1	Natural Gas	Consumer Instantaneous	1	0	0.95-UEF	200000-Btu/Hr	0	n/a	n/a	n/a	n/a

WATER HEATING - HERS VERIFICATION

01	02	03	04
Name	Pipe Insulation	Parallel Piping	Compact Distribution
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required

SPACE CONDITIONING SYSTEMS

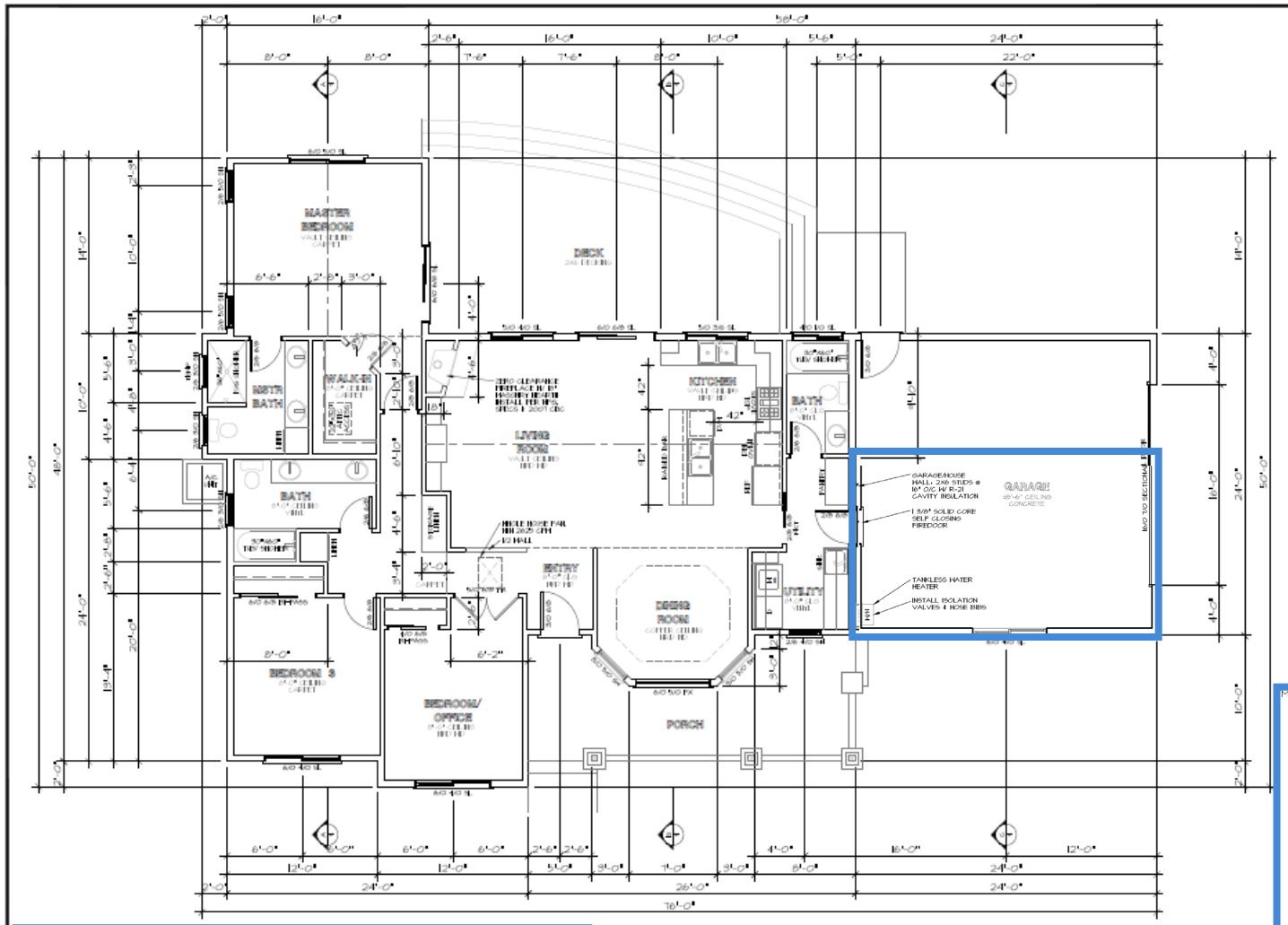
01	02	03	04	05	06	07
Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name	Required Thermostat Type
HVAC System1	Heating and cooling system other	Heating Component 1	Cooling Component 1	HVAC Fan 1	Air Distribution System 1	Setback

HVAC - HEATING UNIT TYPES

01	02	03	04	05
Name	System Type	Number of Units	Heating Efficiency Type	Efficiency
Heating Component 1	Central gas furnace	1	AFUE	92

HVAC - COOLING UNIT TYPES

01	02	03	04	05	06	07	08
Name	System Type	Number of Units	Efficiency EER	Efficiency SEER	Zonally Controlled	Mulit-speed Compressor	HERS Verification
Cooling Component 1	Central split AC	1	12.2	14	Not Zonal	Single Speed	Cooling Component 1-hers-cool



FLOOR PLAN NOTES:

INSULATION

1. ROOF/ATTIC: INSTALL R-38 LOOSE-FILL FIBERGLASS INSULATION IN CEILING & R-19 LOOSE-FILL INSULATION W/ BOX NETTING BELOW ROOF DECK (PER MFG SPECS).
2. EXTERIOR WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY & R-4 EPS RIGID FOAM INSULATION OVER SHEATHING.
3. GARAGE TO HOUSE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
4. KNEE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
5. FLOORS: INSTALL R-19 FIBERGLASS BATT INSULATION BETWEEN FLOOR JOISTS, FASTEN RETAINING RODS @ 24" O/C.
6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

WINDOWS & DOORS

6. ALL WINDOWS SHALL BE "REALLY GOOD WINDOW CO." SERIES "BEST EVER" VINYL FRAMED & NFRC RATED WITH A MAXIMUM U-FACTOR OF 0.32 AND A MAXIMUM SHGC OF 0.25.
7. ALL WINDOWS SHALL BE HAVE A MINIMUM OF (1) TEMPERED PANE OR GLASS BLOCK, OR HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
8. AT LEAST ONE WINDOW IN EACH BEDROOM SHALL MEET EMERGENCY ESCAPE REQUIREMENTS. A MINIMUM NET CLEAR OPENING OF 5 SQUARE FEET. MINIMUM NET CLEAR OPENING HEIGHT OF 24 INCHES. MINIMUM NET CLEAR OPENING WIDTH OF 20 INCHES; AND A CLEAR OPENING MAX HEIGHT NOT TO EXCEED 44 INCHES ABOVE THE FLOOR.
9. ALL EXTERIOR DOORS SHALL HAVE DEAD BOLTS W/ STEEL PLATE @ THE DEAD BOLT STRIKER, SOLID SHIM 6" ABOVE & BELOW W/ 2-#8X3" SCREWS.
10. FRONT DOOR SHALL HAVE A PEEP HOLE OR VISION PANEL.
11. ALL EXTERIOR DOORS SHALL BE OF APPROVED NONCOMBUSTIBLE CONSTRUCTION OR SOLID CORE WOOD AND HAVING STILES & RAILES NOT LESS THAN 1 3/8" THICK W/ INTERIOR FIELD PANELS NO LESS THAN 1 1/4" THICK, OR SHALL HAVE A FIRE RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
12. ALL LANDINGS W/ SLIDERS OR IN SHIMS DOORS SHALL HAVE A MAXIMUM STEP DOWN OF 1 3/4" MEASURED FROM TOP OF FLOOR.
13. ALL DOORS SHALL MEET THE MINIMUM STANDARDS AS ESTABLISHED BY THE I.B.C. TITLE-24 STANDARDS.

MECHANICAL & PLUMBING

1. ALL DUCTS SHALL BE R-8 FLEX DUCTING IN ATTIC. SEAL ALL CONNECTIONS & PENETRATIONS. HERS VERIFIED DUCT LEAKAGE
2. PERMANENT LABEL AT RETURN FILTER GRILL SHALL READ "USE ONLY REPLACEMENT FILTERS WITH AN INTIAL RESISTANCE LESS THAN 0.032 AT 400 CFM AIRFLOW RATE"
3. INDOOR AIR QUALITY MIN VENTILATION AIRFLOW RATE = 47.5 CFM.
4. WHOLE HOUSE FAN MIN AIRFLOW RATE = 2625.5 CFM
5. INSTALL ISOLATION VALVES AND HOSE BIBS AT TANKLESS WATER HEATER
6. INSULATE ALL HOT WATER PIPES W/ MIN 1" PIPE INSULATION
7. T&P VALVE ON WATER HEATER DRAINED TO OUTSIDE
8. GAS LINE TO WATER HEATER W/ 200 KBTU/H SUPPLY CAPACITY
9. TUB/SHOWER SHALL BE NO MORE THAN 16 GALLONS
10. ALL TUB/SHOWER OPENINGS SHALL BE RODENT PROOF, WITH 1" CEMENT COVERING IN AN APPROVED MANNER
11. ALL SHOWERS AND TUB/SHOWER WALLS SHALL HAVE SMOOTH HARD, NONABSORBENT SURFACE OVER A MOISTURE RESISTANT UNDERLAYMENT TO A HEIGHT OF 70" ABOVE DRAIN INLET.
12. DRYER DUCT TO BE SMOOTH METAL DUCT THAT EXTENDS TO OUTSIDE WITH A BACKDRAFT DAMPER, 14' MAX LENGTH, INCLUDING (2) 90° ELBOWS PER CMC.

MECHANICAL SCHEDULE

SYSTEM TYPE	SYSTEM REQUIREMENTS	NOTES
HEATING	GAS FURNACE, 60 KBTU/H OUTPUT, 92% AFUE	LOCATED IN ATTIC
COOLING	SPLIT 3 1/2 TON AC UNIT, 14 SEER, 12.2 EER, 42 KBTU/H TOTAL OUTPUT	HERS VERIFIED AIRFLOW, FAN EFFICIENCY, REFIGERANT CHARGE
DUCTS	R-8 FLEX DUCTS (IN ATTIC) - MIN. 350 CFM/TON OR MIN GRILL SIZE TABLE 150.0-B OR C	HERS VERIFIED DUCT LEAKAGE, MIN MERV 6 FILTER MEDIA ON RETURN
WHOLE HOUSE FAN	QUIET COOL MODEL QC ES-3100, 2685 CFM, 266 WATTS	N/A
INDOOR AIR QUALITY (IAQ)	PANASONIC, MODEL FV05VS3, 60 CFM 16.3 WATTS	LOCATED IN LAUNDRY ROOM
DOMESTIC HOT WATER (DHW)	0.95 EF TANKLESS WATER HEATER, 0.0 GAL, 199.9 KBTU/H	ALL H/W PIPES INSULATED (NO HERS)

MAIN FLOOR PLAN
1/4"=1'-0"

N

BUILDING CALCULATIONS

MAIN FLOOR	1151 S.F.
GARAGE	576 S.F.
PORCH	217 S.F.
DECK	333 S.F.

DESIGN-IT-RIGHT ARCHITECTS

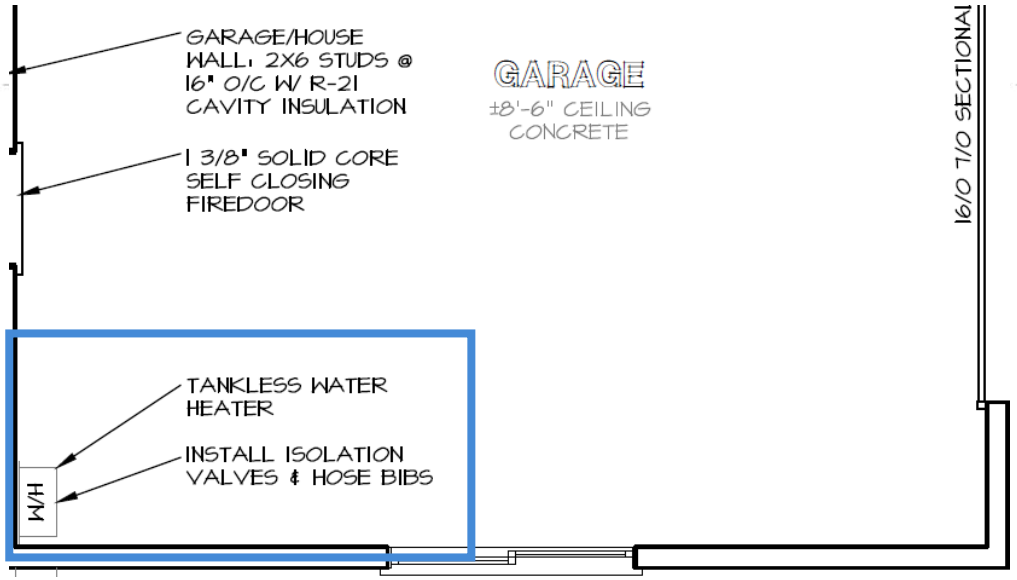
SITE INFORMATION:
[illegible] JACKSON RD.
STOCKTON CA

PROPOSED PROJECT FOR:
JOSEPH SAMPLE

MAIN FLOOR PLAN

REVISION DATE	BY

DRAWN BY: R. BRIAN SELBY
DATE: JAN 2017
SCALE: 1/4"=1'-0"
JOB NAME: SAMPLE
JOB NO: SAMPLE
SHEET NO: 3
OF 11



MECHAINCAL & PLUMBING

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2. PERMANENT LABEL AT RETURN FILTER GRILL SHALL READ "USE ONLY REPLACEMENT FILTERS WITH AN INTIAL RESISTANCE LESS THAN 0.032 AT 400 CFM AIRFLOW RATE"
3. INDOOR AIR QUALITY MIN VENTILATION AIRFLOW RATE = 47.5 CFM.
4. WHOLE HOUSE FAN MIN AIRFLOW RATE = 2625.5 CFM
5. INSTALL ISOLATION VALVES AND HOSE BIBS AT TANKLESS WATER HEATER
6. INSULATE ALL HOT WATER PIPES W/ MIN 1" PIPE INSULATION
7. T&P VALVE ON WATER HEATER DRAINED TO OUTSIDE
8. GAS LINE TO WATER HEATER W/ 200 KBTU/H SUPPLY CAPACITY

