TRI-COUNTY
REGIONAL ENERGY NETWORK
SAN LUIS OBISPO • SANTA BARBARA • VENTURA

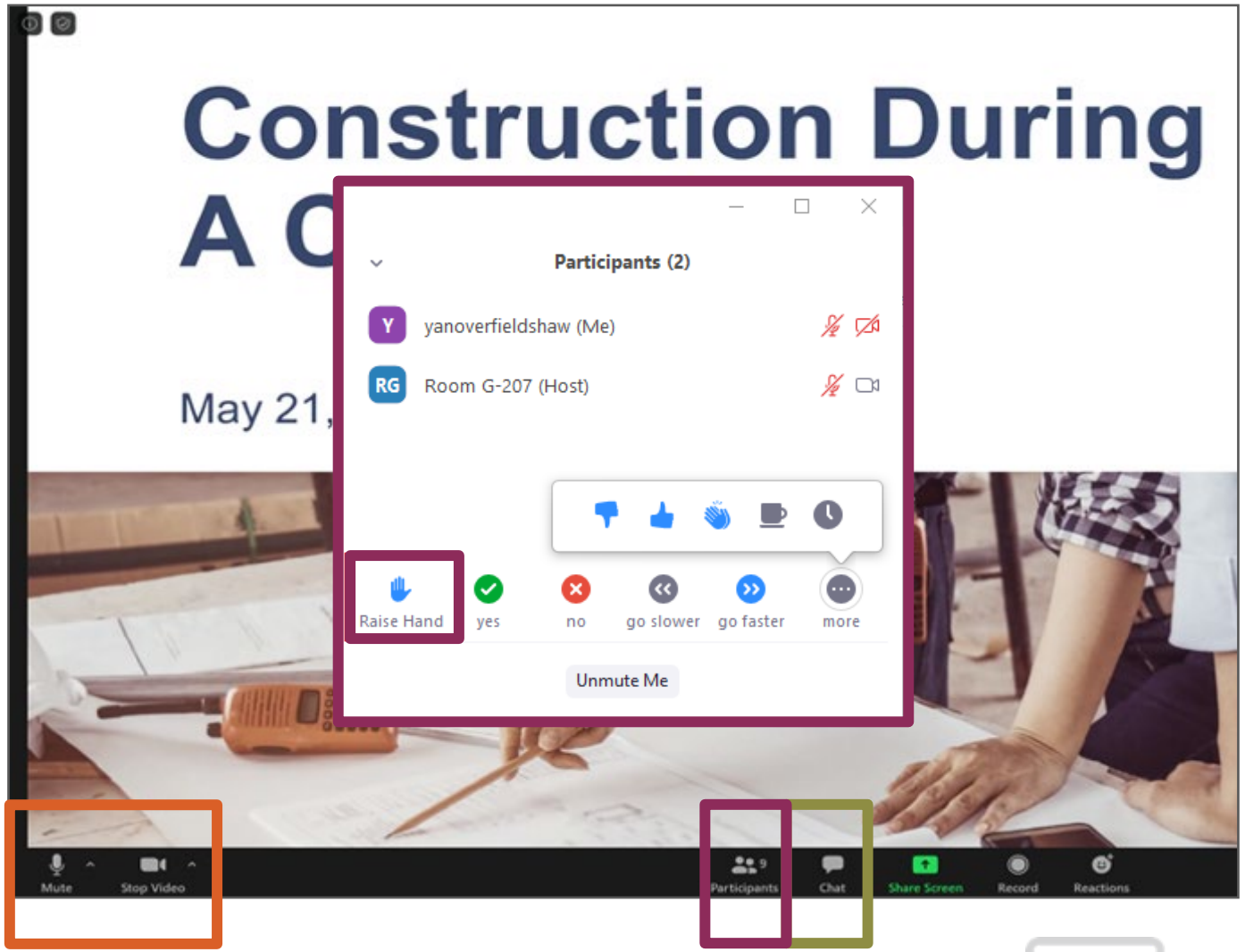
Understanding HERS Registries for Building Departments

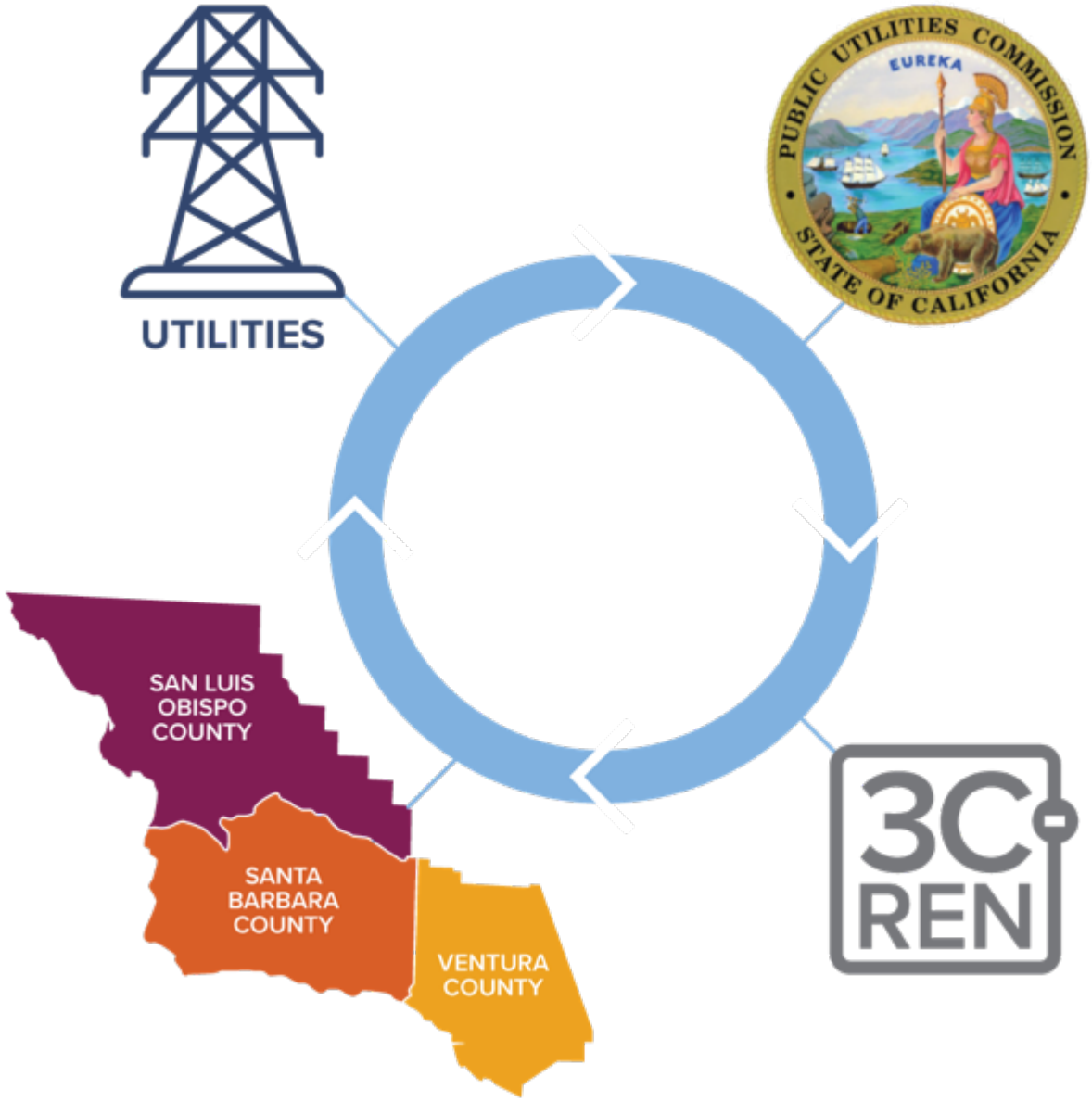
Russ King – Coded Energy

June 5, 2025

Zoom Orientation

- Add an **introduction** in the chat.
  Be sure **full name** is displayed.
- Did you call in? Please **share** first and last name with us.
- Please **mute** upon joining
- Use the "**Chat**" to share questions or comments
- Under "**Participant**" select "**Raise Hand**" to share a question or comment verbally
- Session will be **recorded** and posted to 3C-REN's on-demand page
- Slides/recording are **shared** after most events
- 3C-REN does **not** allow **AI notetakers**, unless used to accommodate a disability.





Tri-County Regional Energy Network

3C-REN is a collaboration between the tri-counties

Our programs reduce energy use for a more sustainable, equitable and economically vibrant Central Coast

Our free services are funded via the CPUC, bringing ratepayer dollars back to the region

Our Services

Incentives

HOME ENERGY SAVINGS

3c-ren.org/for-residents
3c-ren.org/multifamily

COMMERCIAL ENERGY SAVINGS

3c-ren.org/commercial

Contractors can enroll at
3c-ren.org/contractors

Training

BUILDING PERFORMANCE TRAINING

3c-ren.org/events
3c-ren.org/building

ENERGY CODE CONNECT

3c-ren.org/code

View past trainings at
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Technical Assistance

AGRICULTURE ENERGY SOLUTIONS

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ENERGY ASSURANCE SERVICES

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3C REN

Local Governments Empowering Our Communities

HERS Registry Training for Building Departments

Single Family Residential

BayREN Codes & Standards

www.BayREN.org

Introduction

Today's Learning Objectives

- Understand what the **HERS program** is in the energy code.
- Understand how HERS verification fits into the **overall compliance process**.
- Understand **when a project is required to be registered** with a HERS provider and when it is not.
- Understand **how to find a project** in a HERS registry.
- Understand **how to use the HERS registry** to track compliance documentation for a project.
- Understand how to use a HERS registry to **save time on field inspections.**

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Home Energy Rating System (HERS) Registry

What is the HERS Program?

HERS stands for **Home Energy Rating System**.

It is a long-standing training and certification program for field verification of energy features.

- The people doing these verifications are called "**HERS Raters**".
- The organizations that train and track HERS Raters are called "**HERS Providers**".
- For the Title 24 Part 6 energy code, HERS Raters are 3rd party special inspectors to verify energy features designated as "**HERS measures**".
- All other "non-HERS measures" are the responsibility of the building inspector.

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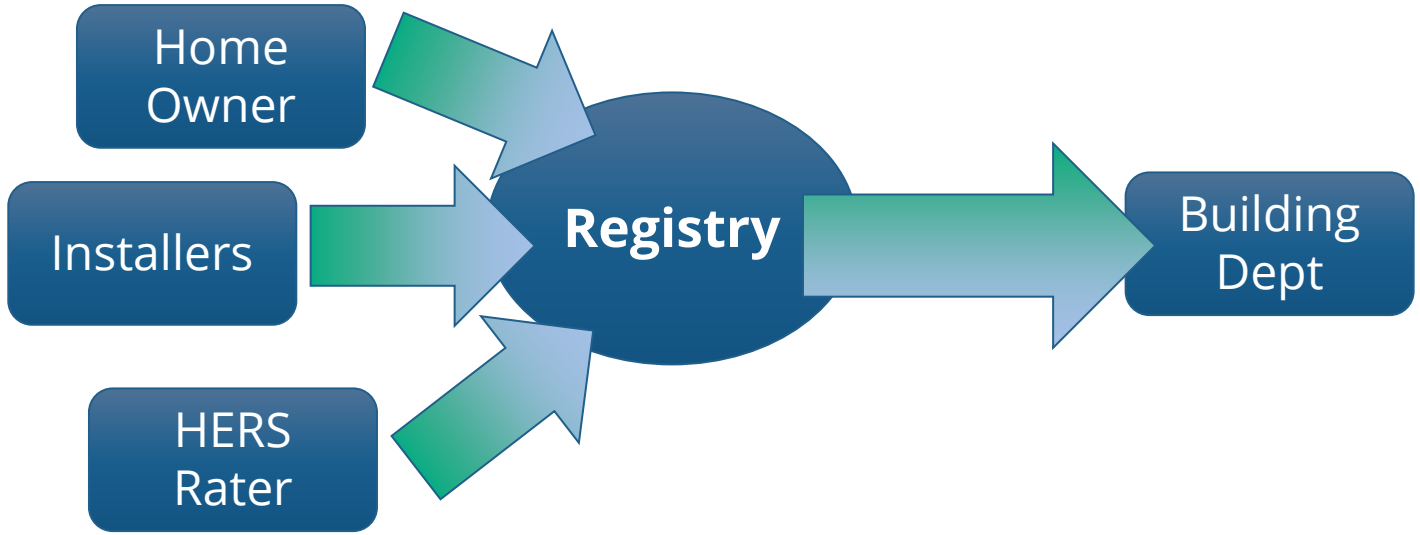
Rebranding for 2025 Code

- The term **Home Energy Rating System** comes from a very different program from the 1990's.
- It has always been a bit of a misnomer. For what we are talking about here, they are not "rating" anything, they are verifying compliance with the energy code.
- For the 2025 Energy Code (effective Jan 1, 2026) the Energy Commission will be changing the HERS name to "Energy Code Compliance _____ ", acronym: ECC
- This will apply to Providers, Registry and Raters. ("Raters" is to ingrained to easily change.)
- Until then, it is still the HERS program.