MECHANICAL SCHEDULE

SYSTEM TYPE	SYSTEM REQUIREMENTS	NOTES
HEATING	GAS FURNACE, 60 KBTU/H OUTPUT, 92% AFUE	LOCATED IN ATTIC
COOLING	SPLIT 3 1/2 TON AC UNIT, 14 SEER, 12.2 EER. 42 KBTU/H TOTAL OUTPUT	HERS VERIFIED AIRFLOW, FAN EFFICIENCY, REFIGERANT CHARGE
DUCTS	R-8 FLEX DUCTS (IN ATTIC) - MIN. 350 CFM/TON OR MIN GRILL SIZE TABLE 150.0-B OR C	HERS VERIFIED DUCT LEAKAGE, MIN MERV 6 FILTER MEDIA ON RETURN
WHOLE HOUSE FAN	QUIET COOL MODEL QC ES-3100, 2685 CFM, 266 WATTS	N/A
INDOOR AIR QUALITY (IAQ)	PANASONIC, MODEL FV05VS3, 60 CFM 16.3 WATTS	LOCATED IN LAUNDRY ROOM
DOMESTIC HOT WATER (DHW)	0.95 EF TANKLESS WATER HEATER, 0.0 GAL, 199.9 KBTU/H	ALL H/W PIPES INSULATED (NO HERS)

Field Inspectors

Verify at rough frame

- ✓ Water heater piping distribution and insulation
- ✓ If gas or propane, verify heat pump ready measures are met

Verify at final

- ✓ Water heater type and efficiency
- ✓ Fenestration alternative for storage-type water heaters
- ✓ Compact distribution or heat recovery if modeled

Lighting Residential

Mandatory § 110.9, § 150.0(k)

Lighting Mandatory Requirements

Residential § 110.9, § 150.0(k)1

JA8 high efficacy light sources

- Manufacturer test procedures updated
- Light sources must be certified to JA8-2019 on or after January 1, 2020
- Existing JA8-2016 light sources may be installed and do not need to be retested
- JA8-2019 light sources can be installed for projects complying under 2016 code

Lighting Mandatory Requirements

2019 Reference Joint Appendices

JA8-2019 Requirements

Category	Requirements
R9	≥ 50 for all light sources other than T20
Rated life	≥ 15,000 hours
Minimum dimming levels	≤ 10%
Flicker	< 30% for frequencies of 200 Hz or below (at 20% light output)
Audible noise	≤ 24 dBa at 1 meter from light source (at full light output, and 20%)
Elevated temperature (for enclosed luminaires)	Energy Star testing procedure to ensure life and quality of light lasts at higher temps

Lighting Mandatory Requirements

2019 Reference Joint Appendices

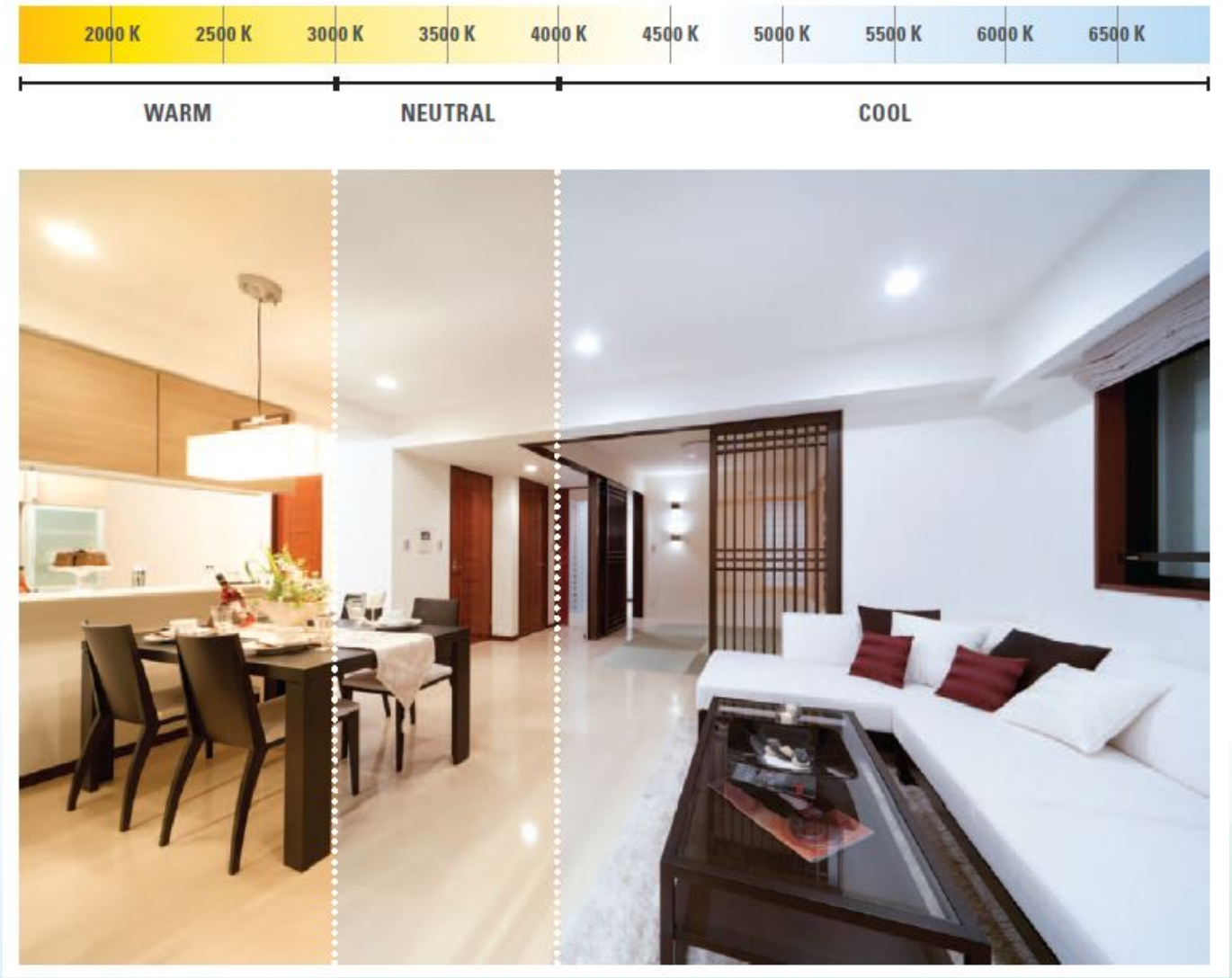
JA8-2019 Requirements (continued)

Category	Requirements
Color rendering index (CRI)	≥ 90 for all products other than T20 lamps
Color rendering index (CRI)	≥ 82 for T20 lamps
Luminous efficacy	45 lumens per watt (tested at full output)
Power factor	≥ 0.90 when tested at full output
Start time	Must turn on within 0.5s
Correlated color temp (CCT)	≤ 4000K

JA8-2019 Color Rendering Index (CRI)

Source: California Lighting Technology Center

JA8-2019 Correlated Color Temperature (CCT)



Source: California Lighting Technology Center

Lighting Mandatory Requirements

Residential § 150.0(k)1E, I

Night, step and path lights

- Vacancy sensor required if either
  - Greater than 5 watts
  - Greater than 150 lumens

Light sources internal to drawers, cabinets, or linen closets

- Vacancy sensor required if either
  - Greater than 5 watts
  - Greater than 150 lumens
  - Not controlled to automatically turn lighting off when closed

Lighting Mandatory Requirements

Residential § 150.0(k)1G

Screw base luminaires

- Not in recessed downlight luminaires in ceilings
- Shall contain lamps that comply with JA8
- Lamps shall be labeled as JA8-2016 or JA8-2019
- Exception: Luminaires with hard-wired ballasts for high intensity discharge lamps (HID)

Lighting Mandatory Requirements

Residential § 150.0(k)1H

Enclosed luminaires with separable light sources

- Must contain light sources marked JA8-2016-E or JA8-2019-E
- Defined as having ventilation openings < 3 in^2 per lamp
- Both indoor and outdoor

Lighting Mandatory Requirements

Residential § 150.0(k)2

Bathrooms, garages, laundry rooms, utility rooms

- At least one luminaire controlled by either
  - Vacancy sensor
  - Occupancy sensor configured for manual-ON (now allow dipswitch)

All JA8 light sources must be controlled by either

- Dimmer
- Vacancy sensor
- Occupancy sensor
- Exceptions: closets less than 70 ft^2, luminaires in hallways

Lighting Summary of Changes

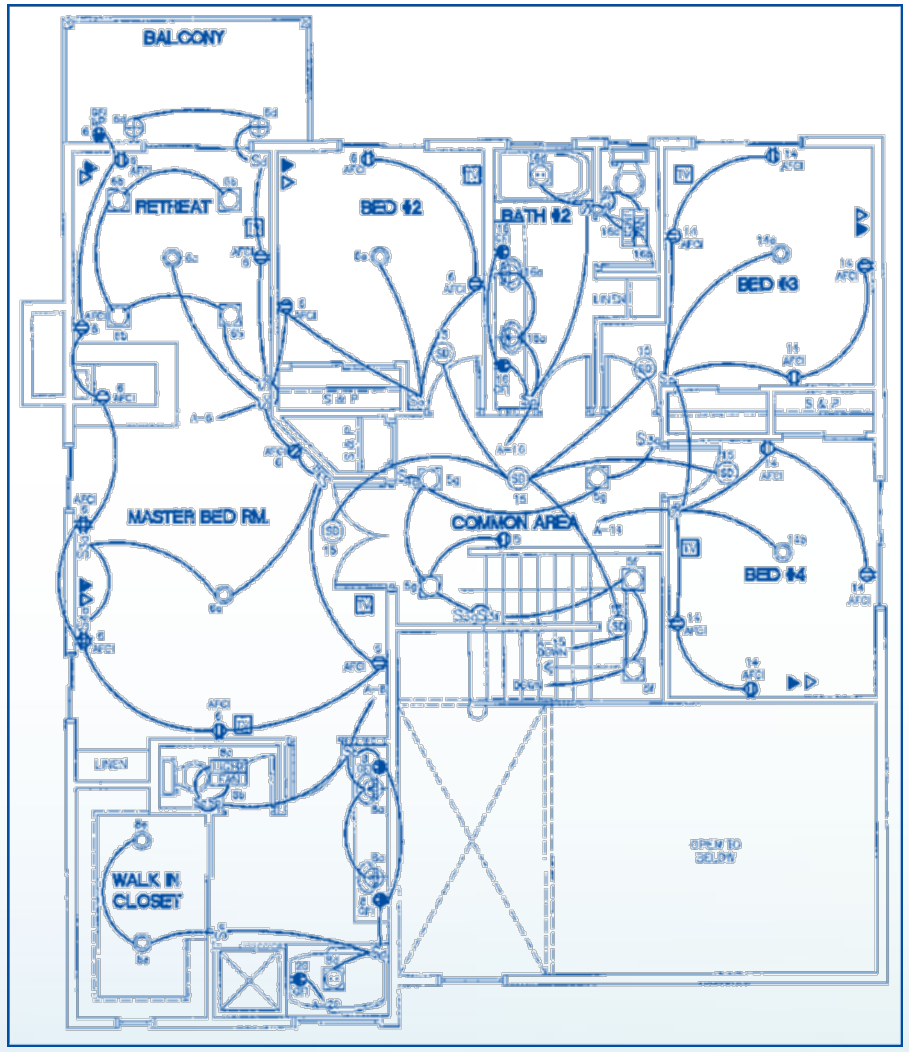
All indoor general lighting LED light sources

- JA8 certified
  - Exception for decorative and outdoor LEDs
- Bathroom, garage, laundry, utility rooms
  - At least one light source must be controlled by vacancy sensor
  - All others in these spaces must be on either occupancy or vacancy sensor, or dimmer
- All other indoor spaces
  - Occupancy sensor, vacancy sensor, or dimmer
  - Exception for closets less than 70 ft^2, and hallways

JA8 elevated temperature certification required

- Lamps and separable light sources in downlights and enclosed luminaires

Plans Examiners



Verify lighting and controls on electrical plans

- ✓All lighting must be high efficacy
- ✓Under cabinet lighting must be separately switched
- ✓Vacancy sensor in bathrooms, garages, laundry, utility rooms
- ✓Controls for outdoor lighting
- ✓May ask for CF2R lighting form
  - No CF1R for lighting

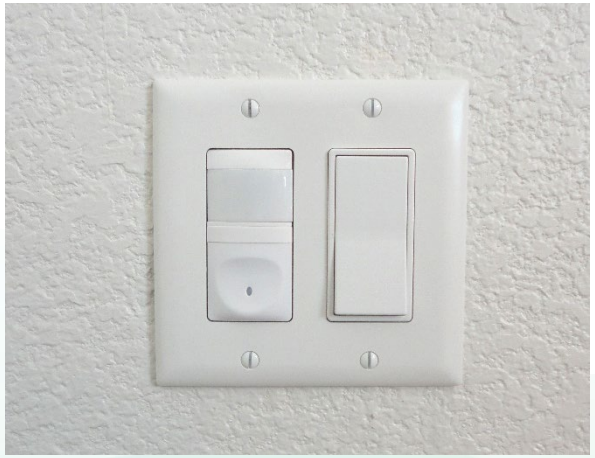
Field Inspectors

Verify at rough frame

- ✓ IC/AT rated cans
- ✓ GU-24 sockets

Verify at final

- ✓ All lighting is high efficacy
- ✓ JA8 lamps have labels, plus controls
- ✓ No screw base in recessed cans
- ✓ Vacancy sensor in bathroom, garage, laundry, utility rooms
- ✓ All general lighting LEDs on occupancy, vacancy, or dimmer
- ✓ Controls for outdoor lighting



Photovoltaic Residential

Administrative § 10-109, 10-115

Prescriptive: § 150.1(c)14

Photovoltaic Administrative Requirements

All Buildings § 10-109

Local jurisdictions can apply for PV exclusion

- Written application must be submitted to the CEC
- Requires public review within jurisdiction of entity, or service area of utility prior to application
- Must show not cost effective for particular buildings
  - Implementation of public agency rules regarding utility system cost and revenue requirements
  - Compensation for customer-owned generation
  - Interconnection fees

Community Shared Solar Administrative Requirements

All Buildings § 10-115

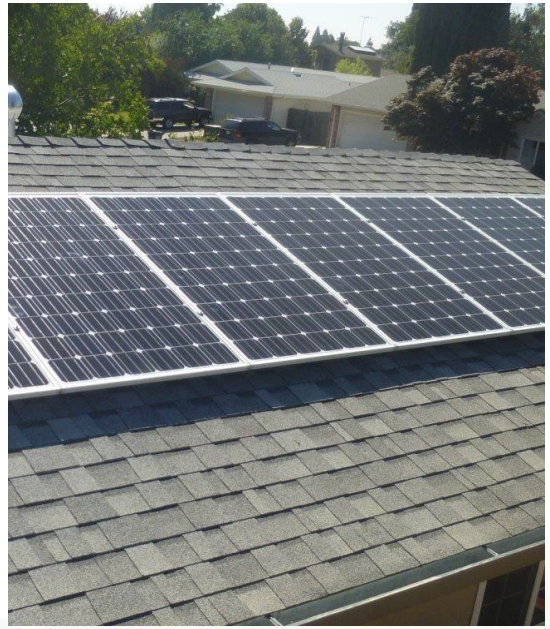
Community shared solar or battery storage

- Must be installed and available for inspection by final
- Must provide ≤ energy performance than designed
- Must provide energy saving benefits directly to buildings
  - Actual reduction in consumption of dedicated building
  - Utility energy reduction credits
  - Payments to the building
- Minimum 20 year benefit
- Must be approved by the CEC

Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14

- PV systems sized to offset annual kWhs of mixed-fuel home
- Meet requirements in Reference Joint Appendix JA11
  - Verification of number of panels, panel type, size, orientation, tilt, and shading
  - Solar access tools
    - ✓Aurora Solar approved
    - ✓Sun Eye default tool
  - Remote monitoring capability required, with mobile app
- Several exceptions



Photovoltaic Prescriptive Requirements

Residential § 150.1(c)14

PV Sizes for Mixed Fuel Homes. 2700 SF Prototype			
CZ	Efficiency EDR without PV, based on 2019 Efficiency Measures	Total EDR with PV	kW PV Size for Displacing kWh Electric Only
1 - Humboldt	48.0	26.5	3.4
2 - Santa Rosa	41.2	18.0	2.9
3 - San Francisco	46.9	22.7	2.8
4 - San Jose	43.1	22	2.9
5 - Santa Maria	42.5	20.2	2.7
6 - Costal LA	48.0	20.9	2.9
7 - San Diego	48.0	14.9	2.7
8 - Disneyland	43.0	14.6	2.9
9 - Burbank	46.2	23.3	3.1
10 - Riverside	45.2	23.5	3.3
11- Redding	43.3	23.4	3.8
12 - Sacramento	43.1	24.5	3.1
13 - Fresno	44.8	22.1	4.0
14 - Palmdale	44.6	21.3	3.4
15 - Palm Springs	48.0	17.9	5.7
16 - Tahoe	46.3	27.5	3.0

- PV size is 2.8 kW average
- PV installed in existing homes is 7.2kW average
- Varies with climate zone and house size

Photovoltaic Prescriptive Requirements

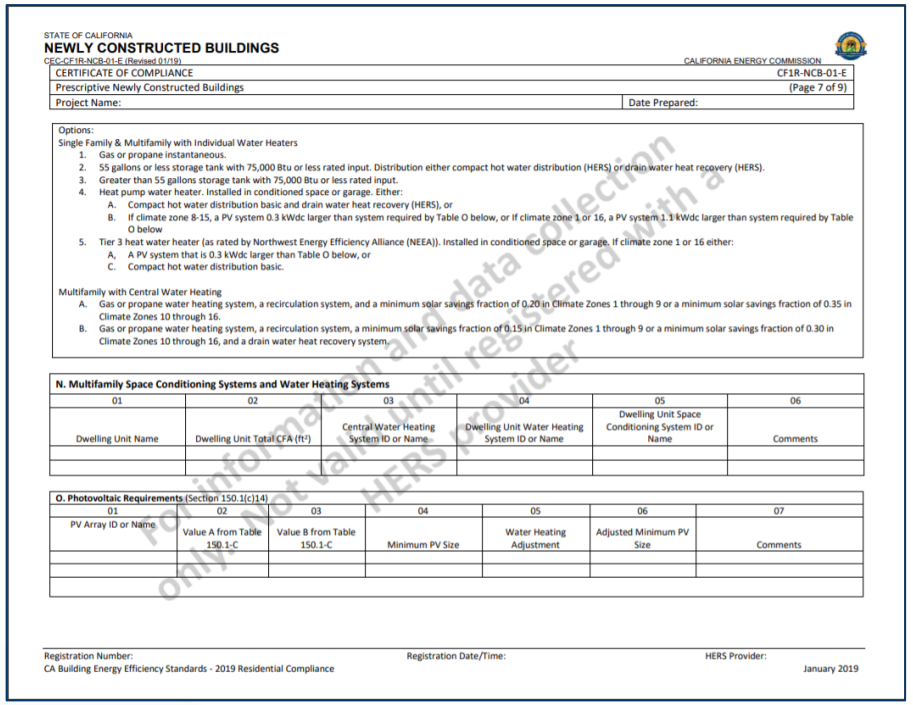
Residential § 150.1(c)14

Exceptions

- Shading due to external barriers
- Dwelling unit plan with solar ready approved prior to January 1, 2020
- Variances allowed for multi-story buildings with limited roof space
- PV size may be reduced 25% with battery storage system (minimum 7.5 kWh)

Plans Examiners

- ✓ Ensure panel cut sheets match designed power ratings
  - Maximum power times number of panels should meet or exceed or PV kW requirement
- ✓ If specific azimuth designed, plans match
- ✓ Climate zones 1 and 16, verify water heater adjustment if heat pump
- ✓ Verify no shading from architectural and other features
- ✓ Verify perimeter path and clearance to roof ridge according to Fire code
- ✓ Make sure notes are for CA codes (not NEC)



STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CEC-CF1R-NCB-01-E (Revised 01/19) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
Prescriptive Newly Constructed Buildings	(Page 7 of 9)
Project Name:	Date Prepared:

Options:
Single Family & Multifamily with Individual Water Heaters
1. Gas or propane instantaneous.
2. 55 gallons or less storage tank with 75,000 Btu or less rated input. Distribution either compact hot water distribution (HERS) or drain water heat recovery (HERS).
3. Greater than 55 gallons storage tank with 75,000 Btu or less rated input.
4. Heat pump water heater. Installed in conditioned space or garage. Either:
   A. Compact hot water distribution basic and drain water heat recovery (HERS), or
   B. If climate zone 8-15, a PV system 0.3 kWdc larger than system required by Table O below, or If climate zone 1 or 16, a PV system 1.1 kWdc larger than system required by Table O below
5. Tier 3 heat water heater (as rated by Northwest Energy Efficiency Alliance (NEEA)). Installed in conditioned space or garage. If climate zone 1 or 16 either:
   A, A PV system that is 0.3 kWdc larger than Table O below, or
   C. Compact hot water distribution basic.

Multifamily with Central Water Heating
A. Gas or propane water heating system, a recirculation system, and a minimum solar savings fraction of 0.20 in Climate Zones 1 through 9 or a minimum solar savings fraction of 0.35 in Climate Zones 10 through 16.
B. Gas or propane water heating system, a recirculation system, a minimum solar savings fraction of 0.15 in Climate Zones 1 through 9 or a minimum solar savings fraction of 0.30 in Climate Zones 10 through 16, and a drain water heat recovery system.

N. Multifamily Space Conditioning Systems and Water Heating Systems

01	02	03	04	05	06
Dwelling Unit Name	Dwelling Unit Total CFA (ft²)	Central Water Heating System ID or Name	Dwelling Unit Water Heating System ID or Name	Dwelling Unit Space Conditioning System ID or Name	Comments

O. Photovoltaic Requirements (Section 150.1(c)14)

01	02	03	04	05	06	07
PV Array ID or Name	Value A from Table 150.1-C	Value B from Table 150.1-C	Minimum PV Size	Water Heating Adjustment	Adjusted Minimum PV Size	Comments

Registration Number: Registration Date/Time: HERS Provider:
CA Building Energy Efficiency Standards - 2019 Residential Compliance January 2019

Project Name: Sample House
Calculation Date/Time: 2019-07-08T18:42:27-07:00
Calculation Description: Title 24 Analysis
Input File Name: Sample T24 2019 CBECC.ribd19

ENERGY DESIGN RATING

	Energy Design Ratings		Compliance Margins	
	Efficiency[1] (EDR)	Total[2] (EDR)	Efficiency[1] (EDR)	Total[2] (EDR)
Standard Design	45.9	24.7		
Proposed Design	45.4	24.2	0.5	0.5

RESULT: [3]: COMPLIES

[1] Efficiency measures include improvements like a better building envelope and more efficient equipment
[2] Total EDR includes efficiency, photovoltaics and batteries
[3] Building complies when all efficiency and total margins are greater than or equal to zero

- Standard Design PV Capacity: 2.68 kW
- PV System resized to 2.68 kWdc (a factor of 0.893) to achieve 'Standard Design PV' PV scaling

ENERGY USE SUMMARY

Energy Use (kTDV/ft^2-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	18.54	17.25	1.29	7
Space Cooling	28.53	30.02	-1.49	-5.2
IAQ Ventilation	2.79	2.79	0	0
Water Heating	14.18	12.55	1.63	11.5
Self Utilization Credit	n/a	0	0	n/a
Compliance Energy Total	**64.04**	**62.61**	**1.43**	**2.2**

REQUIRED PV SYSTEMS

01	02	03	04	05	06	07	08	09	10	11
DC System Size (kWdc)	Exception	Module Type	Array Type	Power Electronics	CFI	Azimuth (deg)	Tilt Input	Array Angle (deg)	Tilt: (x in 12)	Inverter Eff. (%)
2.68	NA	Standard	Fixed (open rack)	none	true	n/a	n/a	n/a	n/a	96

Field Inspectors

- ✓ Verify system matches plans
  - Spec sheets should match, including power, inverter efficiencies, number of panels
- ✓ If purlin supports designed, verify installed at rough frame stage
- ✓ Ensure no unnecessary shading from roof penetrations
  - Flues should be at least a distance twice height away from arrays (2 feet tall flue should be 4 feet from array)

HVAC
Residential

Mandatory § 110.2, § 110.5, § 110.12, § 150.0(m, o)

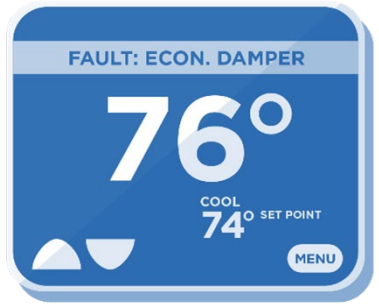
Performance § 150.1(b)

Prescriptive § 150.2(a)1

HVAC Mandatory Requirements

All Buildings § 110.2, § 110.5, § 110.12

- Space conditioning equipment efficiencies updated to align with ASHRAE 90.1-2016
- Pilot lights prohibited for indoor and outdoor fireplaces
- Demand manage requirements updated
  - Thermostats meet JA5 requirements where applicable, if no EMCS is installed
  - Communication protocols either
    - ✓ Must be certified as Open ADR 2.0a or b Virtual End Node (VEN), certified and listed at the Open ADR Alliance website
    - ✓ Must be *capable of responding* to open ADR 2.0b VEN, certified to CEC and listed on the CEC Manufacturers Certification web page



HVAC Mandatory Requirements

Residential § 150.0(m)1

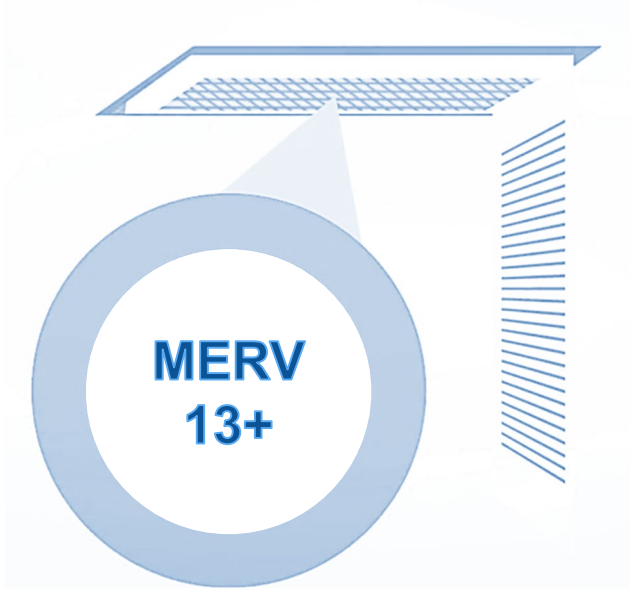
California Mechanical Code compliance and duct insulation

- Mandatory R-6, or R4.2 if duct system is entirely inside thermal boundary
- Two exceptions added to minimum duct insulation requirements
  - Duct portions inside wall cavities are not required to be insulated when both
    - ✓ Cavity, duct or plenum is located entirely inside the thermal envelope
    - ✓ All transitions into unconditioned space is air-sealed and insulated to R-6
  - Duct portions completely exposed and surrounded by directly conditioned space not required to be insulated

R-6

HVAC Mandatory Requirements

Residential § 150.0(m)12



Air filtration

- MERV 13 filter efficiency required
- Ducted heating or cooling systems, supply-only ventilation systems, and on the supply side of balanced mechanical ventilation systems (HRV, ERV)
  - Not applicable to evaporative coolers
- Space conditioning system air filters must be labeled with efficiency and max pressure drop
- 2 inch filters, pressure drop determined by designer
- 1-inch filters allowed, but must meet extra requirements

HVAC Mandatory Requirements

Residential § 150.0(m)13

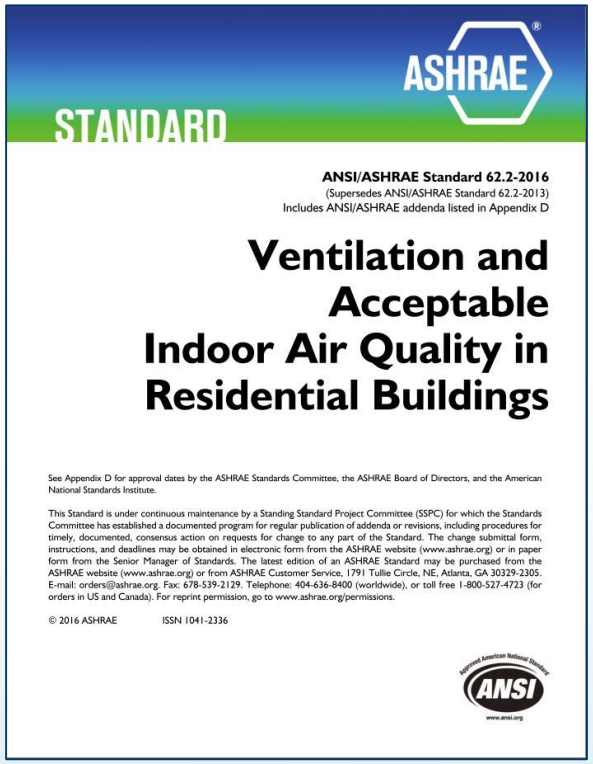
Space conditioning system airflow rate and fan efficacy