What is a HERS Registry?

HERS Providers are required to maintain "**HERS Registries**" - online databases that provide access to all the energy code compliance documentation and test results for projects requiring HERS verification.



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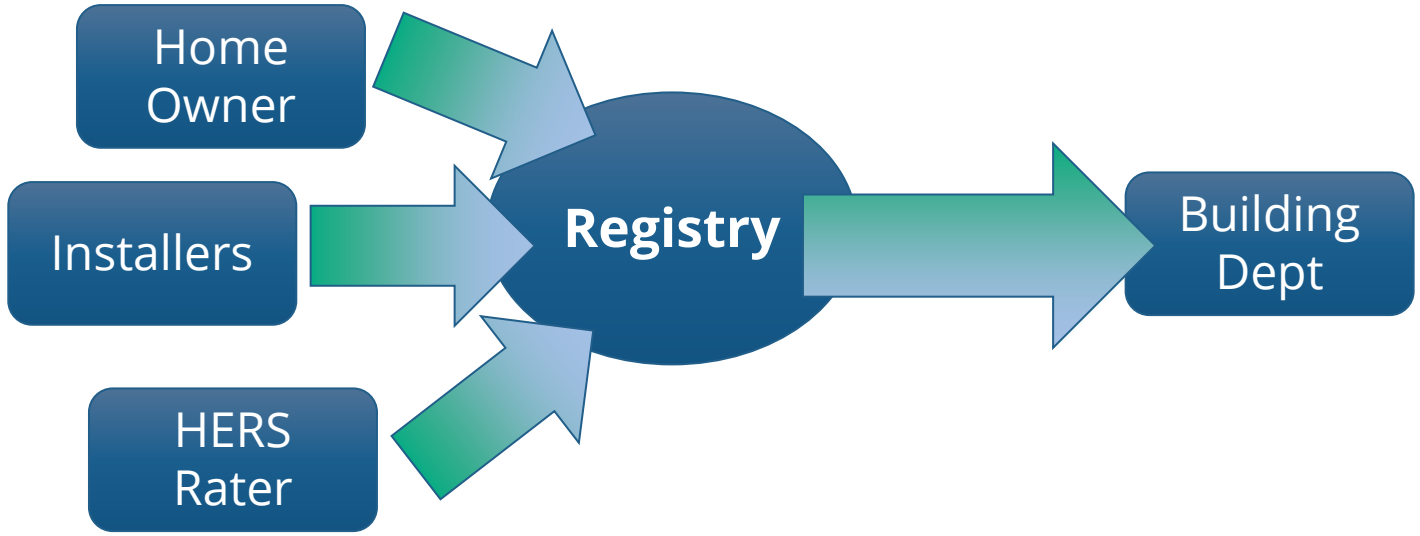
What is a HERS Registry?

You can track the status of projects from start to finish

- Once a project is in the registry, it can be tracked from start to finish by *anyone* involved with the project, especially the **building department**.
- It is common for documents and requirements to change as a project progresses.
- The registry tracks these changes.



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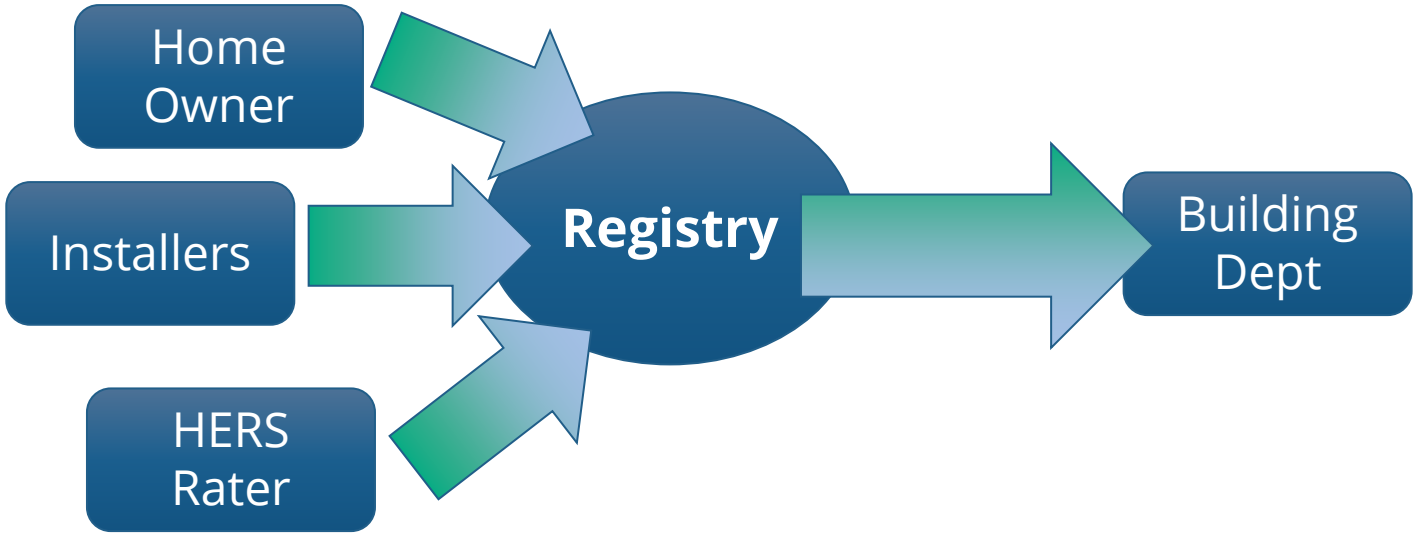
What is a HERS Registry?

- No more paper for any registered projects. (unless you prefer hard copies)
- *Anyone* can register a new project with a HERS Provider, even a homeowner.
- *Anyone* can be given access to view the status of the project electronically.
- A project can be viewed **in the field** using a smart phone or tablet with internet access.



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HERS Registry Building Types

Building Type Reorganization (for 2022)

With the 2022 Standards, there is a significant change with how building types are organized as it relates to energy code.

- Definition of **Single Family Residential** has been clarified.
- **Low-rise Multifamily** now has its own sections of code. Sections 160, 170 and 180)
- Compliance documentation is now specific to:
  - Single Family Residential (**CF forms**)
  - Low-rise Multifamily Residential (**LRC forms**) - NEW
  - High-rise Multifamily Residential (**NRC forms)**

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HERS Registry – Single Family Residential

- When a project requires **at least one HERS** verified feature, the CF1R Certificate of Compliance (**and all subsequent CF2R and CF3R documents**) must be "***registered***" with a HERS provider.
- A HERS registry is an on-line ***database*** that "*generates*" all the CF1R, CF2R and CF3R documents for a registered project.
- This allows all interested parties the ability to create, complete, sign, and view **all** documents electronically in one single location.

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HERS Registry – Single Family Residential

- It will be rare for projects not to require any HERS verification.
- Forms for non-HERS projects must be tracked manually.
- They can be hard copies or electronic files, but the electronic files will not reside in a central location.

HERS Registry – Single Family Residential

The following **residential** projects **all** require HERS verification and therefore must be registered with a HERS provider:

- Any new construction home.
- Any addition over 1000 square feet.
- Any **addition** or **alteration** that involves adding or replacing:
  - An A/C condenser,
  - An A/C coil,
  - An air handler (furnace) or
  - 25 feet or more of duct.

  (There are some exceptions to these HERS tests, but not many.)

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HERS Registry – Low-rise Multi-Family

Low-rise Multi Family Residential projects will be treated very similarly to single family residential projects.

Except that:

- The forms will be named differently
  - **LMCC** (like the CF1R for single family)
  - **LMCI** (like the CF2R for single family)
  - **LMCV** (like the CF3R for single family)

HERS Registry – Low-rise Multi-Family

- **Nonresidential portions** of the buildings (office, work out room, laundry area, common areas, etc.) may be treated separately as nonresidential projects and use Non-Res forms (NRCC, NRCI, NRCV, NRCA).

HERS Registry – Low-rise Multi-Family

- As of April 1, 2024, LRMF projects that have at least one HERS measure, must be registered with a HERS provider and use only registered forms, just like single family projects.
- LRMF projects will each have a Project Status Report (PSR) like SFR projects. (This is Good!)

HERS Registry – Nonresidential

- For **Nonresidential** projects there are some similarities between HERS testing (NRCV forms) and acceptance testing (NRCA forms).
- HERS is *independent* 3rd party testing by a special inspector.
- Acceptance Testing can be done by the installer, if certified, or a 3rd party.
- There is no nonresidential registry that helps you determine what forms are required, like there is for residential.
- If nonresidential forms are required, only the NRCV forms need to be registered.

HERS Registry – Nonresidential

The following features require HERS verification on *non-multifamily* **Nonresidential** :

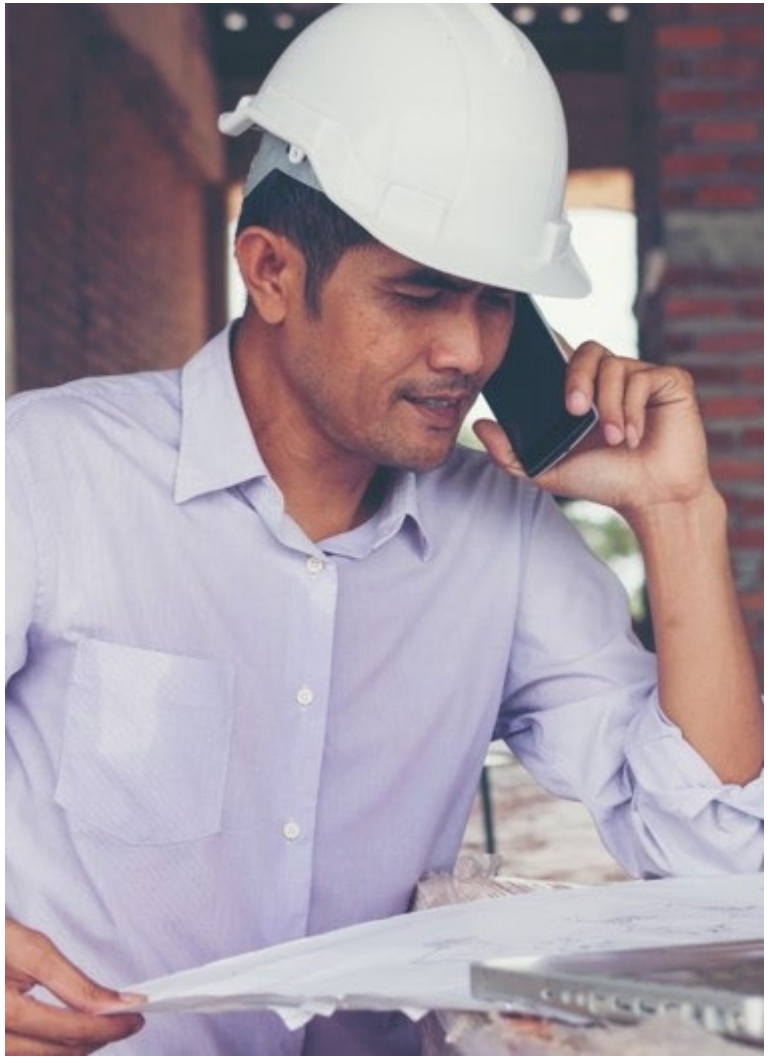
- Duct leakage, if modeled in the performance approach. (NRCV-MCH-04)
- Duct leakage, if required by the prescriptive approach for new construction or alterations (NRCV-MCH-04)

HERS Registry – Highrise Residential

Highrise residential projects (considered “Nonresidential”) have the following HERS tests:

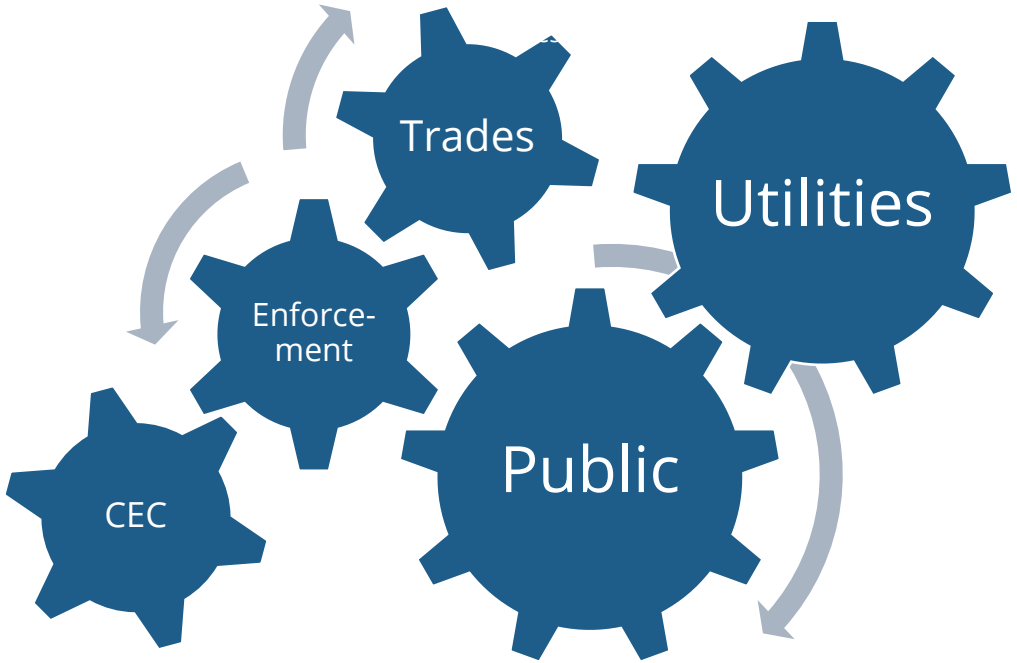
- Enclosure air leakage (NRCV-MCH-24)
- Mechanical Ventilation (NRCV-MCH-27)
- Central Hot Water System Distribution (NRCV-PLB-21)
- Single Dwelling Hot Water System Distribution (NRCV-PLB-22)

The Energy Code Compliance Process



The Compliance Process

Before “diving into” the details of the energy code, it is first important to understand the overall process and how different people fit into it.



Energy Code Compliance Options

Mandatory Measures: Minimum requirements that must **always** be met

Prescriptive Path

- Usually a "prescribed" list of measures by CZ
- No design flexibility
- Common for alterations, changeouts, and smaller additions.

Pick One

Performance Path

- The energy performance of the "prescriptive package" is the target, but tradeoffs are allowed.
- Based on an energy simulation using State-approved software (CBECC, Energy Pro, etc.)
- Very common for new construction and larger additions.
- Rare for alterations, changeouts, etc.

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“Prescriptive” Approach - Uses Table 150.1-A

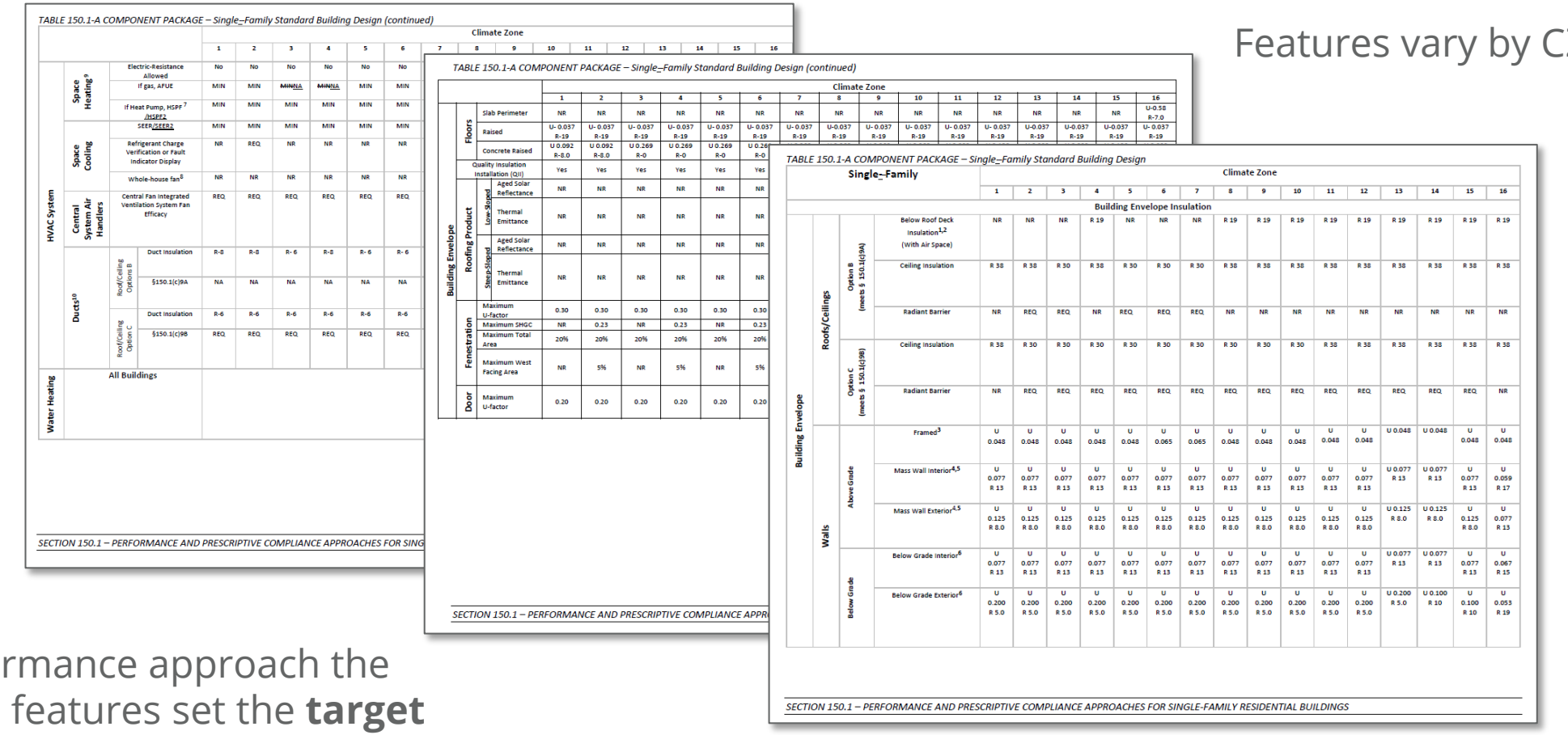


TABLE 150.1-A COMPONENT PACKAGE – Single–Family Standard Building Design (continued)

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HVAC System	Space Heating[9]	Electric-Resistance Allowed	No	No	No	No	No	No										
		If gas, AFUE	MIN	MIN	~~MINNA~~	~~MINNA~~	MIN	MIN										
		If Heat Pump, HSPF[7] /HSPF2	MIN	MIN	MIN	MIN	MIN	MIN										
	Space Cooling	SEER/SEER2	MIN	MIN	MIN	MIN	MIN	MIN										
		Refrigerant Charge Verification or Fault Indicator Display	NR	REQ	NR	NR	NR	NR										
		Whole-house fan[8]	NR	NR	NR	NR	NR	NR										
	Central System Air Handlers	Central Fan Integrated Ventilation System Fan Efficacy	REQ	REQ	REQ	REQ	REQ	REQ										
	Ducts[10]	Roof/Ceiling Options B: Duct Insulation	R-8	R-8	R- 6	R-8	R- 6	R- 6										
		Roof/Ceiling Options B: §150.1(c)9A	NA	NA	NA	NA	NA	NA										
		Roof/Ceiling Option C: Duct Insulation	R-6	R-6	R-6	R-6	R-6	R-6										
		Roof/Ceiling Option C: §150.1(c)9B	REQ	REQ	REQ	REQ	REQ	REQ										
Water Heating	All Buildings																	

SECTION 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR SING

TABLE 150.1-A COMPONENT PACKAGE – Single–Family Standard Building Design (continued)

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope	Floors	Slab Perimeter	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U-0.58 R-7.0
		Raised	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U-0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U- 0.037 R-19	U-0.037 R-19	U-0.037 R-19	U-0.037 R-19	U- 0.037 R-19
		Concrete Raised	U 0.092 R-8.0	U 0.092 R-8.0	U 0.269 R-0	U 0.269 R-0	U 0.269 R-0	U 0.269 R-0										
		Quality Insulation Installation (QII)	Yes	Yes	Yes	Yes	Yes	Yes										
	Roofing Product	Low-Sloped: Aged Solar Reflectance	NR	NR	NR	NR	NR	NR										
		Low-Sloped: Thermal Emittance	NR	NR	NR	NR	NR	NR										
		Steep-Sloped: Aged Solar Reflectance	NR	NR	NR	NR	NR	NR										
		Steep-Sloped: Thermal Emittance	NR	NR	NR	NR	NR	NR										
	Fenestration	Maximum U-factor	0.30	0.30	0.30	0.30	0.30	0.30										
		Maximum SHGC	NR	0.23	NR	0.23	NR	0.23										
		Maximum Total Area	20%	20%	20%	20%	20%	20%										
		Maximum West Facing Area	NR	5%	NR	5%	NR	5%										
	Door	Maximum U-factor	0.20	0.20	0.20	0.20	0.20	0.20										

SECTION 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPR

TABLE 150.1-A COMPONENT PACKAGE – Single–Family Standard Building Design

Single–Family

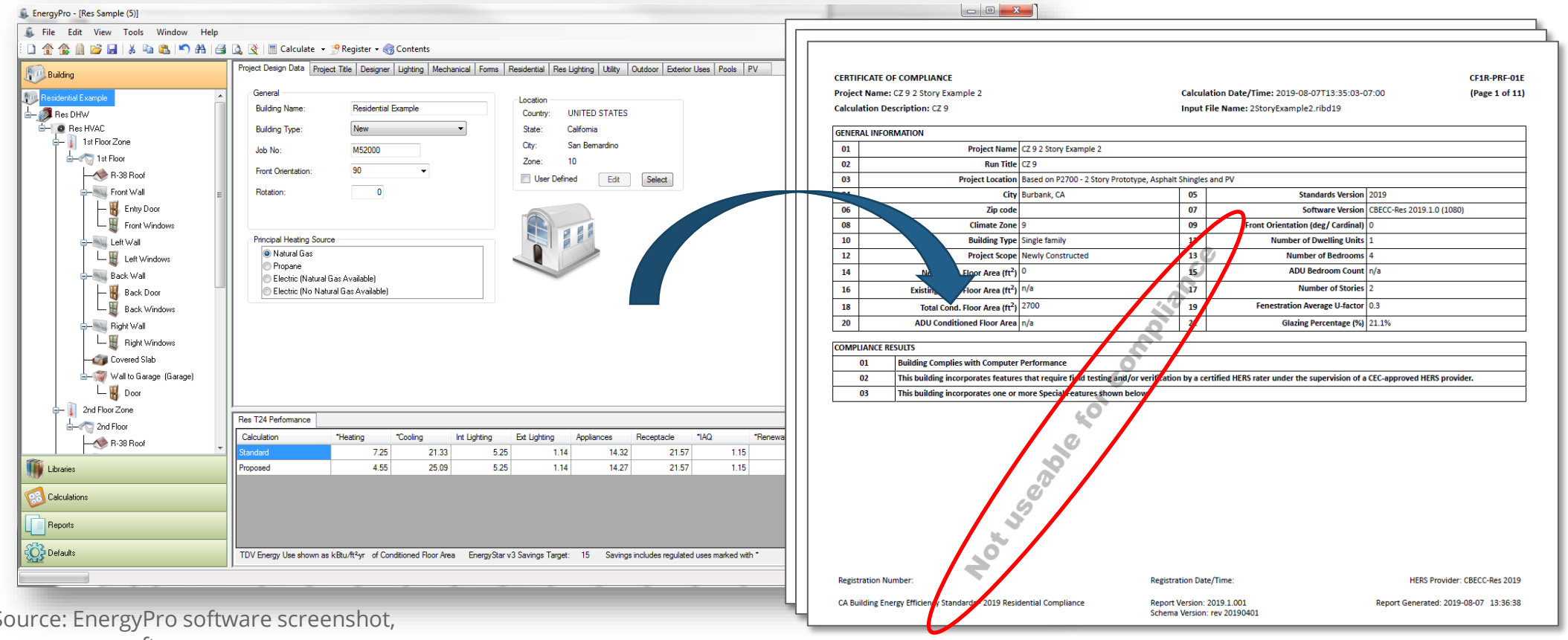
				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation																			
Building Envelope	Roofs/Ceilings	Option B (meets § 150.1(c)9A)	Below Roof Deck Insulation[1,2] (With Air Space)	NR	NR	NR	R 19	NR	NR	NR	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19
			Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets § 150.1(c)9B)	Ceiling Insulation	R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
	Walls	Above Grade	Framed[3]	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
			Mass Wall Interior[4,5]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
			Mass Wall Exterior[4,5]	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.077 R 13
		Below Grade	Below Grade Interior[6]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
			Below Grade Exterior[6]	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.053 R 19

SECTION 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR SINGLE-FAMILY RESIDENTIAL BUILDINGS

Features vary by CZ

In the performance approach the prescriptive features set the **target** energy use but trade-offs between features are allowed.