- All single and multi-zone systems
  - Must demonstrate airflow at ≥ 350 CFM per ton
  - 0.45 watts per CFM minimum fan efficacy for systems with gas furnaces manufactured on or after July 3, 2019
    - ✓ US DOE requires fans to provide minimum efficiency equivalent to constant torque brushless permanent magnet (BPM) type motors
- Small duct high velocity system requirements added
  - Must demonstrate airflow at ≥ 250 CFM per ton
  - 0.62 watt per CFM minimum fan efficacy
- HERS verification required

Ventilation Mandatory Requirements

Residential § 150.0(o)1

Higher ventilation rates to meet ASHRAE 62.2-2016



2016 Equation 150.0-B: $Q_{tot} = \mathbf{0.01} \times A_{floor} + 7.5 \times (Nbr + 1)$

2019 Equation 150.0-B: $Q_{tot} = \mathbf{0.03} \times A_{floor} + 7.5 \times (Nbr + 1)$

Q_{tot} = total required ventilation rate, cfm

A_{floor} = dwelling-unit floor area, ft^2

Nbr = number of bedrooms (not less than 1)

Ventilation Mandatory Requirements

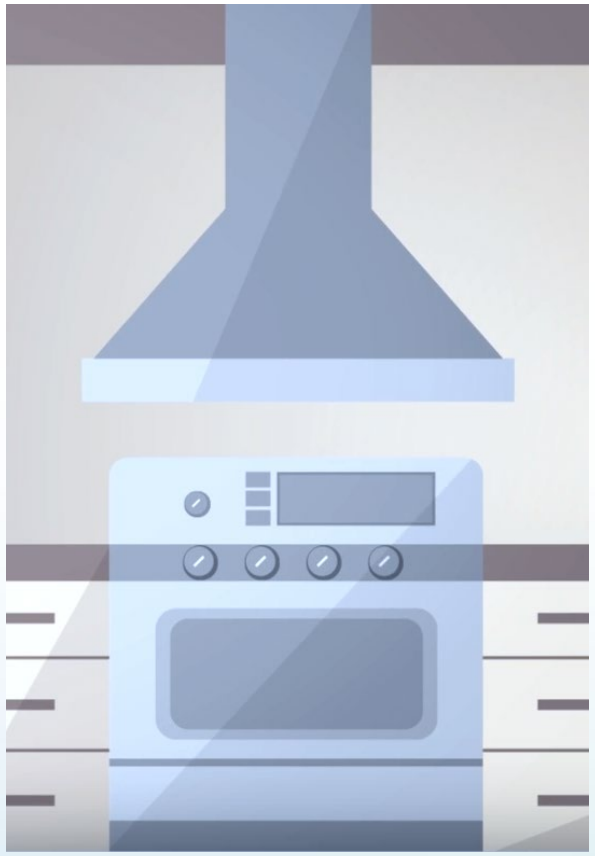
Residential § 150.0(o)1E

Multifamily dwelling units must have either

- Balanced ventilation system
- Continuously operating supply or exhaust ventilation system
  - Continuous systems require HERS verification for envelope leakage with blower door test
    - ✓ Maximum leakage of 0.3 CFM at 50Pa

Ventilation Mandatory Requirements

Residential § 150.0(o)1G, 2B



Kitchen range hoods

- HERS verification of range hood HVI ratings for airflow and sound
  - AHAM approved as alternate
- Range hoods must have minimum airflow of 100 CFM
- Maximum sone rating of 3.0
  - Fans over 400 CFM exempt

All other kitchen exhaust fans must have minimum airflow of 300 CFM per ASHRAE 62.2

HVAC Performance Requirements

Residential § 150.1(b)3B

New HERS field verification requirements for performance credits

- Heat pump HSPF rating > 8.2
- Heat pump rated heat capacity heating capacity values at 47 degrees Fahrenheit and 17 degrees Fahrenheit
- Whole house fan flow rate and fan efficacy
- Central fan integrated cooling flow rate and fan efficacy

Ventilation Prescriptive Requirements

Additions § 150.2(a)1C

Mechanical ventilation for indoor air quality

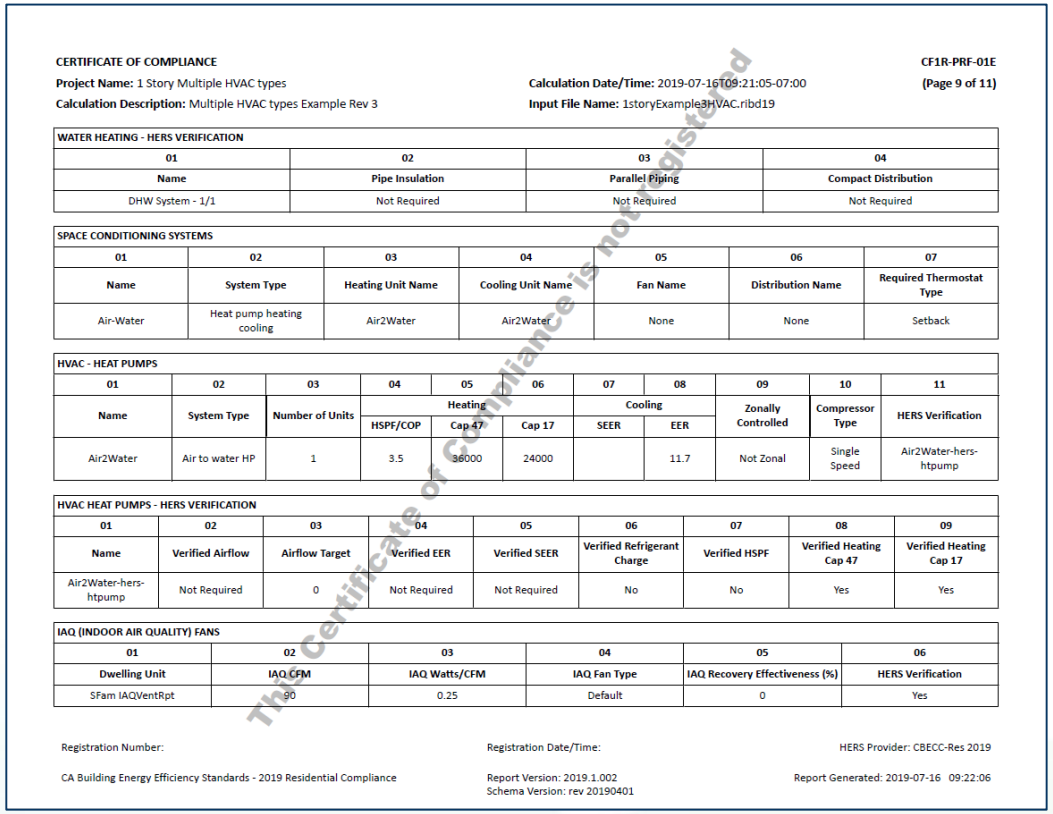
- Addition of new dwelling unit(s) to existing building meet mandatory requirements per
  - 150.0(o)1C for single family detached
  - 150.0(o)1E for multifamily with individual dwelling unit ventilation systems
  - 150.0(o)1F for multifamily with central ventilation systems

HVAC Summary of Changes

- Aligns equipment efficiencies with ASHRAE 90.1
- Changes requirements for duct insulation in conditioned spaces
- Aligns IAQ with ASHRAE 62.2 with some amendments
- Adds requirements for small duct high velocity systems
- Decreased fan efficacy for furnace air handlers

Plans Examiners

- ✓ Verify minimum efficiency
- ✓ Verify duct location and insulation
- ✓ Verify duct leakage testing specified
- ✓ Refrigerant charge and air flow
  - Including split or mini-split system
- ✓ Verify MERV 13 air filters specified
- ✓ Ventilation system requirements
  - Whole house fan
  - Kitchen range hood



CERTIFICATE OF COMPLIANCE CF1R-PRF-01E

Project Name: 1 Story Multiple HVAC types **Calculation Date/Time:** 2019-07-16T09:21:05-07:00 (Page 9 of 11)

Calculation Description: Multiple HVAC types Example Rev 3 **Input File Name:** 1storyExample3HVAC.ribd19

WATER HEATING - HERS VERIFICATION

01	02	03	04
Name	Pipe Insulation	Parallel Piping	Compact Distribution
DHW System - 1/1	Not Required	Not Required	Not Required

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name	Required Thermostat Type
Air-Water	Heat pump heating cooling	Air2Water	Air2Water	None	None	Setback

HVAC - HEAT PUMPS

01	02	03	04	05	06	07	08	09	10	11
Name	System Type	Number of Units	Heating			Cooling		Zonally Controlled	Compressor Type	HERS Verification
			HSPF/COP	Cap 47	Cap 17	SEER	EER			
Air2Water	Air to water HP	1	3.5	36000	24000		11.7	Not Zonal	Single Speed	Air2Water-hers-htpump

HVAC HEAT PUMPS - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	Verified Airflow	Airflow Target	Verified EER	Verified SEER	Verified Refrigerant Charge	Verified HSPF	Verified Heating Cap 47	Verified Heating Cap 17
Air2Water-hers-htpump	Not Required	0	Not Required	Not Required	No	No	Yes	Yes

IAQ (INDOOR AIR QUALITY) FANS

01	02	03	04	05	06
Dwelling Unit	IAQ CFM	IAQ Watts/CFM	IAQ Fan Type	IAQ Recovery Effectiveness (%)	HERS Verification
SFam IAQVentRpt	90	0.25	Default	0	Yes

Registration Number: Registration Date/Time: HERS Provider: CBECC-Res 2019

CA Building Energy Efficiency Standards - 2019 Residential Compliance Report Version: 2019.1.002 Schema Version: rev 20190401 Report Generated: 2019-07-16 09:22:06

WATER HEATERS

01	02	03	04	05	06	07	08	09	10	11	12
Name	Heating Element Type	Tank Type	# Units	Tank Vol. (gal)	Energy Factor or Efficiency	Input Rating or Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss or Recovery Eff.	1st Hr. Rating or Flow Rate	NEEA Heat Pump Brand or Model / Other	Tank Location or Ambient Condition
DHW Heater 1	Natural Gas	Consumer Instantaneous	1	0	0.95-UEF	200000-Btu/Hr	0	n/a	n/a	n/a	n/a

WATER HEATING - HERS VERIFICATION

01	02	03	04
Name	Pipe Insulation	Parallel Piping	Compact Distribution
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required

SPACE CONDITIONING SYSTEMS

01	02	03	04	05	06	07
Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name	Required Thermostat Type
HVAC System1	Heating and cooling system other	Heating Component 1	Cooling Component 1	HVAC Fan 1	Air Distribution System 1	Setback

HVAC - HEATING UNIT TYPES

01	02	03	04	05
Name	System Type	Number of Units	Heating Efficiency Type	Efficiency
Heating Component 1	Central gas furnace	1	AFUE	92

HVAC - COOLING UNIT TYPES

01	02	03	04	05	06	07	08
Name	System Type	Number of Units	Efficiency EER	Efficiency SEER	Zonally Controlled	Mulit-speed Compressor	HERS Verification
Cooling Component 1	Central split AC	1	12.2	14	Not Zonal	Single Speed	Cooling Component 1-hers-cool

Gas furnace check fan watt draw and date manufactured

HVAC COOLING - HERS VERIFICATION

01	02	03	04	05	06
Name	**Verified Airflow**	**Airflow Target**	**Verified EER**	**Verified SEER**	**Verified Refrigerant Charge**
Cooling Component 1-hers-cool	Required	350	Required	Not Required	Required

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07	08	09	10	11	12
			Duct Ins. R-value		**Duct Location**		**Surface Area**				
Name	**Type**	**Design Type**	**Suppy**	**Return**	**Supply**	**Return**	**Supply**	**Return**	**Bypass Duct**	**Duct Leakage**	**HERS Verification**
Air Distribution System 1	Unconditioned attic	Non-Verified	R-8	R-8	Attic	Attic	773.26	115.37	No Bypass Duct	Sealed and Tested	Air Distribution System 1-hers-dist

HVAC DISTRIBUTION - HERS VERIFICATION

01	02	03	04	05	06	07	08	09
Name	**Duct Leakage Verification**	**Duct leakage target (%)**	**Verified Duct Location**	**Verified Duct Design**	**Buried Ducts**	**Deeply Buried Ducts**	**Low-leakage Air Handler**	**Low Leakage Ducts Entirely in Conditioned Space**
Air Distribution System 1-hers-dist	Yes	5	Not Required	Not Required	Not Required	Credit not taken	Required	No

HVAC - FAN SYSTEMS

01	02	03	04
Name	**Type**	**Fan Power (Watts/CFM)**	**Name**
HVAC Fan 1	Single speed PSC furnace fan	0.58	HVAC Fan 1-hers-fan

Correction notice or warning?

HVAC FAN SYSTEMS - HERS VERIFICATION

01	02	03
Name	Verified Fan Watt Draw	Required Fan Power(Watts/CFM)
HVAC Fan 1-hers-fan	Required	0.58

IAQ (INDOOR AIR QUALITY) FANS

01	02	03	04	05	06
Dwelling Unit	IAQ CFM	IAQ Watts/CFM	IAQ Fan Type	IAQ Recovery Effectiveness (%)	HERS Verification
SFam IAQVentRpt	81	0.25	Default	0	Yes

COOLING VENTILATION

01	02	03	04	05	06	07
Name	Airflow Rate (CFM/ft2)	Cooling Vent CFM	Cooling Vent Watts/CFM	Total Watts	Number of Fans	HERS Verification
Cool Vent Fan 1	1.53	2685	0.099	265.815	1	Yes

HVAC - HEATING UNIT TYPES				
01	02	03	04	05
Name	System Type	Number of Units	Heating Efficiency Type	Efficiency
Heating Component 1	Central gas furnace	1	AFUE	92

HVAC - COOLING UNIT TYPES							
01	02	03	04	05	06	07	08
Name	System Type	Number of Units	Efficiency EER	Efficiency SEER	Zonally Controlled	Mulit-speed Compressor	HERS Verification
Cooling Component 1	Central split AC	1	12.2	14	Not Zonal	Single Speed	Cooling Component 1-hers-cool

MECHANICAL SCHEDULE

SYSTEM TYPE	SYSTEM REQUIREMENTS	NOTES
HEATING	GAS FURNACE, 60 KBTU/H OUTPUT, 92% AFUE	LOCATED IN ATTIC
COOLING	SPLIT 3 1/2 TON AC UNIT, 14 SEER, 12.2 EER. 42 KBTU/H TOTAL OUTPUT	HERS VERIFIED AIRFLOW, FAN EFFICIENCY, REFIGERANT CHARGE
DUCTS	R-8 FLEX DUCTS (IN ATTIC) - MIN. 350 CFM/TON OR MIN GRILL SIZE TABLE 150.0-B OR C	HERS VERIFIED DUCT LEAKAGE, MIN MERV 6 FILTER MEDIA ON RETURN
WHOLE HOUSE FAN	QUIET COOL MODEL QC ES-3100, 2685 CFM, 266 WATTS	N/A
INDOOR AIR QUALITY (IAQ)	PANASONIC, MODEL FV05VS3, 60 CFM 16.3 WATTS	LOCATED IN LAUNDRY ROOM
DOMESTIC HOT WATER (DHW)	0.95 EF TANKLESS WATER HEATER, 0.0 GAL, 199.9 KBTU/H	ALL H/W PIPES INSULATED (NO HERS)

MECHAINCAL & PLUMBING

1. ALL DUCTS SHALL BE R-8 FLEX DUCTING IN ATTIC. SEAL ALL CONNECTIONS & PENETRATIONS. HERS VERIFIED DUCT LEAKAGE
2. PERMANENT LABEL AT RETURN FILTER GRILL SHALL READ "USE ONLY REPLACEMENT FILTERS WITH AN INTIAL RESISTANCE LESS THAN 0.032 AT 400 CFM AIRFLOW RATE"
3. INDOOR AIR QUALITY MIN VENTILATION AIRFLOW RATE = 47.5 CFM.
4. WHOLE HOUSE FAN MIN AIRFLOW RATE = 2625.5 CFM
5. INSTALL ISOLATION VALVES AND HOSE BIBS AT TANKLESS WATER HEATER
6. INSULATE ALL HOT WATER PIPES W/ MIN 1" PIPE INSULATION
7. T&P VALVE ON WATER HEATER DRAINED TO OUTSIDE
8. GAS LINE TO WATER HEATER W/ 200 KBTU/H SUPPLY CAPACITY

Field Inspectors

- ✓ Verify HVAC efficiency
- ✓ Verify MERV 13 filters
- ✓ Verify ventilation systems
- ✓ Verify HERS duct leakage and refrigerant charge completed
- ✓ HERS forms are completed and registered with approved HERS provider

Envelope Requirements Residential

Administrative § 10-111

Mandatory § 100.1, § 110.6, § 150.0(c)

Prescriptive § 150.1(c)1-5

Fenestration and Exterior Doors Administrative Requirements

All Buildings § 10-111

World's Best Door Co.

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

NFRC National Fenestration Rating Council™ CERTIFIED

ENERGY PERFORMANCE RATINGS

Product Description* Default Frame** Wood	U-Factor/Solar Heat Gain Coefficient (SHGC)			
	1/4 Lite <4101	1/2 Lite <9001	3/4 Lite <11001	Full Lite >11001
2A1/na/AIR/0.250	0.23 / —	0.30 / —	0.36 / 0.33	0.40 / 0.40
2A1/.020(3)/AIR/0.750	0.21 / —	0.24 / —	0.26 / 0.31	0.28 / 0.36
2A1/na/AIR/0.675	0.23 / —	0.28 / —	0.33 / 0.34	0.34 / 0.40
3SS/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

Clarifications on labeling requirements

- Label efficiency values must be NFRC rated or CEC defaults
- Requires exterior doors to be NRFC rated and labeled
- Default values for doors in Reference Joint Appendix JA4.5

Exterior Door Mandatory Requirements

All Buildings § 100.1, §110.6

Exterior doors require U-factor rating

- National Fenestration Rating Council (NFRC)
- Default values for doors in Reference Joint Appendix JA4.5
  - These values are intentionally conservative
  - Will not meet prescriptive requirements
- Doors with ≥ 25% glazing treated as fenestration

Exterior Door Prescriptive Requirements

Residential § 150.1(c)5

Doors separating conditioned from unconditioned space

- Less than 25% glazed
- Must be NFRC rated and labeled
- Exception for fire protection doors between house and garage

Per Table 150.1-A, Table 150.1-B

- Maximum U-factor of 0.20

Fenestration Prescriptive Requirements

Residential § 150.1(c)3

Windows and glazed doors

Per Table 150.1-A, Table 150.1-B

- Maximum U-factor of 0.30
- Maximum SHGC of 0.23
- No SHGC requirement in climate zones 1,3,5,16

Addition of glazed doors

- 25% or more glazed

Insulation Mandatory Requirements

Residential § 150.0(c)

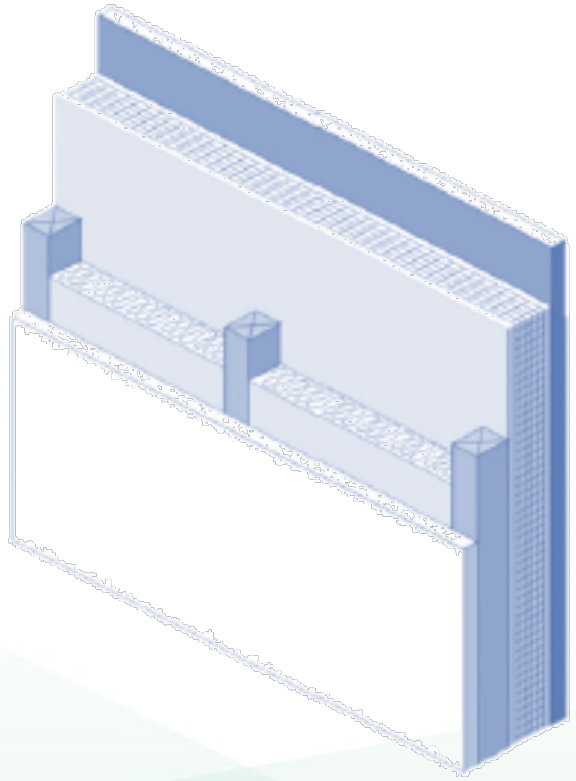
Wall insulation

2x4 walls assembly U-factor 0.102

2x6 walls assembly U-factor of 0.71

Opaque non-framed assembly U-factor 0.102
Masonry walls must meet prescriptive requirements (no trade-offs)

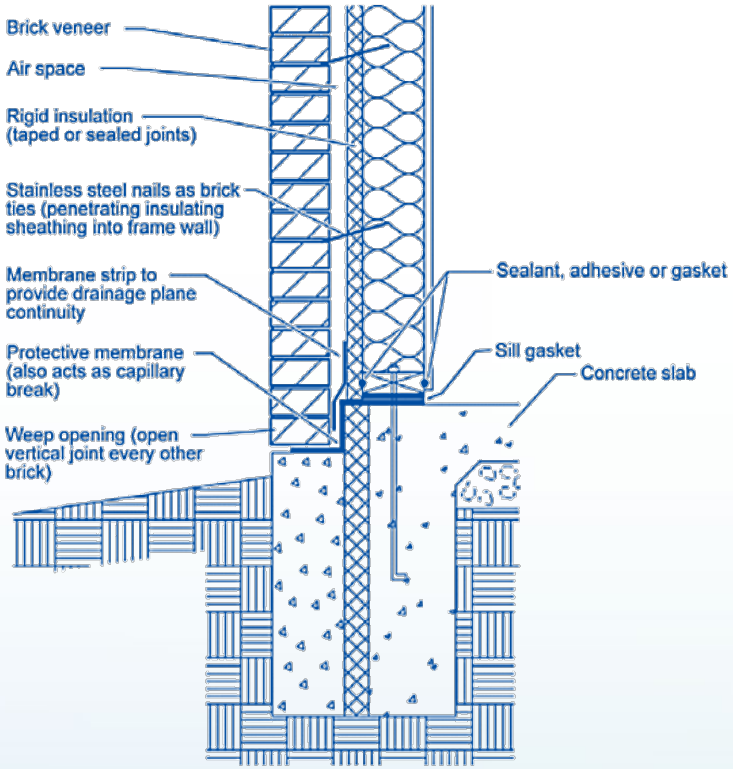
- Climate zones 1-15, above grade
  - ✓ Interior insulation – U-factor 0.77
  - ✓ Exterior insulation – U-factor 0.125
- Climate zone 16, above grade
  - ✓ Interior insulation – U-factor 0.59
  - ✓ Exterior insulation – U-factor 0.77



Insulation Prescriptive Requirements

Residential § 150.1(c)1B

Figure 28: Wood-Framed Wall With Brick Veneer

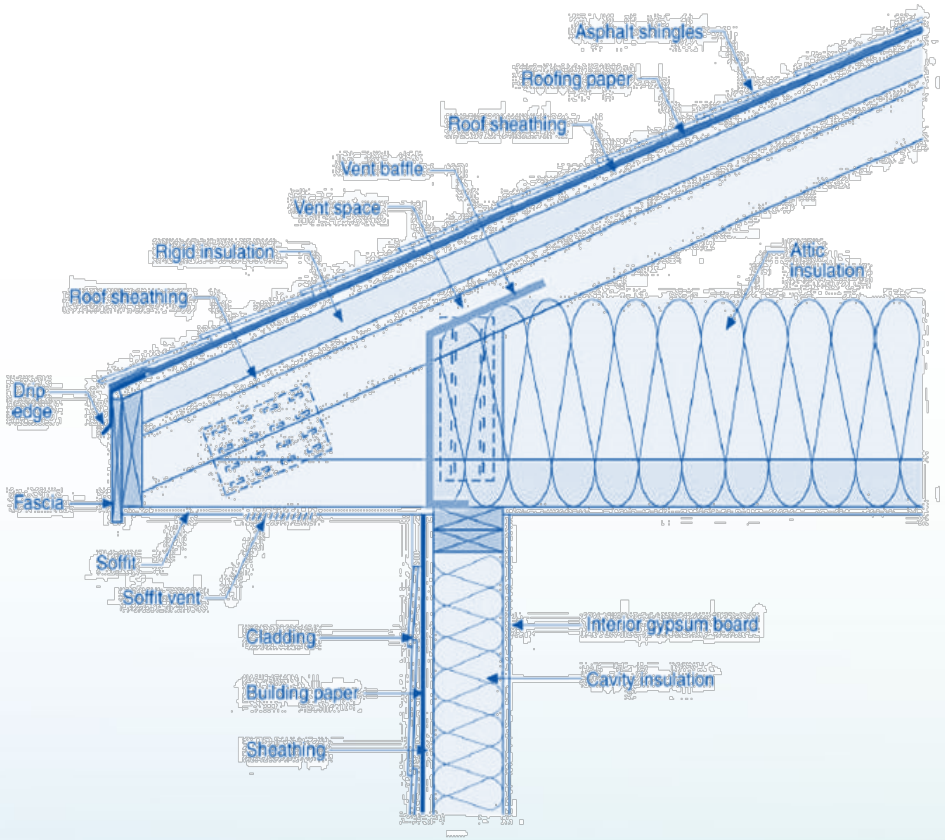


Wall insulation per Tables 150.1-A and 150.1-B

- Climate zones 1-5, 8-16 framed
  - Single family U-factor 0.048 (R-21 plus R-5)
  - Multifamily U-factor 0.051
- Climate zones 6-7 framed
  - U-factor 0.065
- Mass walls above and below grade must be insulated
- All other unframed walls meet framed U-factors

Insulation Prescriptive Requirements

Residential § 150.1(c)1A



Roof and ceiling insulation

Option A removed

- No longer a prescriptive option
- Only with performance method
  - Continuous insulation above roof rafters
  - Ceiling insulation

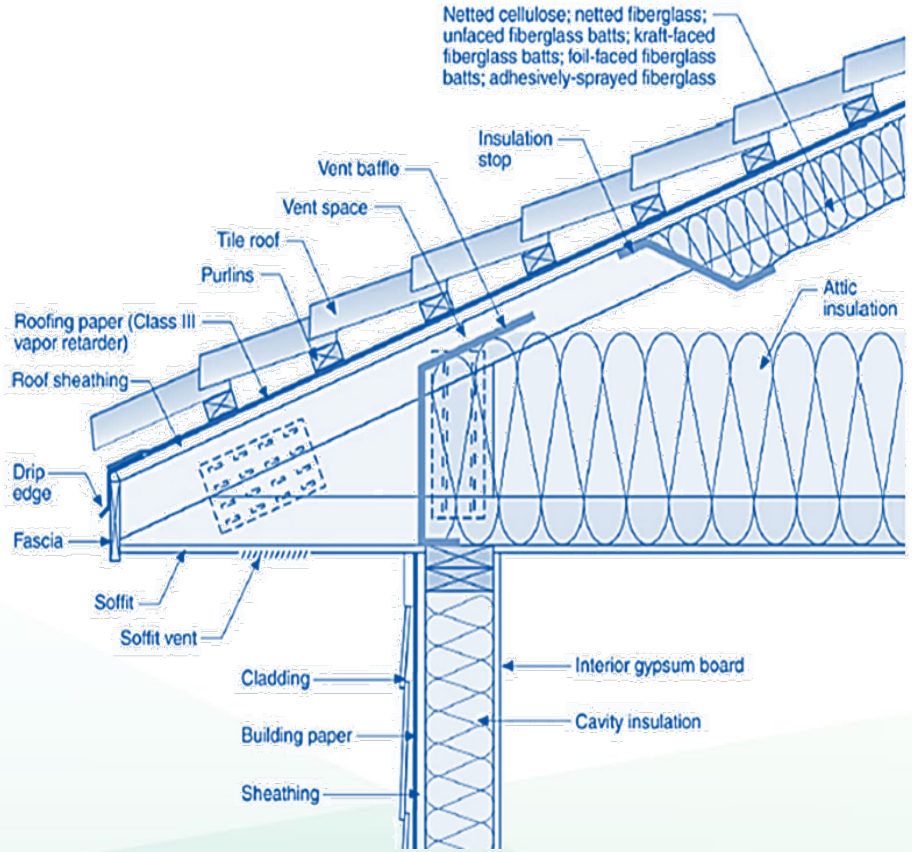
Insulation and Radiant Barrier Prescriptive Requirements

Residential § 150.1(c)1A, 2

Roof and ceiling insulation

Option B - Tables 150.1-A and 150.1-B

- Vented attic
- Below roof deck insulation
  - Single family R-19 in climate zones 4, 8-16
  - Multifamily R-19 in climate zones 4, 8, 9, 11-15
  - Multifamily R-13 in climate zones 10, 16
  - Roof assembly air space required
- Ceiling insulation R-30 or R-38 per Tables
- Radiant barrier in climate zones 2-3, 5-7
- Duct insulated to R-6 or R-8 per Tables



Insulation and Radiant Barrier Prescriptive Requirements

Residential § 150.1(c)1A,2

Roof and ceiling insulation

Option C - Tables 150.1-A and 150.1-B

- Ducts located in conditioned space with R-6 insulation
- Meet 150.1(c)9B with HERS verification
- Ceiling insulation
  - R-38 in climate zones 1, 11-16
  - R-30 in climate zones 2-10
- Radiant barrier in climate zones 2-15