“Performance” Approach Uses a Computer to Calculate Energy Use



Source: EnergyPro software screenshot, www.energysoft.com

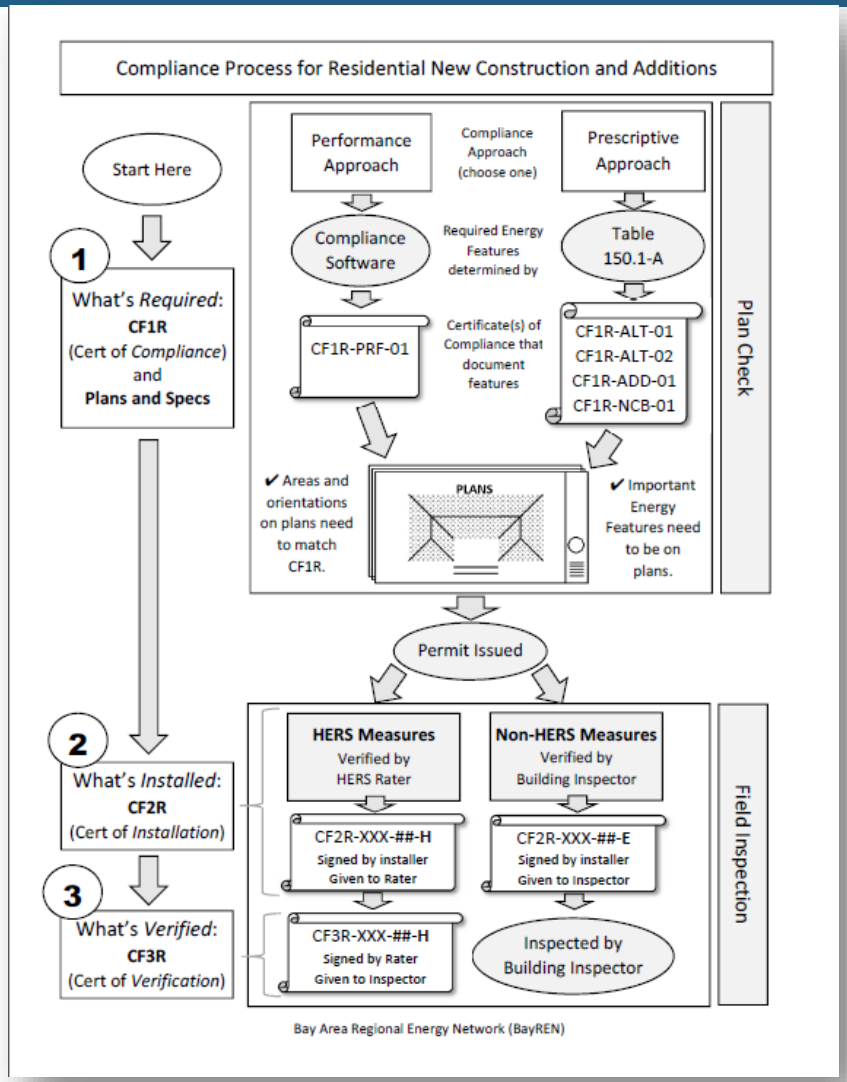
After the house is made to comply in the software, a file is uploaded to the HERS registry which creates the registered CF1R. It can also print an unregistered CF1R, like this one. Do not accept unregistered CF1Rs for new construction.

“Mandatory Measures” must always be met regardless of the approach

- Mandatory measures are shown on most CF2R forms and can be found in section 150.0.
- They include things like minimum efficiencies for equipment and required features on controls.
- They also set that absolute lowest you can go on some features that might be traded off in the performance method.

Compliance Process Flow Diagram

Refer to full-size copy provided with your handouts.



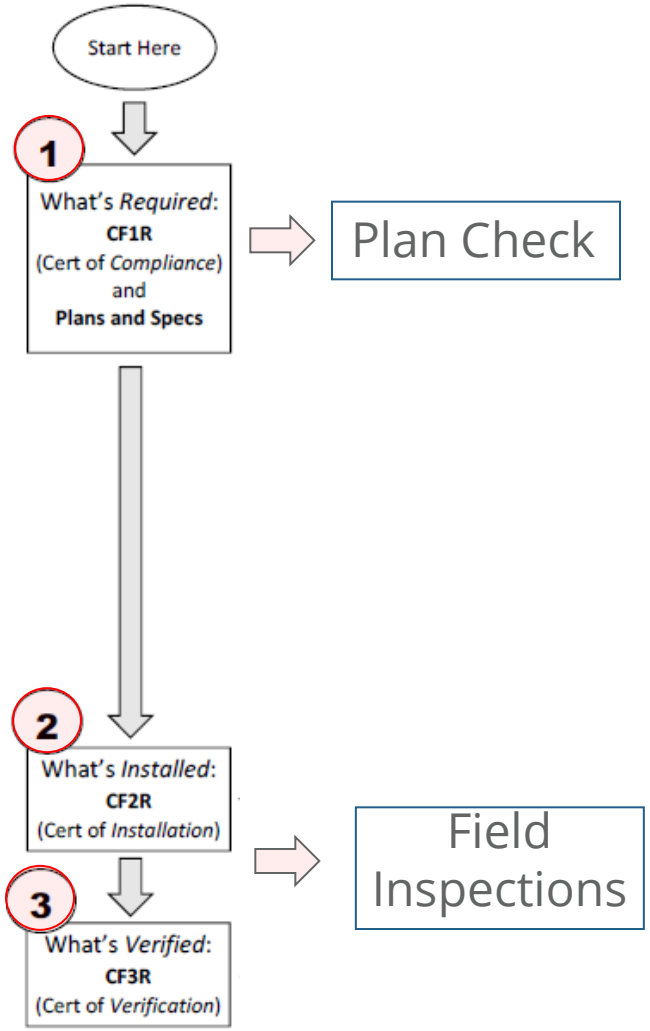
Compliance Process Flow Diagram

- Notice that the forms follow a simple 1 - 2 - 3 flow:

  CF1R ⇨ CF2R ⇨ CF3R

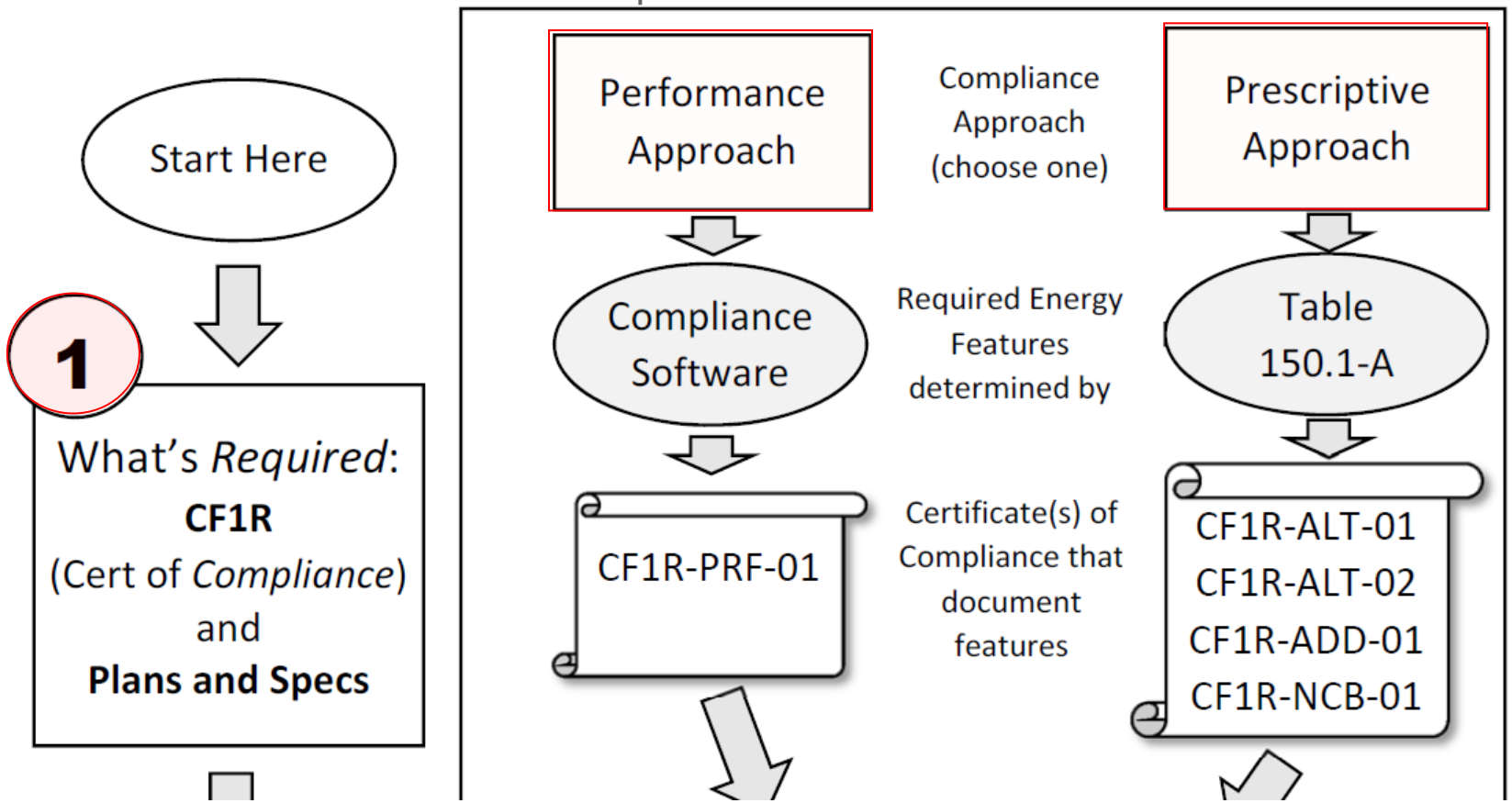
- Notice that process is divided into Plan Check and Field Inspection sections and that good communication must flow between them.

- The forms are intended to facilitate this.