Quality Insulation Installation Prescriptive Requirements

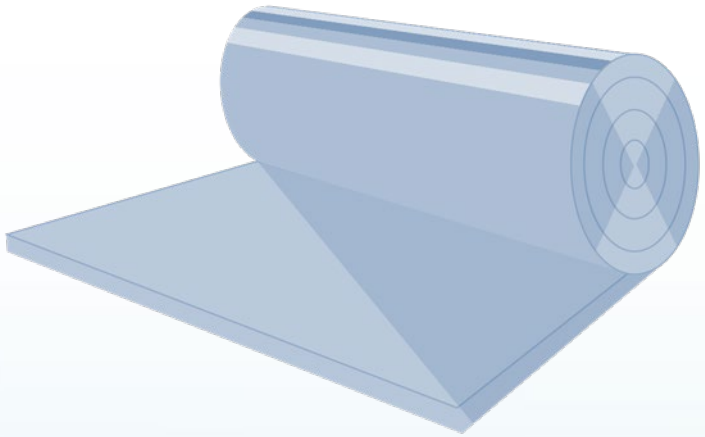
Residential § 150.1(c)1E

Quality insulation installation (QII)

- Requires HERS verification of installed insulation and exterior air barrier
- Meet criteria in Reference Residential Appendix RA3.5
- Not mandatory, but difficult to offset
- Modeling without can have 7-11% penalty
- Climate zone 7 not required for multifamily

Insulation Prescriptive Requirements

Additions § 150.2(a)1



All additions

- Existing and wall extensions, wood-framed
  - R-21 in 2x6, no continuous
  - R-15 in 2x4, no continuous
- Existing walls - no insulated header or air sealing required

Additions ≤ 700 square feet

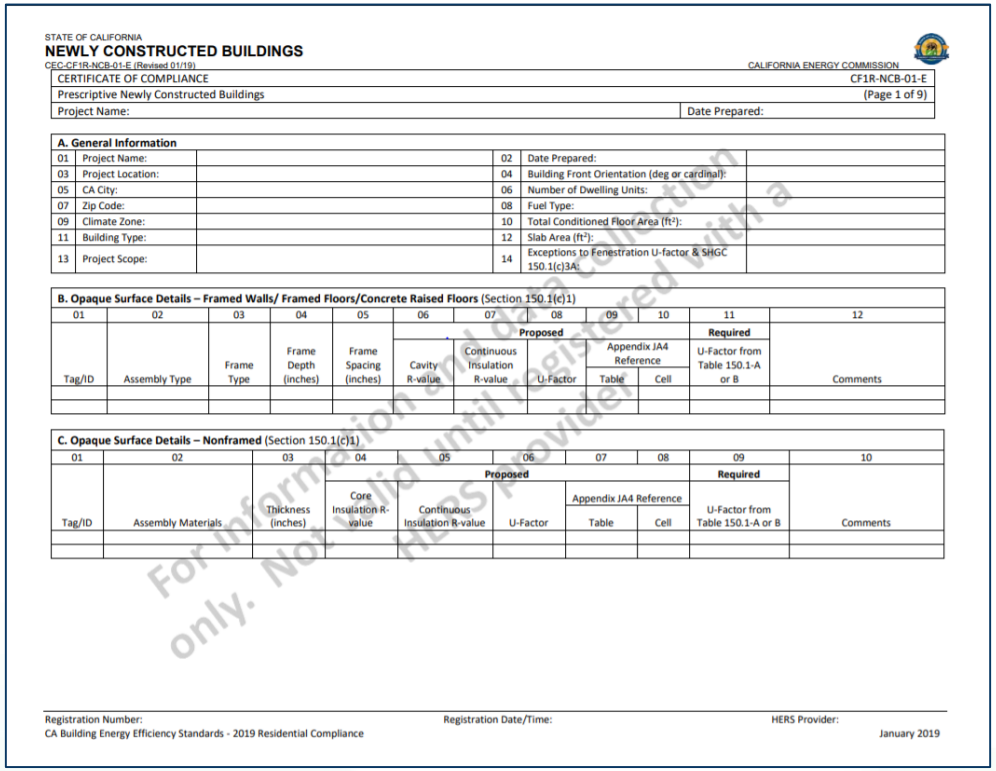
- Ceiling insulation
  - R-38 in climate zones 1,11-16
  - R-30 in climate zones 2-10
  - Radiant barrier in climate zones 2-15
  - Exception: R-22 allowed in rafter roofs
- QII not required

Envelope Summary of Changes

- Addition of exterior door labeling requirements
  - 25% or more glass is fenestration
- High performance attics
  - R-19 between rafters becomes new baseline
- High performance walls
  - Max U-factor of 0.048
- Increased window efficiency
  - Max U-factor of 0.30, SHGC of 0.23
- Quality insulation installation (QII) prescriptive baseline
  - HERS required

Plans Examiners

- ✓ Should have QII, with HERS
- ✓ Verify required insulation values
  - ✓ *Remember mandatory assembly U-factors*
- ✓ Verify required fenestration values
- ✓ Verify required door values
- ✓ Verify CF1R values match plans
- ✓ Penalized if R-values are less, or if U-factors and SHGCs are more



STATE OF CALIFORNIA
NEWLY CONSTRUCTED BUILDINGS
CEC-CF1R-NCB-01-E (Revised 01/19) — CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF COMPLIANCE	CF1R-NCB-01-E
Prescriptive Newly Constructed Buildings	(Page 1 of 9)
Project Name:	Date Prepared:

A. General Information

01	Project Name:	02	Date Prepared:		
03	Project Location:	04	Building Front Orientation (deg or cardinal):		
05	CA City:	06	Number of Dwelling Units:		
07	Zip Code:	08	Fuel Type:		
09	Climate Zone:	10	Total Conditioned Floor Area (ft²):		
11	Building Type:	12	Slab Area (ft²):		
13	Project Scope:	14	Exceptions to Fenestration U-factor & SHGC 150.1(c)3A:		

B. Opaque Surface Details – Framed Walls/ Framed Floors/Concrete Raised Floors (Section 150.1(c)1)

01	02	03	04	05	Proposed					Required	12
								Appendix JA4 Reference			
Tag/ID	Assembly Type	Frame Type	Frame Depth (inches)	Frame Spacing (inches)	Cavity R-value	Continuous Insulation R-value	U-Factor	Table	Cell	U-Factor from Table 150.1-A or B	Comments

C. Opaque Surface Details – Nonframed (Section 150.1(c)1)

01	02	03	04	05	06	07	08	09	10
		Proposed						Required	
						Appendix JA4 Reference			
Tag/ID	Assembly Materials	Thickness (inches)	Core Insulation R-value	Continuous Insulation R-value	U-Factor	Table	Cell	U-Factor from Table 150.1-A or B	Comments

Registration Number: — Registration Date/Time: — HERS Provider:
CA Building Energy Efficiency Standards - 2019 Residential Compliance — January 2019

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- PV System: 2.68 kWdc
- Whole house fan
- Cool roof
- Insulation below roof deck
- Window overhangs and/or fins

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the buildng tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

Building-level Verifications:
- Quality insulation installation (QII)
- IAQ mechanical ventilation
- Kitchen range hood
- Whole House Fan Airflow and Fan Efficacy

Cooling System Verifications:
- Minimum Airflow
- Verified EER
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM

Heating System Verifications:
- -- None --

HVAC Distribution System Verifications:
- Duct Sealing

Domestic Hot Water System Verifications:
- -- None --

BUILDING - FEATURES INFORMATION

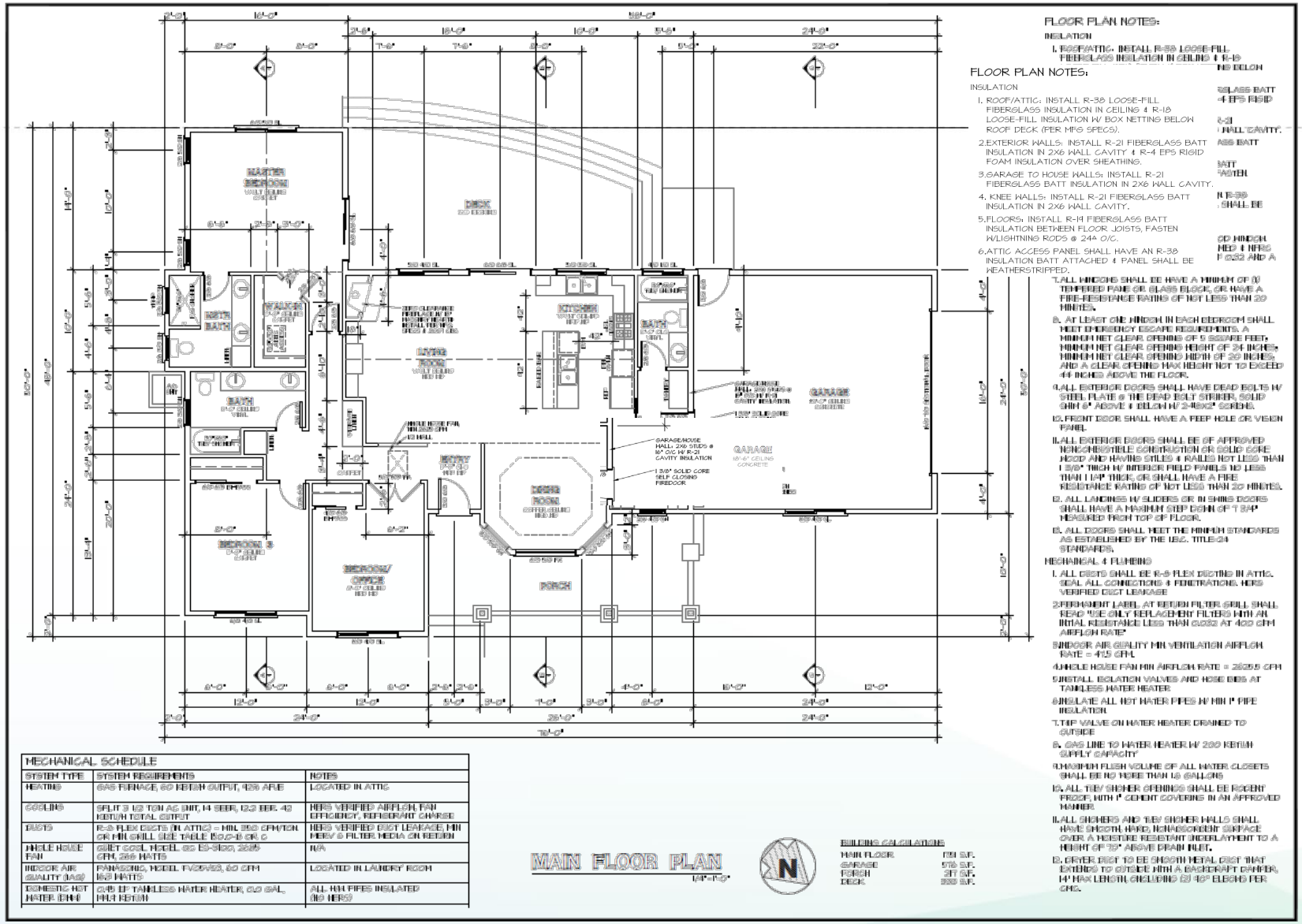
01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (ft^2)	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
Sample House	1751	1	3	1	1	1

SLAB FLOORS

01	02	03	04	05	06	07
Name	Zone	Area (ft2)	Perimeter (ft)	Edge Insul. R-value & Depth	Carpeted Fraction	Heated
Slab-on-Grade	__Garage__	576	72	None	0%	No

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
Garage Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	No insulation	n/a	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	No insulation	n/a	0.644	Cavity / Frame: no insul. / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
Attic RoofHouse	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	R 18	n/a	0.055	Under Roof Joists: R-5.0 insul. Cavity / Frame: R-13.0 / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)



FLOOR PLAN NOTES:

INSULATION

1. ROOF/ATTIC: INSTALL R-38 LOOSE-FILL FIBERGLASS INSULATION IN CEILING & R-18 LOOSE-FILL INSULATION W/ BOX NETTING BELOW ROOF DECK (PER MFG SPECS).
2. EXTERIOR WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY & R-4 EPS RIGID FOAM INSULATION OVER SHEATHING.
3. GARAGE TO HOUSE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
4. KNEE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
5. FLOORS: INSTALL R-19 FIBERGLASS BATT INSULATION BETWEEN FLOOR JOISTS, FASTEN W/LIGHTNING RODS @ 24" O/C.
6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

FLOOR PLAN NOTES:

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6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

7. ALL WINDOWS SHALL BE HAVE A MINIMUM OF (1) TEMPERED PANE OR GLASS BLOCK, OR HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
8. AT LEAST ONE WINDOW IN EACH BEDROOM SHALL MEET EMERGENCY ESCAPE REQUIREMENTS. A MINIMUM NET CLEAR OPENING OF 5 SQUARE FEET. MINIMUM NET CLEAR OPENING HEIGHT OF 24 INCHES. MINIMUM NET CLEAR OPENING WIDTH OF 20 INCHES. AND A CLEAR OPENING MAX HEIGHT NOT TO EXCEED 44 INCHES ABOVE THE FLOOR.
9. ALL EXTERIOR DOORS SHALL HAVE DEAD BOLTS W/ STEEL PLATE @ THE DEAD BOLT STRIKER, SOLID SKIN 6" ABOVE & BELOW W/ 24 GAUGE SCREENS.
10. FRONT DOOR SHALL HAVE A PEEP HOLE OR VISION PANEL.
11. ALL EXTERIOR DOORS SHALL BE OF APPROVED NONCOMBUSTIBLE CONSTRUCTION OR SOLID CORE WOOD AND HAVING STILES & RAILS NOT LESS THAN 1 3/8" THICK W/ EXTERIOR FIELD PANELS NO LESS THAN 1 1/4" THICK, OR SHALL HAVE A FIRE RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
12. ALL LANDINGS W/ SLIDERS OR IN SWING DOORS SHALL HAVE A MAXIMUM STEP DOWN OF 7 3/4" MEASURED FROM TOP OF FLOOR.
13. ALL DOORS SHALL MEET THE MINIMUM STANDARDS AS ESTABLISHED BY THE I.B.C. TITLE-24 STANDARDS.