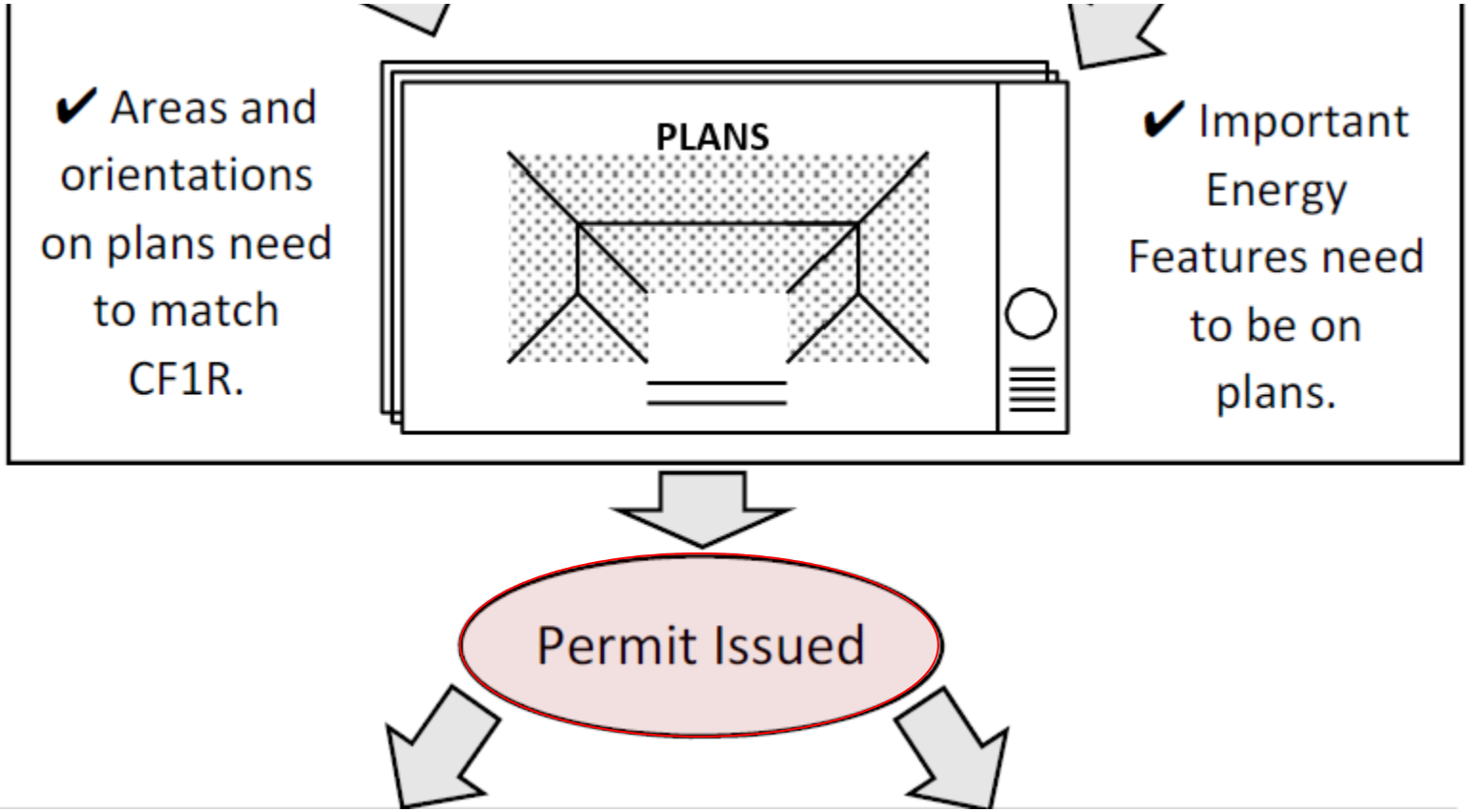
Compliance Process Flow Diagram

The document author determines which compliance approach is to be used and creates the compliance documents.



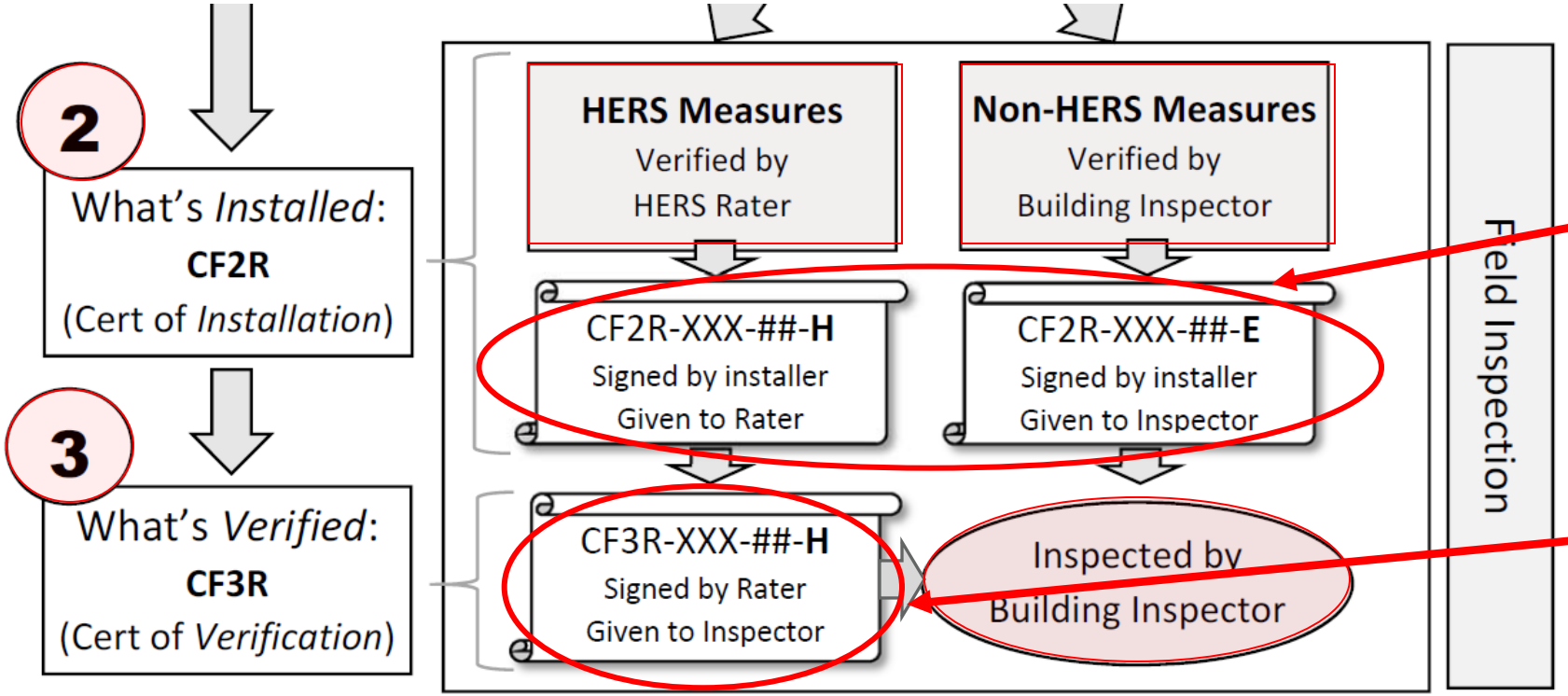
Compliance Process Flow Diagram

After the plans have been checked for accuracy and the compliance documents are verified to match, the permit is issued.



Compliance Process Flow Diagram

- The project starts and the energy features are installed.
- The responsible persons submit the supporting documents.
- The building inspector verifies that all documents have been submitted.



ALL measures (HERS and non-HERS) require a CF2R.

Only HERS measures require a CF3R.

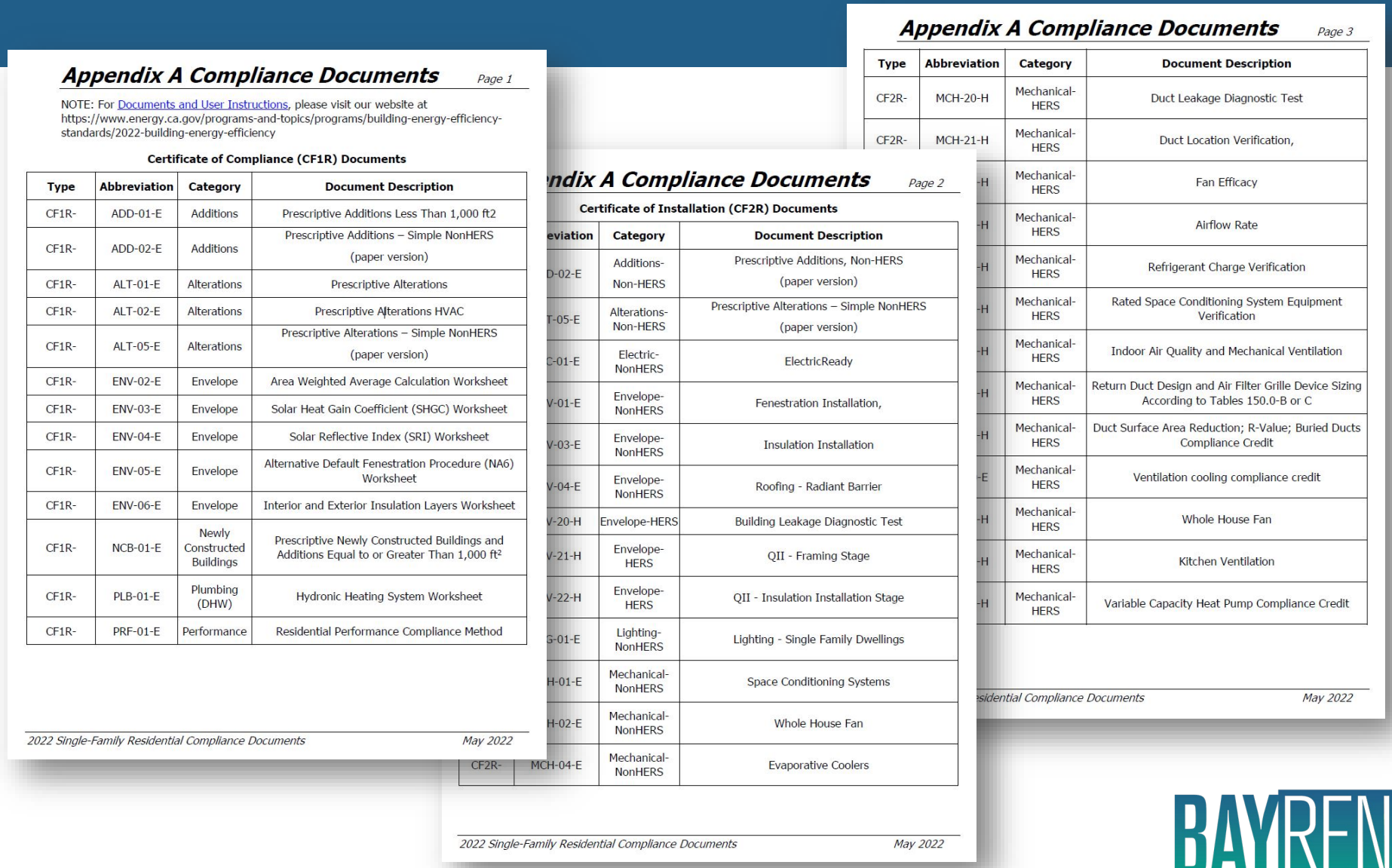
Energy Code Compliance Documents

Compliance Documents List

There are LOTS of compliance documents: CF1Rs, CF2Rs, and CF3Rs.

The good news is that, thanks to the HERS Registries, most of them are all electronic.

Refer to full-size copy provided with your handouts.



Appendix A Compliance Documents *Page 1*

NOTE: For Documents and User Instructions, please visit our website at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency

Certificate of Compliance (CF1R) Documents

Type	Abbreviation	Category	Document Description
CF1R-	ADD-01-E	Additions	Prescriptive Additions Less Than 1,000 ft2
CF1R-	ADD-02-E	Additions	Prescriptive Additions – Simple NonHERS (paper version)
CF1R-	ALT-01-E	Alterations	Prescriptive Alterations
CF1R-	ALT-02-E	Alterations	Prescriptive Alterations HVAC
CF1R-	ALT-05-E	Alterations	Prescriptive Alterations – Simple NonHERS (paper version)
CF1R-	ENV-02-E	Envelope	Area Weighted Average Calculation Worksheet
CF1R-	ENV-03-E	Envelope	Solar Heat Gain Coefficient (SHGC) Worksheet
CF1R-	ENV-04-E	Envelope	Solar Reflective Index (SRI) Worksheet
CF1R-	ENV-05-E	Envelope	Alternative Default Fenestration Procedure (NA6) Worksheet
CF1R-	ENV-06-E	Envelope	Interior and Exterior Insulation Layers Worksheet
CF1R-	NCB-01-E	Newly Constructed Buildings	Prescriptive Newly Constructed Buildings and Additions Equal to or Greater Than 1,000 ft²
CF1R-	PLB-01-E	Plumbing (DHW)	Hydronic Heating System Worksheet
CF1R-	PRF-01-E	Performance	Residential Performance Compliance Method

2022 Single-Family Residential Compliance Documents *May 2022*

ndix A Compliance Documents *Page 2*

Certificate of Installation (CF2R) Documents

eviation	Category	Document Description
D-02-E	Additions-Non-HERS	Prescriptive Additions, Non-HERS (paper version)
T-05-E	Alterations-Non-HERS	Prescriptive Alterations – Simple NonHERS (paper version)
C-01-E	Electric-NonHERS	ElectricReady
V-01-E	Envelope-NonHERS	Fenestration Installation,
V-03-E	Envelope-NonHERS	Insulation Installation
V-04-E	Envelope-NonHERS	Roofing - Radiant Barrier
V-20-H	Envelope-HERS	Building Leakage Diagnostic Test
V-21-H	Envelope-HERS	QII - Framing Stage
V-22-H	Envelope-HERS	QII - Insulation Installation Stage
G-01-E	Lighting-NonHERS	Lighting - Single Family Dwellings
H-01-E	Mechanical-NonHERS	Space Conditioning Systems
H-02-E	Mechanical-NonHERS	Whole House Fan
CF2R-	MCH-04-E	Mechanical-NonHERS	Evaporative Coolers

2022 Single-Family Residential Compliance Documents *May 2022*

Appendix A Compliance Documents *Page 3*

Type	Abbreviation	Category	Document Description
CF2R-	MCH-20-H	Mechanical-HERS	Duct Leakage Diagnostic Test
CF2R-	MCH-21-H	Mechanical-HERS	Duct Location Verification,
		Mechanical-HERS	Fan Efficacy
		Mechanical-HERS	Airflow Rate
		Mechanical-HERS	Refrigerant Charge Verification
		Mechanical-HERS	Rated Space Conditioning System Equipment Verification
		Mechanical-HERS	Indoor Air Quality and Mechanical Ventilation
		Mechanical-HERS	Return Duct Design and Air Filter Grille Device Sizing According to Tables 150.0-B or C
		Mechanical-HERS	Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
		Mechanical-HERS	Ventilation cooling compliance credit
		Mechanical-HERS	Whole House Fan
		Mechanical-HERS	Kitchen Ventilation
		Mechanical-HERS	Variable Capacity Heat Pump Compliance Credit

sidential Compliance Documents *May 2022*

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Compliance Documents

CF1R – Certificates of Compliance

- **CF1R-PRF-01-E**: Used when the *performance* approach is used to demonstrate compliance for any kind of project (computer software).
- **CF1R-NCB-01-E:** Used when the *prescriptive* approach is used to demonstrate compliance for newly constructed homes and additions over 1,000 square feet. Typically filled out using the HERS registry.
- **CF1R-ADD-01-E:** Used when the *prescriptive* approach is used to demonstrate compliance for additions less than or equal to 1,000 square feet. Typically filled out using the HERS registry.

← Most common for New Construction

Existing+Addition+Alteration

- **CF1R-ALT-01**: Used to demonstrate compliance for non-HVAC alterations (roof, windows, walls, etc.).
- **CF1R-ALT-02:** Used to demonstrate compliance for HVAC alterations. (change-outs, cut ins, >25 LF ducts, etc.). Can be hand-filled for permit, but for final, all forms must be registered.

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Compliance Documents

CF-1R – Certificates of Compliance (Worksheets)

Supporting Documents

These forms, or worksheets, may be required when using the ***prescriptive*** approach to show the calculations used. The HERS registry will provide these when HERS verifications are required.

- CF1R-ENV-02-E: Envelope – Area Weighted Avg Calculation *Worksheet*
- CF1R-ENV-03-E: Envelope – SHGC Calculation *Worksheet*
- CF1R-ENV-04-E: Envelope – Solar Reflective Index (SRI) *Worksheet*
- CF1R-ENV-05-E: Envelope – Alternative Default Fenestration *Procedure*
- CF1R-ENV-06-E: Envelope – Interior/Exterior Insulation *Worksheet*
- CF1R-PLB-01-E: Hydronic Heating System *Worksheet*
- CF1R-STH-01-E: Solar Water Heating System *Worksheet*

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Compliance Documents

CF-2R – Certificates of Installation – Non-HERS Measures (-E)

- CF2R-ENV-01-E: Fenestration (windows, skylights, etc.)
- CF2R-ENV-03-E: Insulation
- CF2R-ENV-04-E: Roofing products and radiant barrier
- CF2R-LTG-01-E: Lighting features – Single Family
- CF2R-MCH-01-E: Mechanical systems (HVAC)
- CF2R-MCH-02-E: Whole house fan
- CF2R-MCH-04-E: Evaporative coolers
- CF2R-MCH-30-E: Central Fan Ventilation Cooling System (VCS)
- CF2R-PVB-01-E: Documents correct PV System Installation
- CF2R-PLB-01-E: Multi-family central hot water distribution systems
- CF2R-PLB-02-E: Single-family central hot water distribution systems
- CF2R-PLB-03-E: Pool and spa heating systems

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Compliance Documents

CF-2R – Certificates of Installation – HERS Measures (-H)

- CF2R-ENV-20-H: Envelope air leakage (blower door test)
- CF2R-ENV-21-H: QII Framing Stage *
- CF2R-ENV-22-H: QII Insulation Stage *
- CF2R-MCH-20-H: Sealed ducts*
- CF2R-MCH-21-H: Supply duct location verification
- CF2R-MCH-22-H: HVAC system fan efficacy (fan watt draw)*
- CF2R-MCH-23-H: HVAC system fan airflow*
- CF2R-MCH-24-H: Enclosure Air Leakage Worksheet
- CF2R-MCH-25-H: HVAC system refrigerant charge*
- CF2R-MCH-26-H: Rated system verification (High SEER/EER)*
- CF2R-MCH-27-H: Ventilation to the ASHRAE 62.2 standard*
- CF2R-MCH-28-H: Return Duct Filter Grille Design (alternative to airflow test)
- CF2R-MCH-29-H: Supply duct surface area and buried ducts verification
- CF2R-MCH-30-H: Ventilation Cooling Airflow Verification
- CF2R-MCH-31-H: Whole House Fan Airflow Verification
- CF2R-MCH-32-H: Kitchen Ventilation*
- CF2R-PLB-21-H: Multi-family central hot water distribution systems
- CF2R-PLB-22-H: Single-family central hot water distribution systems

* Most common HERS Tests

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Compliance Documents

CF-3R – Certificates of Verification HERS

- For each **CF2R-XXX-##-H** there is a corresponding **CF3R-XXX-##-H**
- The list of CF3Rs will look exactly like the list of CF2R-**H**s
- The HERS registry will help you make sure the correct CF2Rs and CF3Rs get used and completed.

Source: CalCERTS® Quick Status Report

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Compliance Documents

LRMF and Non-res Documents

- For LRMF project there will be **LMCC**, **LMCI**, **LMCV** forms instead of CF1R, CF2R, CF3R forms.

- For **Nonresidential** projects, the registry will ONLY list the **NRCV** forms.

Source: CalCERTS® Quick Status Report

HERS & Residential HVAC Alterations

The Process – HVAC Alterations

- See handout: **"Suggested Guidelines for Building Departments to Handle Permit Submittals for HVAC Alterations (Changeouts)"**
- Knowing whether a HERS rater is required on the project needs to be determined as **early as possible** to prevent problems later.
- It is not required to be known prior to ***issuing*** a permit, or even performing the work, but because it can have a substantial impact on cost and scope of the project, it should be done as early as possible.
- Note that a CF1R is not required to issue a permit for an HVAC change-out but is required to close a permit.

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The Process – HVAC Alterations

- The HERS Provider Registry does an excellent job walking people through the complicated process (like “Turbo-Tax”).
- It is *recommended* that all HVAC alterations start there.
- This will help the applicant determine:
  - Whether or not HERS verification is required,
  - What HERS tests and compliance forms are required
- It provides on-line tracking of the process for all parties.
- It will also generate a CF1R specific to the project.

The Process – HVAC Alterations

- Only projects that require HERS verification are required to be registered with a HERS Provider.
- This includes **any alteration** that involves the installation or replacement of the following:
  - A/C condenser
  - A/C coil
  - Package unit
  - Air handler (furnace, fan coil, etc.)
  - Any refrigerant containing component
  - More than 25’ of ducts

These all can potentially trigger duct leakage testing by the HERS Rater along with some other tests. BUT, there are exceptions.

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The Process – HVAC Alterations

Exceptions to the requirement for duct leakage diagnostic test and HERS verification include:

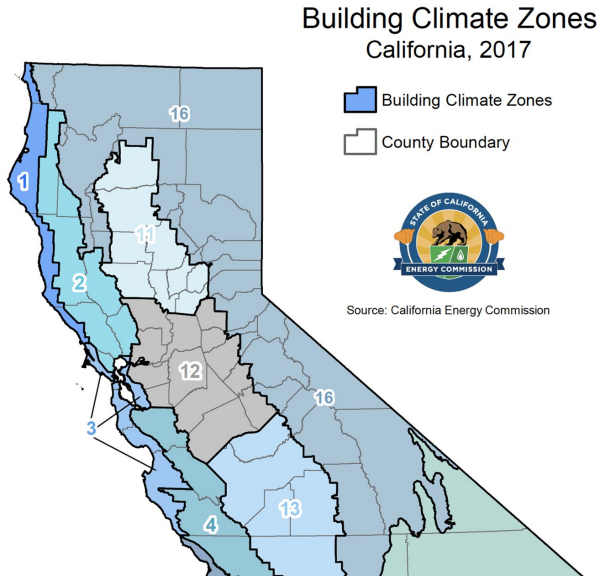
- Duct systems that are insulated or sealed with asbestos
- Duct systems that have been previously tested and verified for duct leakage (must be documented).
- Duct systems with less than 40 feet of ducts

These exceptions are to be verified by the **building inspector** (especially any project claiming asbestos).

The Process – HVAC Alterations

Exceptions to the requirement for refrigerant charge verification by a HERS rater include:

- Projects NOT in climate zones 2, and 8-15
  - Climate Zones 1, 3-7, and 16 are in milder climates and are exempt because there is less of an impact on energy use.
- Factory charged **package units**
  - The refrigerant system is not opened as in a split system and less likely to be poorly charged.
  - A CF2R Certificate of Installation is still required
  - The installer documents the exception with the CF2R



In the Bay Area, refrigerant charge verification is only required in Napa County and parts of Marin and Sonoma Counties.

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HVAC: System Types

Package System

Source: Goodman

Split System

Source: Trane

The “Ideal” Process – HVAC Alterations

1. HVAC contractor bids project
2. Project is entered into registry to determine what HERS tests are required.
3. If contractor wins bid the CF1R-ALT-02 is generated and signed on-line
4. Contractor gets permit with the CF1R
5. Contractor installs equipment
6. Contractor completes and signs CF2Rs on-line
7. Hers Rater performs tests
8. HERS Rater completes and signs CF3Rs on-line
9. Building Department does their inspections, and all forms are checked for completion in registry.
10. Done!

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Sampling

- Sampling is a process that allows homes to be **self tested** by the installer and put into groups of **up to** seven homes.
- The Rater **randomly** selects a house for testing, if it passes, all houses in that group pass.
- Designed for **subdivisions** and common in those projects.
- **Not allowed** for new custom homes.
- Allowed for **HVAC changeouts**, but not as common due to the time it takes to get a group together.
- In all cases, **every house** is tested first by the installer. The house selected by the Rater gets tested **twice**.
- The registry will help track sampling.

Going away in 2025

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Best Practices for HERS and Energy Code Enforcement

Best Practices for **Res New Construction**

- Do not accept unregistered CF1Rs for new construction.
- Make sure project can be found in appropriate registry. If not, it may be registered under the **wrong jurisdiction**.
- Check that the plans match the CF1R – especially windows!
- Use “What to Check on a CF1R” to coordinate plan checking and field inspections.
- Coordinate inspections with HERS tests.
- Before Issuing Certificate of Occupancy, check completion of all forms in registry.
- Get to know your local HERS raters.

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Best Practices for **Res HVAC Changeouts**

- Require a registered CF1R-ALT-02 at time of permit application.
- If no HERS tests are required, confirm exceptions.
- Make sure you can find the project in appropriate registry. If not, it may be registered under the wrong jurisdiction.
- Tell the installing contractor that you will be requiring all forms to be completed in the registry.
- Before closing out the project, confirm completion of all forms in the registry.
- Get to know your local HERS raters.

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Best Practices for **Nonres HERS Tests**

- Require **NRCC** form at time of permit application.
- **NRCC** form will indicate which HERS tests are required (**NRCV** forms)
- If no HERS tests are required, confirm exceptions.
- Make sure you can find the project in appropriate registry. If not, it may be registered under the wrong jurisdiction.
- Tell the installing contractor that you will be requiring all forms to be completed in the registry.
- Before closing out the project, confirm completion of all forms in the registry.
- Get to know your local HERS raters.