MECHANICAL & PLUMBING

1. ALL DUCTS SHALL BE R-8 FLEX DUCTING IN ATTIC. SEAL ALL CONNECTIONS & PENETRATIONS. HERS VERIFIED DUCT LEAKAGE
2. PERMANENT LABEL AT RETURN FILTER GRILL SHALL READ "USE ONLY REPLACEMENT FILTERS WITH AN INITIAL RESISTANCE LESS THAN 0.082 AT 400 CFM AIRFLOW RATE"
3. INDOOR AIR QUALITY MIN VENTILATION AIRFLOW RATE = 415 CFM
4. WHOLE HOUSE FAN MIN AIRFLOW RATE = 2825.5 CFM
5. INSTALL ISOLATION VALVES AND HOSE BIBS AT TANKLESS WATER HEATER
6. INSULATE ALL HOT WATER PIPES W/ MIN 1" PIPE INSULATION
7. T&P VALVE ON WATER HEATER DRAINED TO OUTSIDE
8. GAS LINE TO WATER HEATER W/ 200 KBTUH SUPPLY CAPACITY
9. MAXIMUM FLUSH VOLUME OF ALL WATER CLOSETS SHALL BE NO MORE THAN 1.6 GALLONS
10. ALL TUB/SHOWER OPENINGS SHALL BE RODENT PROOF, WITH 1" CEMENT COVERING IN AN APPROVED MANNER
11. ALL SHOWERS AND TUB/SHOWER WALLS SHALL HAVE SMOOTH, HARD, NONABSORBENT SURFACE OVER A MOISTURE RESISTANT UNDERLAYMENT TO A HEIGHT OF 72" ABOVE DRAIN INLET.
12. DRYER DUCT TO BE SMOOTH METAL DUCT THAT EXTENDS TO OUTSIDE WITH A BACKDRAFT DAMPER, 14' MAX LENGTH, INCLUDING (2) 45° ELBOWS PER CMC.

MECHANICAL SCHEDULE

SYSTEM TYPE	SYSTEM REQUIREMENTS	NOTES
HEATING	GAS FURNACE, 60 KBTUH OUTPUT, 92% AFUE	LOCATED IN ATTIC
COOLING	SPLIT 3 1/2 TON AC UNIT, 14 SEER, 12.2 EER, 42 KBTUH TOTAL OUTPUT	HERS VERIFIED AIRFLOW, FAN EFFICIENCY, REFRIGERANT CHARGE
DUCTS	R-8 FLEX DUCTS IN ATTIC = MIN 350 CFM/TON OR MIN GRILL SIZE TABLE 150.0-B OR C	HERS VERIFIED DUCT LEAKAGE, MIN MERV 6 FILTER MEDIA ON RETURN
WHOLE HOUSE FAN	QUIET COOL, MODEL CC130-3100, 2825 CFM, 265 WATTS	N/A
INDOOR AIR QUALITY (IAQ)	PANASONIC, MODEL FV-05VH2, 60 CFM 1.6 WATTS	LOCATED IN LAUNDRY ROOM
DOMESTIC HOT WATER (DHW)	0.95 EF TANKLESS WATER HEATER, 6.0 GAL, 199.9 KBTUH	ALL HW PIPES INSULATED (NO HERS)

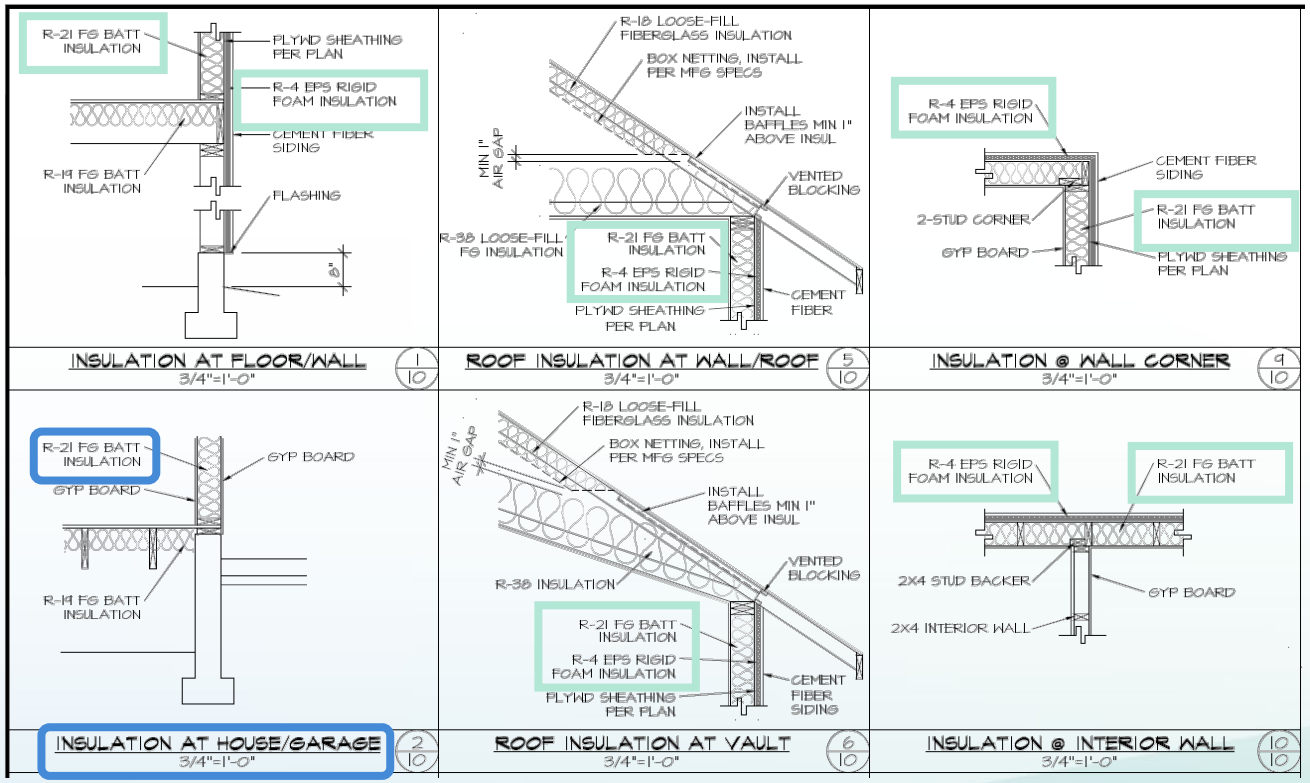
MAIN FLOOR PLAN

1/4"=1'-0"

BUILDING CALCULATIONS

MAIN FLOOR	1751 S.F.
GARAGE	576 S.F.
PORCH	317 S.F.
DECK	333 S.F.

Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
Garage Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	No insulation	n/a	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board



FLOOR PLAN NOTES:

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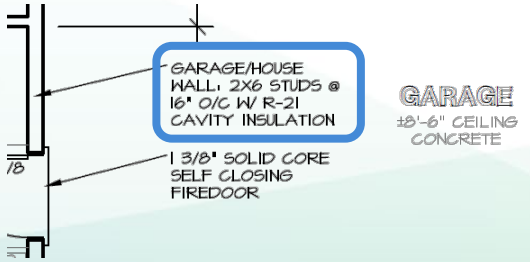
2. EXTERIOR WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY & R-4 EPS RIGID FOAM INSULATION OVER SHEATHING.
3. GARAGE TO HOUSE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
4. KNEE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
5. FLOORS: INSTALL R-19 FIBERGLASS BATT INSULATION BETWEEN FLOOR JOISTS, FASTEN W/LIGHTNING RODS @ 24^A O/C.
6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.



OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
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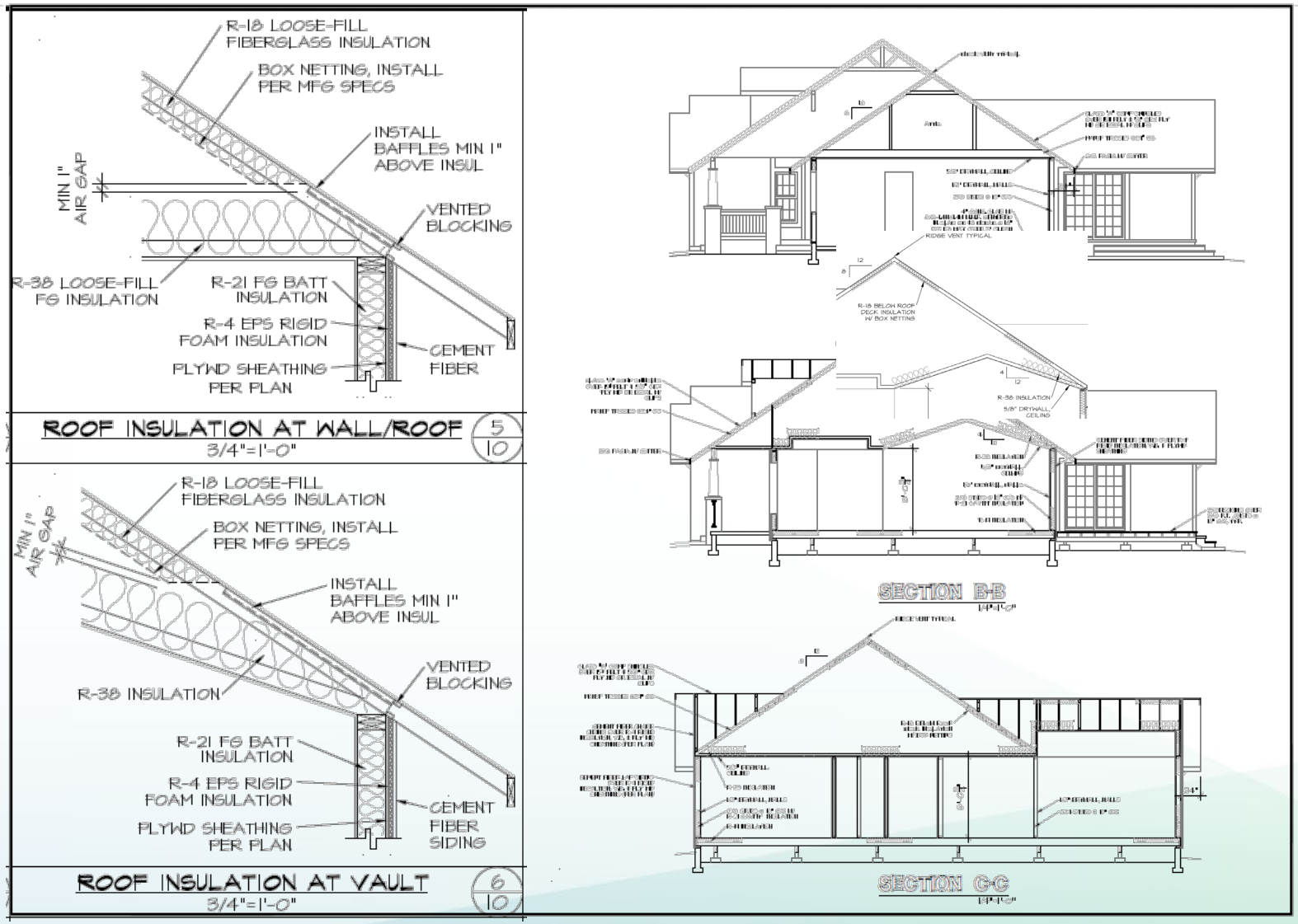
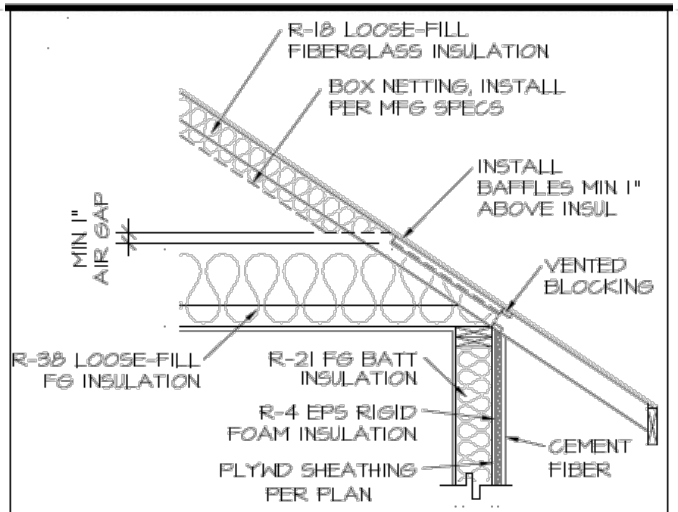
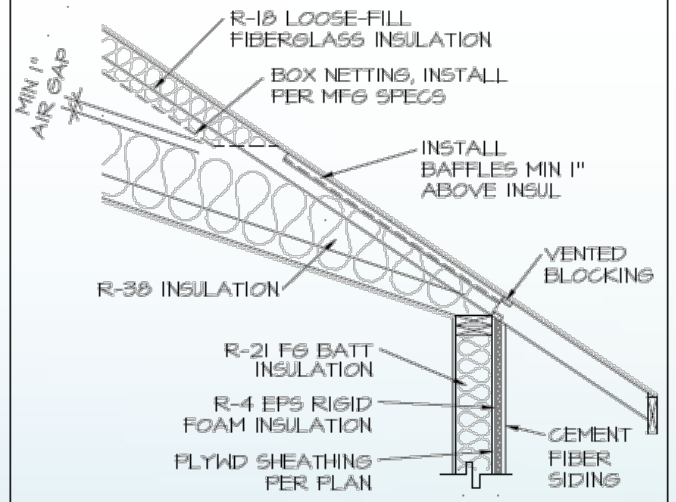
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	No insulation	n/a	0.644	Cavity / Frame: no insul. / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
Attic RoofHouse	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	R 18	n/a	0.055	Under Roof Joists: R-5.0 insul. Cavity / Frame: R-13.0 / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
R-19 Floor Crawlspace	Floors Over Crawlspace	Wood Framed Floor	2x6 @ 16 in. O. C.	R 18	n/a	0.05	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6
Garage Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 16 in. O. C.	No insulation	n/a	0.472	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4
High Performance	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 16 in. O. C.	R-38	n/a	0.025	Inside Finish: Gypsum Board Cavity / Frame: R-9.1 / 2x4 Over Ceiling Joists: R-28.9 insul.