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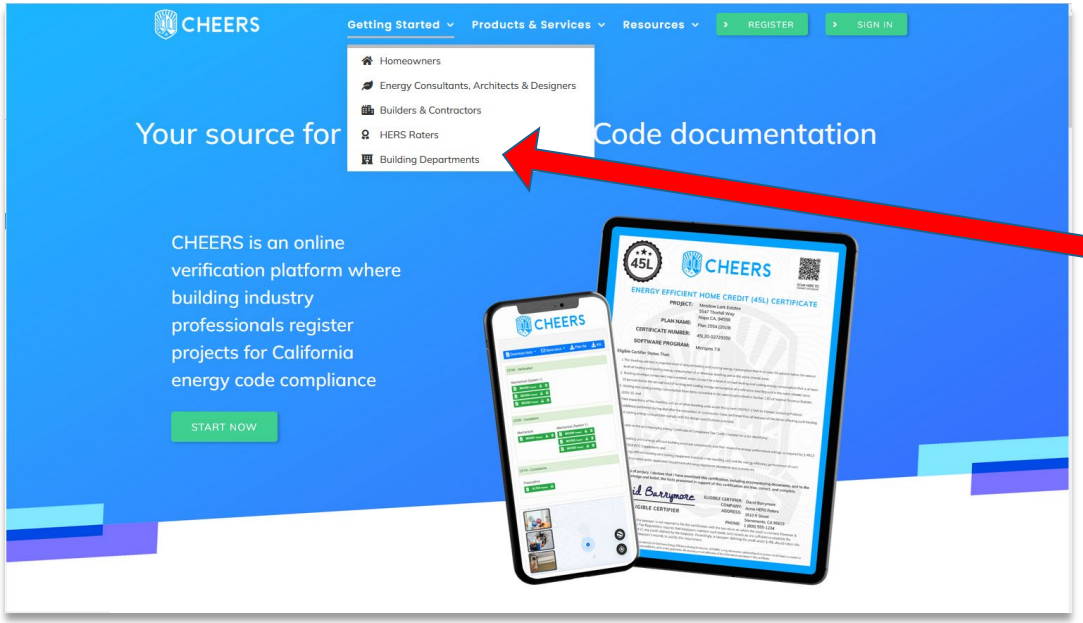
HERS Registry

- Building departments have direct access to registered documents within their jurisdiction through the HERS registry.
- Sign up to get access.



Building department sign-up information

www.cheers.org

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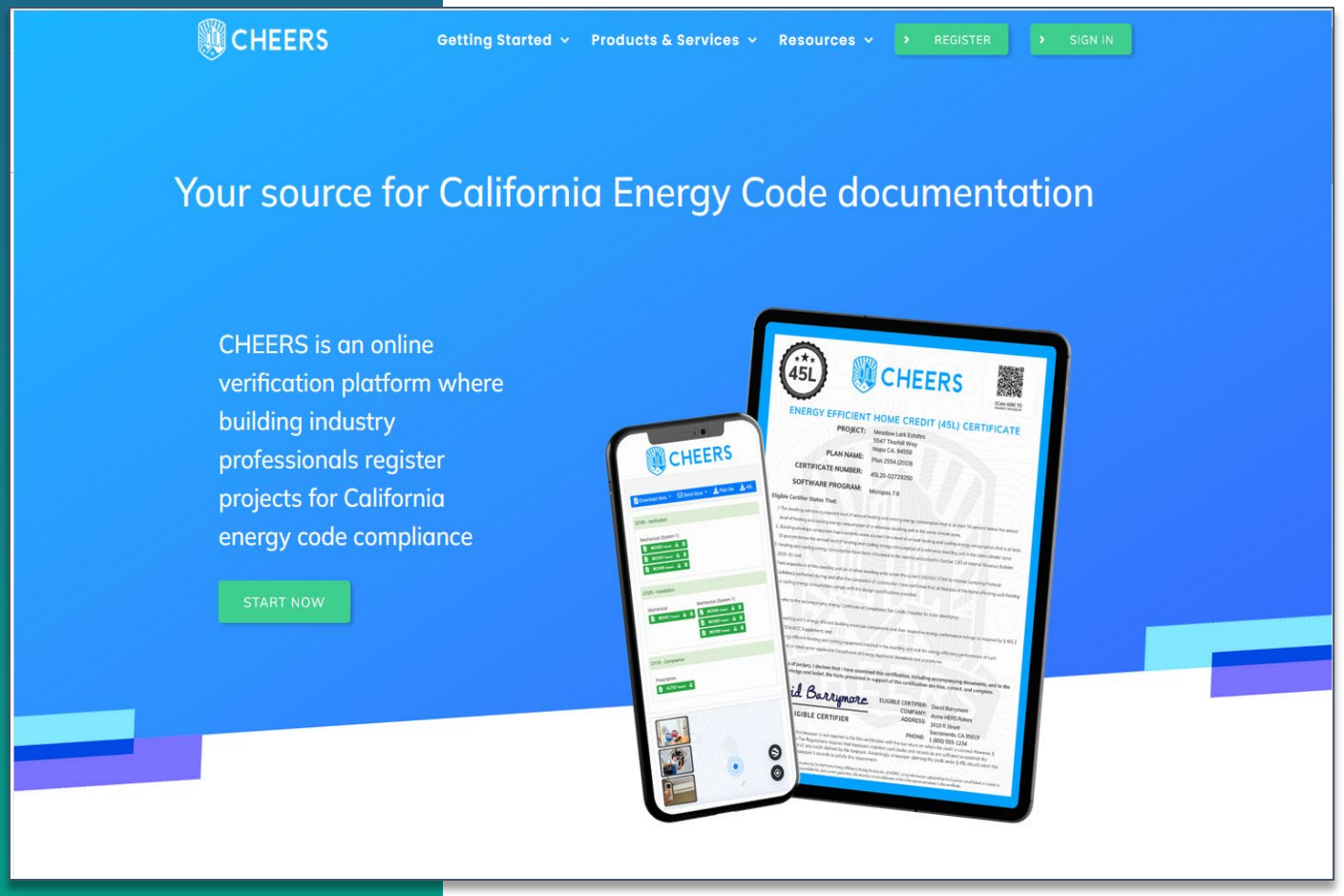
HERS Registry Walk Through



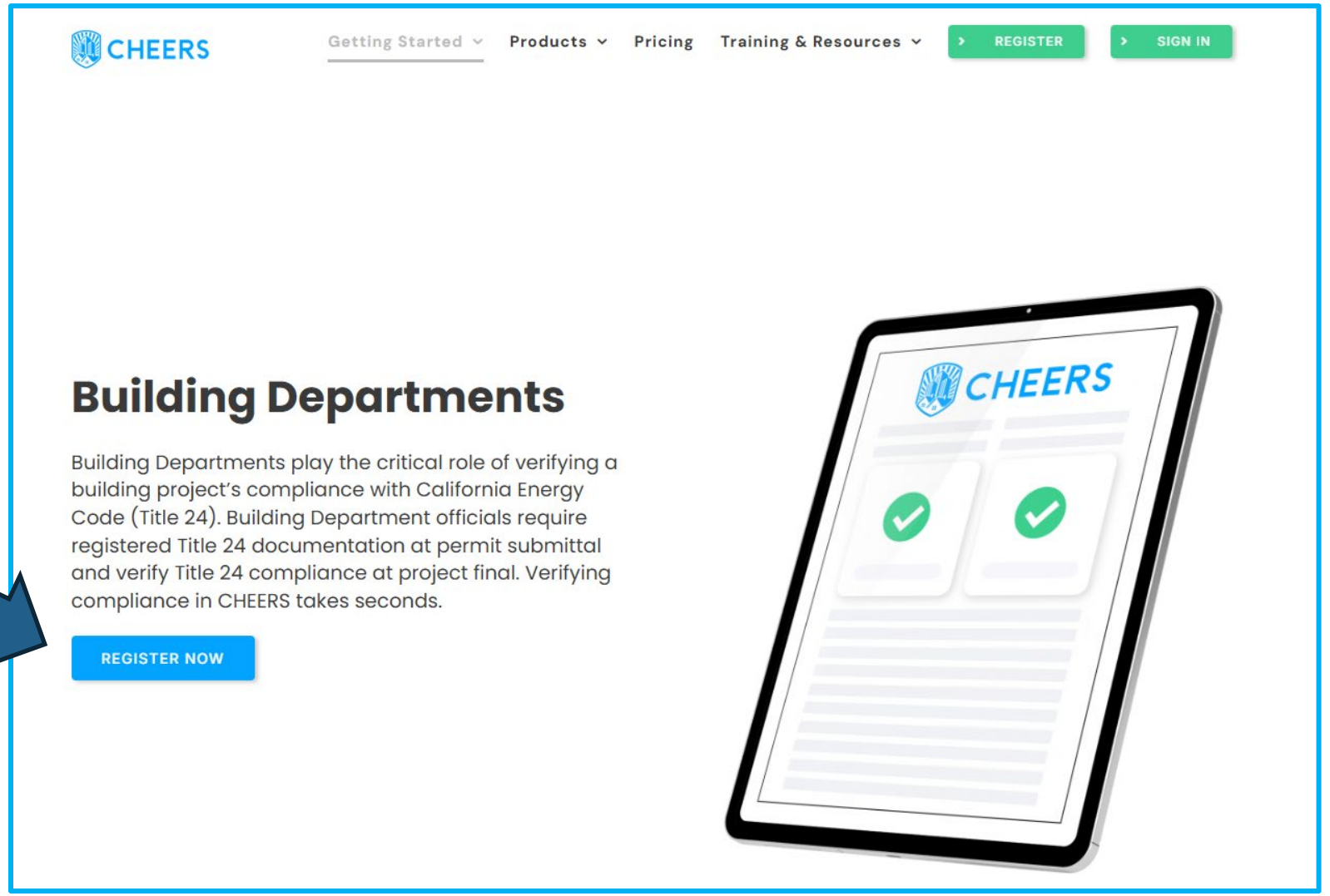
Registry Demonstration

There is currently only one approved HERS provider for 2022 Building Energy Efficiency Standards

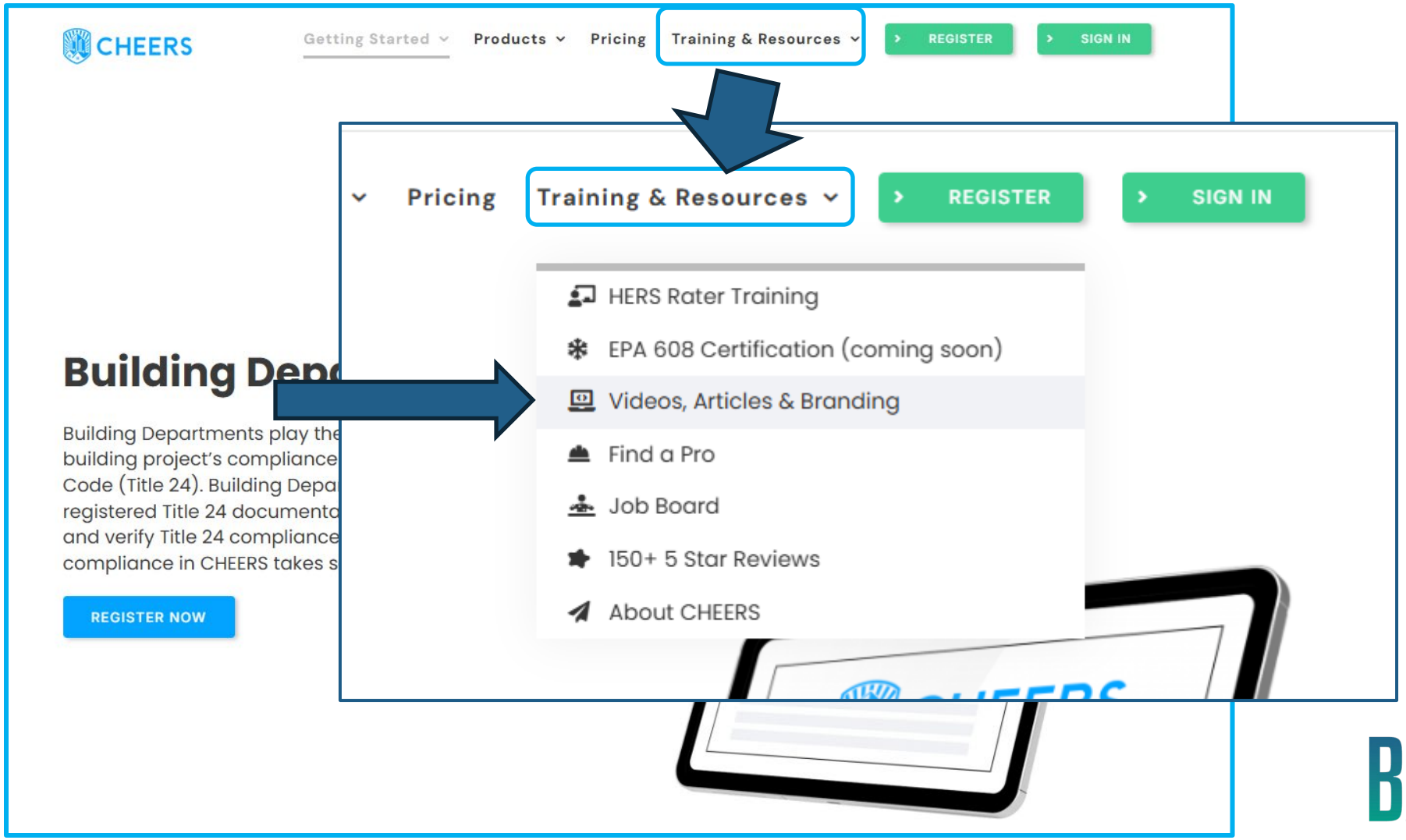
www.CHEERS.org

CalCERTS closed their doors late last year.