R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
INSTALL BAFFLES MIN 1" ABOVE INSUL
MIN 1" AIR GAP
VENTED BLOCKING
R-38 LOOSE-FILL FG INSULATION
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT WALL/ROOF
3/4"=1'-0"
5
10
R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
MIN 1" AIR GAP
INSTALL BAFFLES MIN 1" ABOVE INSUL
VENTED BLOCKING
R-38 INSULATION
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER SIDING
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT VAULT
3/4"=1'-0"
6
10
SECTION B-B
SECTION C-C



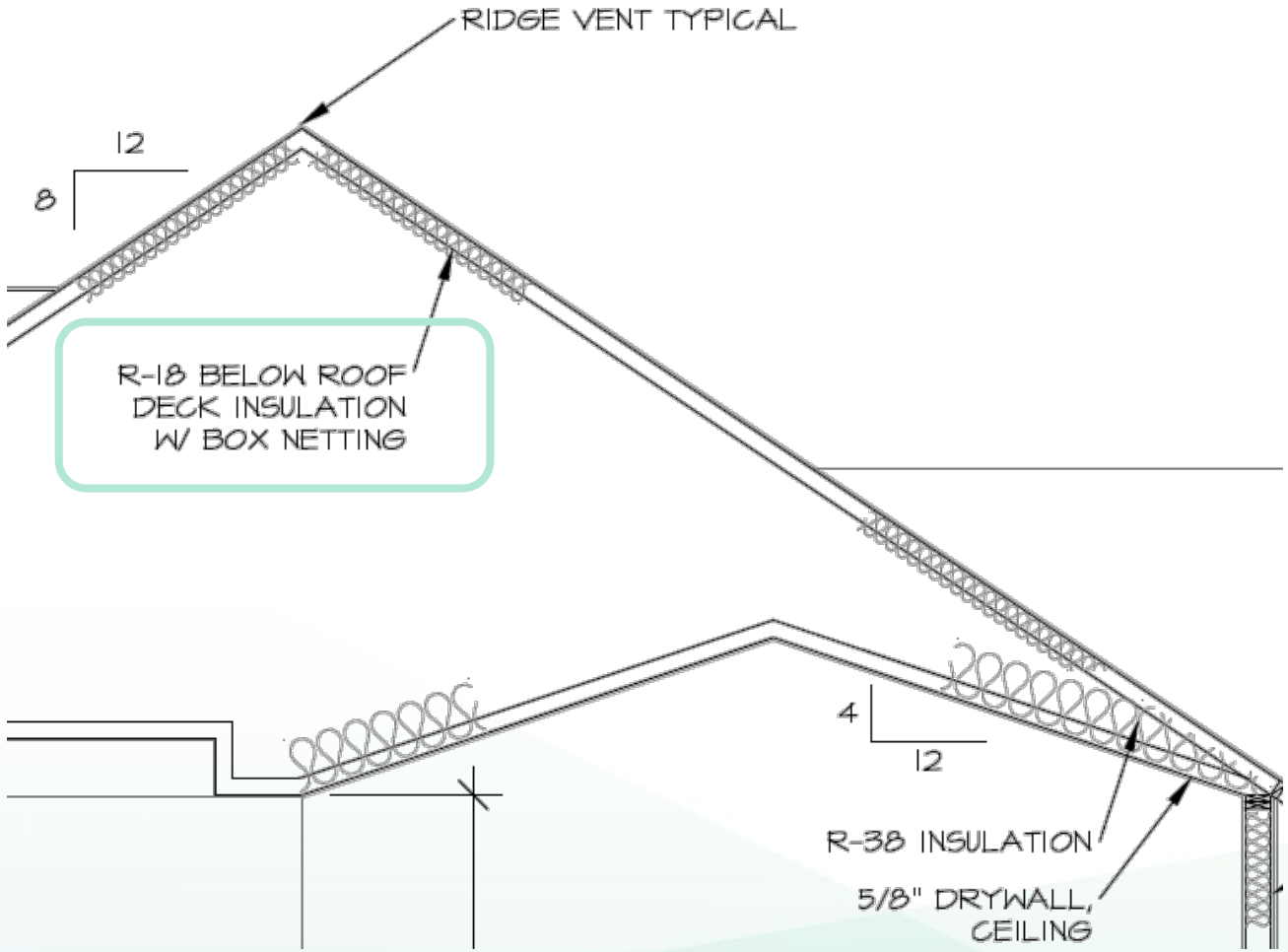
ROOF INSULATION AT WALL/ROOF 5/10

3/4"=1'-0"



ROOF INSULATION AT VAULT 6/10

3/4"=1'-0"



WINDOWS & DOORS

6. ALL WINDOWS SHALL BE "REALLY GOOD WINDOW CO." SERIES: "BEST EVER" VINYL FRAMED & NFRC RATED WITH A MAXIMUM U-FACTOR OF 0.32 AND A MAXIMUM SHGC OF 0.25.
7. ALL WINDOWS SHALL BE HAVE A MINIMUM OF (1) TEMPERED PANE OR GLASS BLOCK, OR HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
8. AT LEAST ONE WINDOW IN EACH BEDROOM SHALL MEET EMERGENCY ESCAPE REQUIREMENTS. A MINIMUM NET CLEAR OPENING OF 5 SQUARE FEET; MINIMUM NET CLEAR OPENING HEIGHT OF 24 INCHES; MINIMUM NET CLEAR OPENING WIDTH OF 20 INCHES; AND A CLEAR OPENING MAX HEIGHT NOT TO EXCEED 44 INCHES ABOVE THE FLOOR.
9. ALL EXTERIOR DOORS SHALL HAVE DEAD BOLTS W/ STEEL PLATE @ THE DEAD BOLT STRIKER, SOLID SHIM 6" ABOVE & BELOW W/ 2-#8X2" SCREWS.
10. FRONT DOOR SHALL HAVE A PEEP HOLE OR VISION PANEL
11. ALL EXTERIOR DOORS SHALL BE OF APPROVED NONCOMBUSTIBLE CONSTRUCTION OR SOLID CORE WOOD AND HAVING STILES & RAILES NOT LESS THAN 1 3/8" THICH W/ INTERIOR FIELD PANELS NO LESS THAN 1 1/4" THICK, OR SHALL HAVE A FIRE RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
12. ALL LANDINGS W/ SLIDERS OR IN SWING DOORS SHALL HAVE A MAXIMUM STEP DOWN OF 7 3/4" MEASURED FROM TOP OF FLOOR.
13. ALL DOORS SHALL MEET THE MINIMUM STANDARDS AS ESTABLISHED BY THE I.B.C. TITLE-24 STANDARDS.

06	07	08	09	10	11	12	13	14
Width (ft)	Height (ft)	Mult.	Area (ft^2)	U-factor	U-factor Source	SHGC	SHGC Source	Exterior Shading
2.5	4	1	10	0.32	NFRC	0.25	NFRC	Insect Screen (default)
6	5	1	30	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	24	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	24	0.32	NFRC	0.25	NFRC	Insect Screen (default)
3	5	1	15	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	7.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	7.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	7.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	12.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	12.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	30	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	20	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	40	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	17.5	0.32	NFRC	0.25	NFRC	Insect Screen (default)
		1	4	0.32	NFRC	0.25	NFRC	Insect Screen (default)

Field Inspectors

At rough frame verify values
- ✓Windows
- ✓Roof and wall continuous insulation

At insulation stage verify values
- ✓Wall and raised floor insulation
- ✓QII (requires HERS)

At final verify
- ✓Ceiling insulation
- ✓CF2R forms
- ✓Registered with HERS Provider
- ✓Request project status report (PSR)

Resources

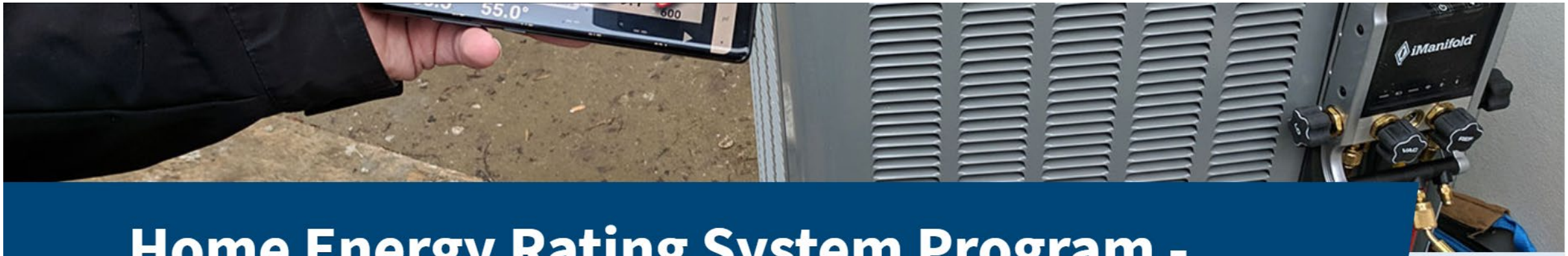
Online Resource Center

Online Resource Center

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

LEARN MORE >

2019 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.

SUBSCRIBE

Building Energy Efficiency Standards

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First Name

Blueprint Newsletter

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.

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Highlights

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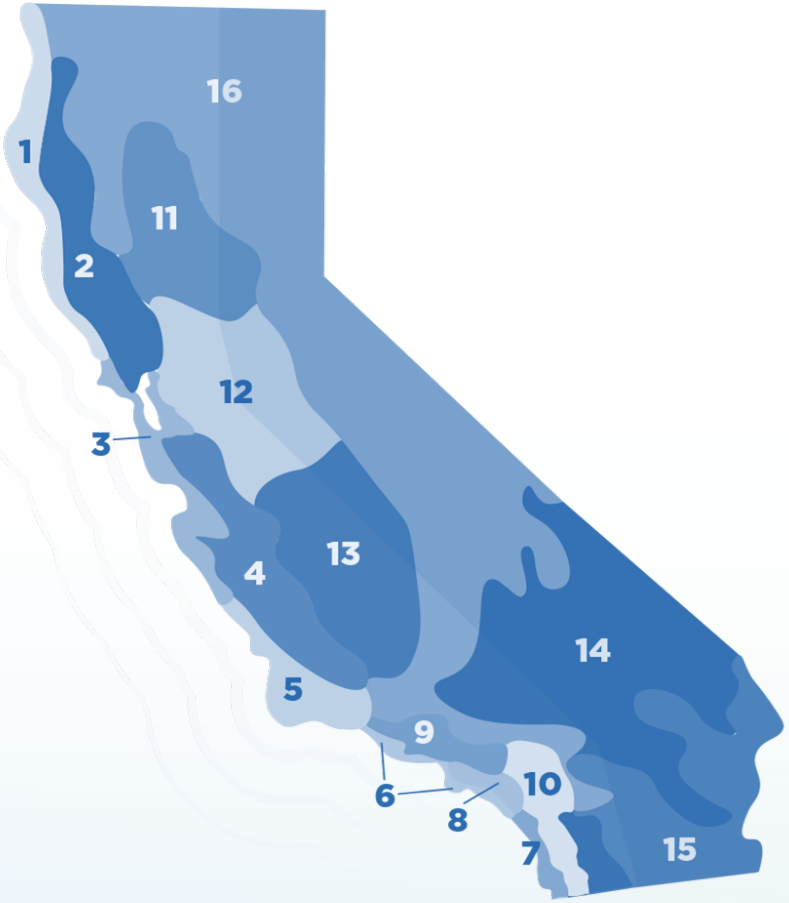


Monday through Friday

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

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

Call

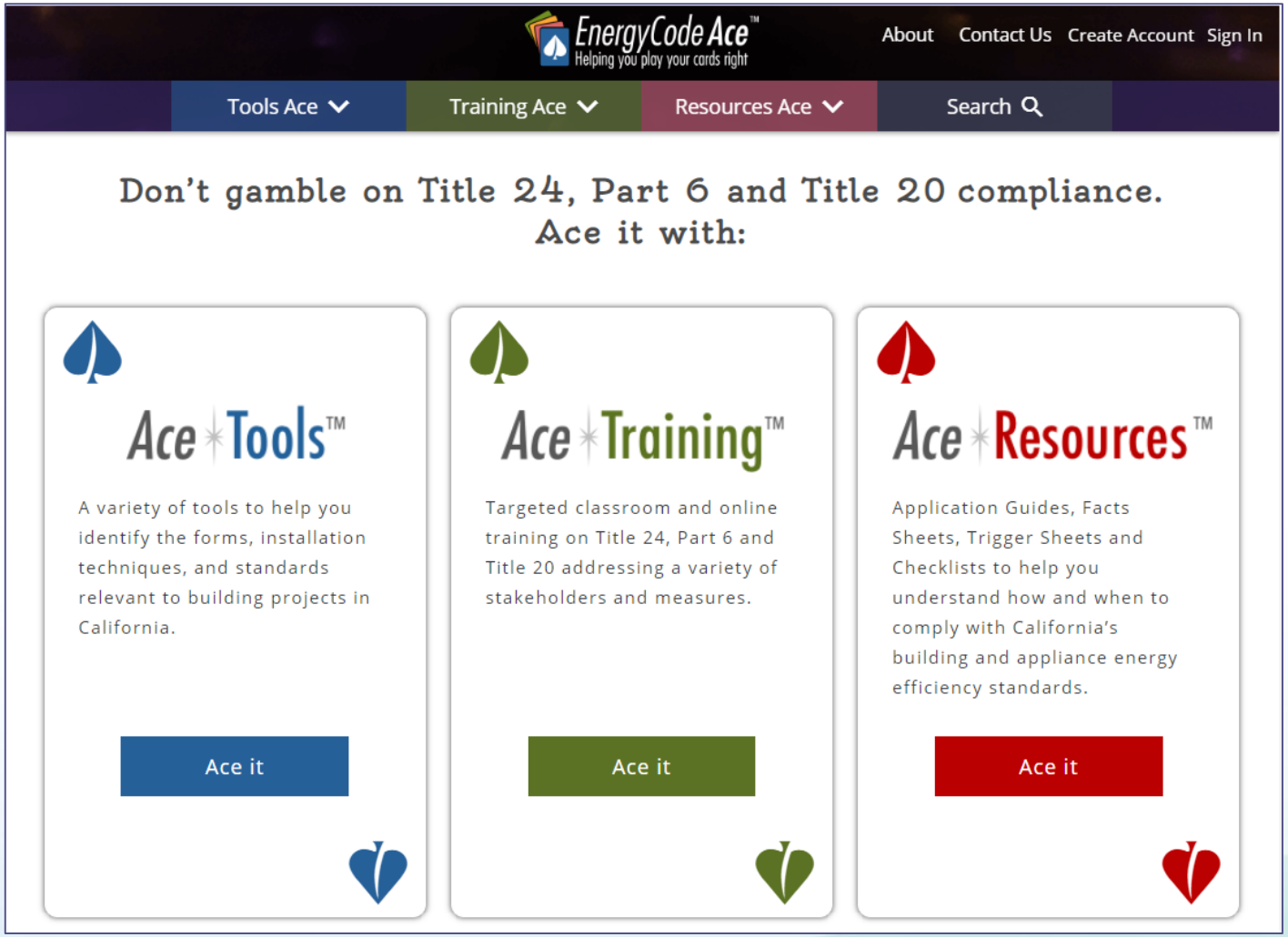
800-772-3300 in CA

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