CHEERS Registry

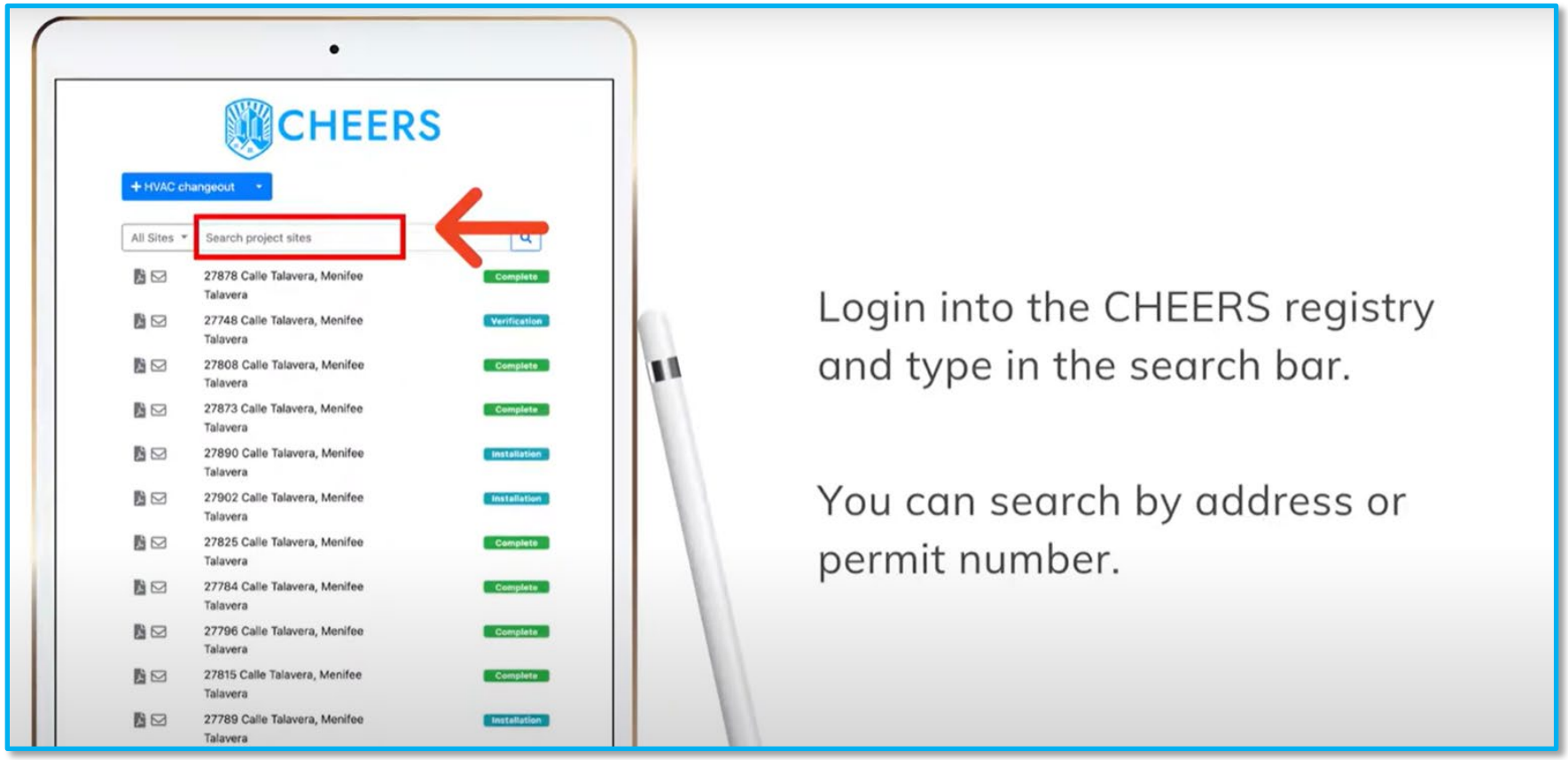


CHEERS Registry



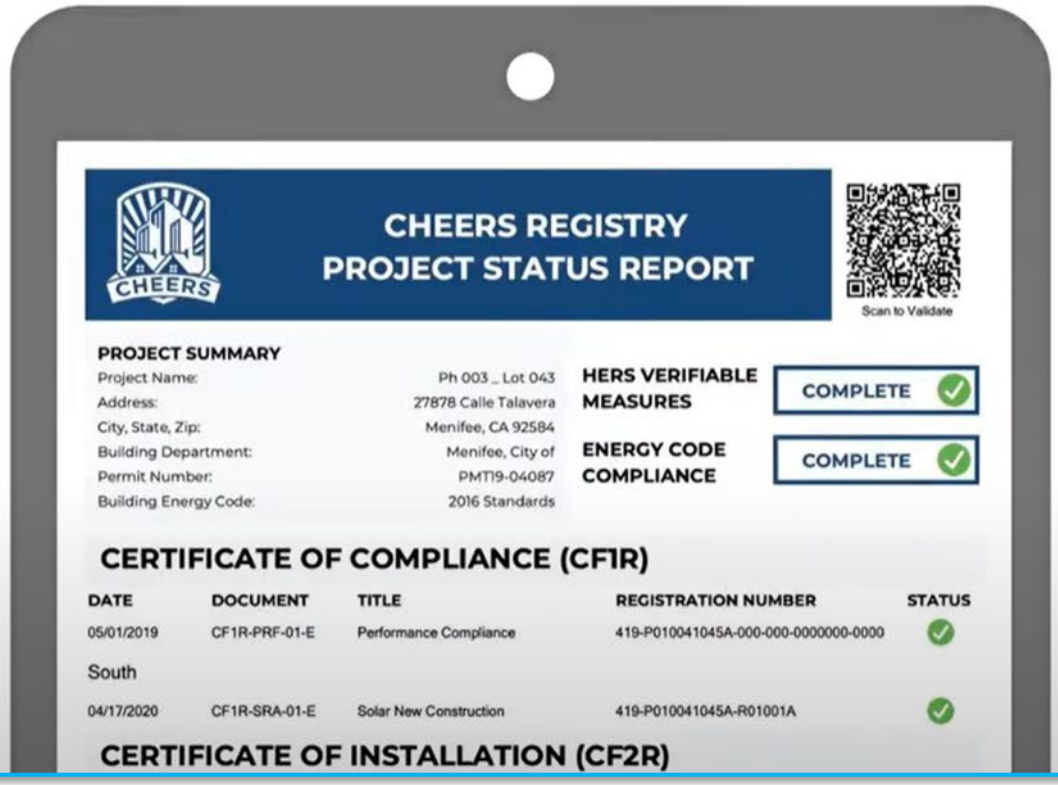
CHEERS Registry

CHEERS Registry



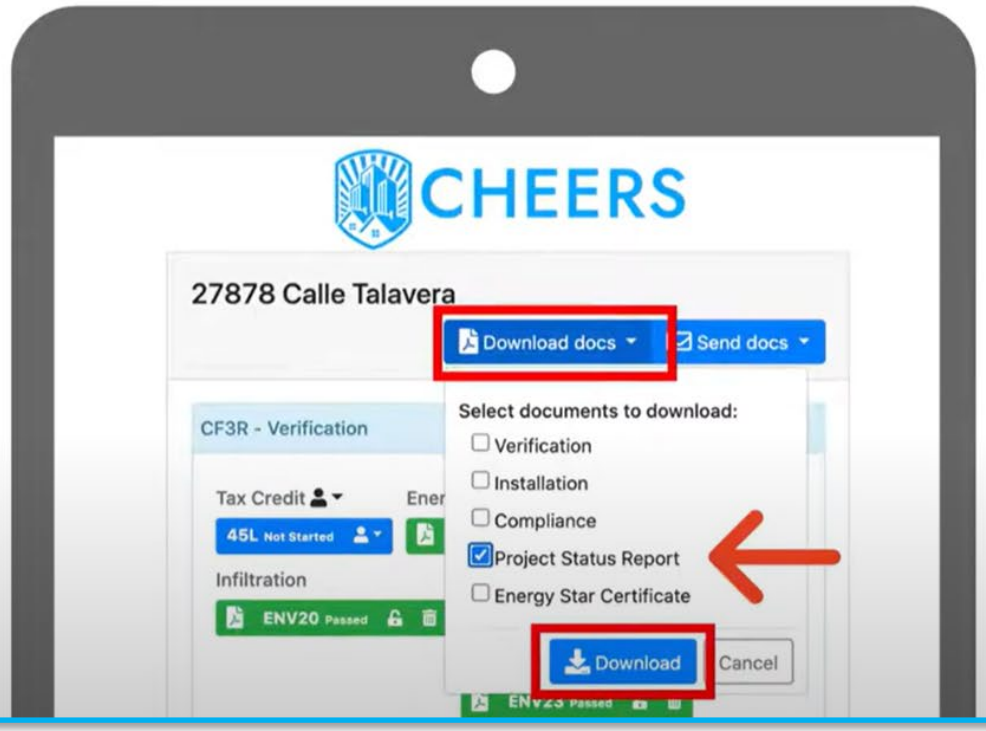
CHEERS Registry

Open the
"Project Status Report."



CHEERS Registry

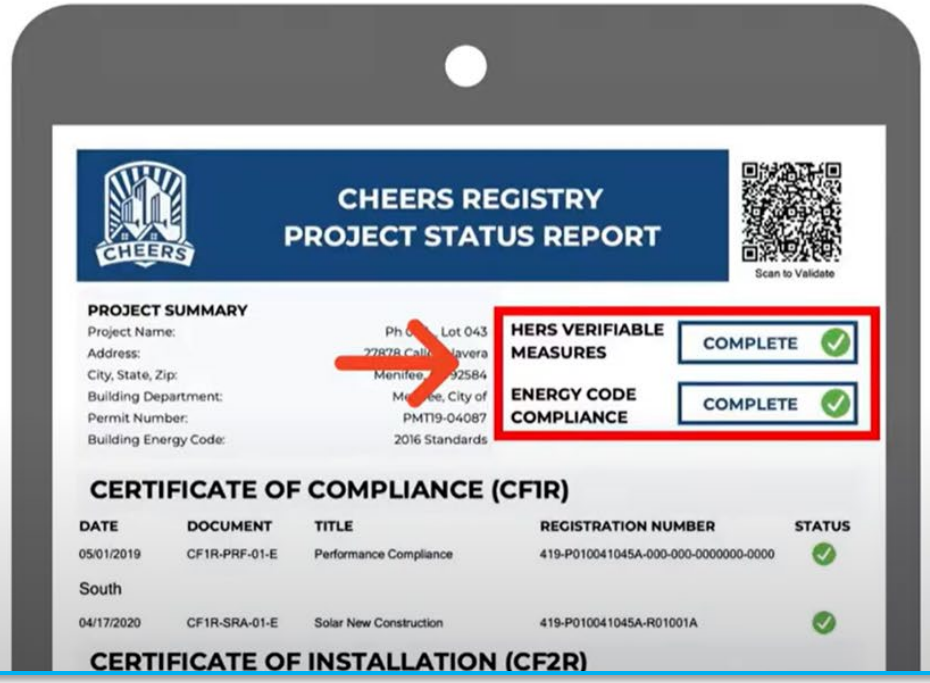
Under Download Docs
choose
"Project Status Report."



BAYREN

CHEERS Registry

Look on the right side for the "Energy Code Compliance" status.



CHEERS Registry

COMPLETE

means project documents are complete and meet requirements for California Energy Code compliance.

INCOMPLETE

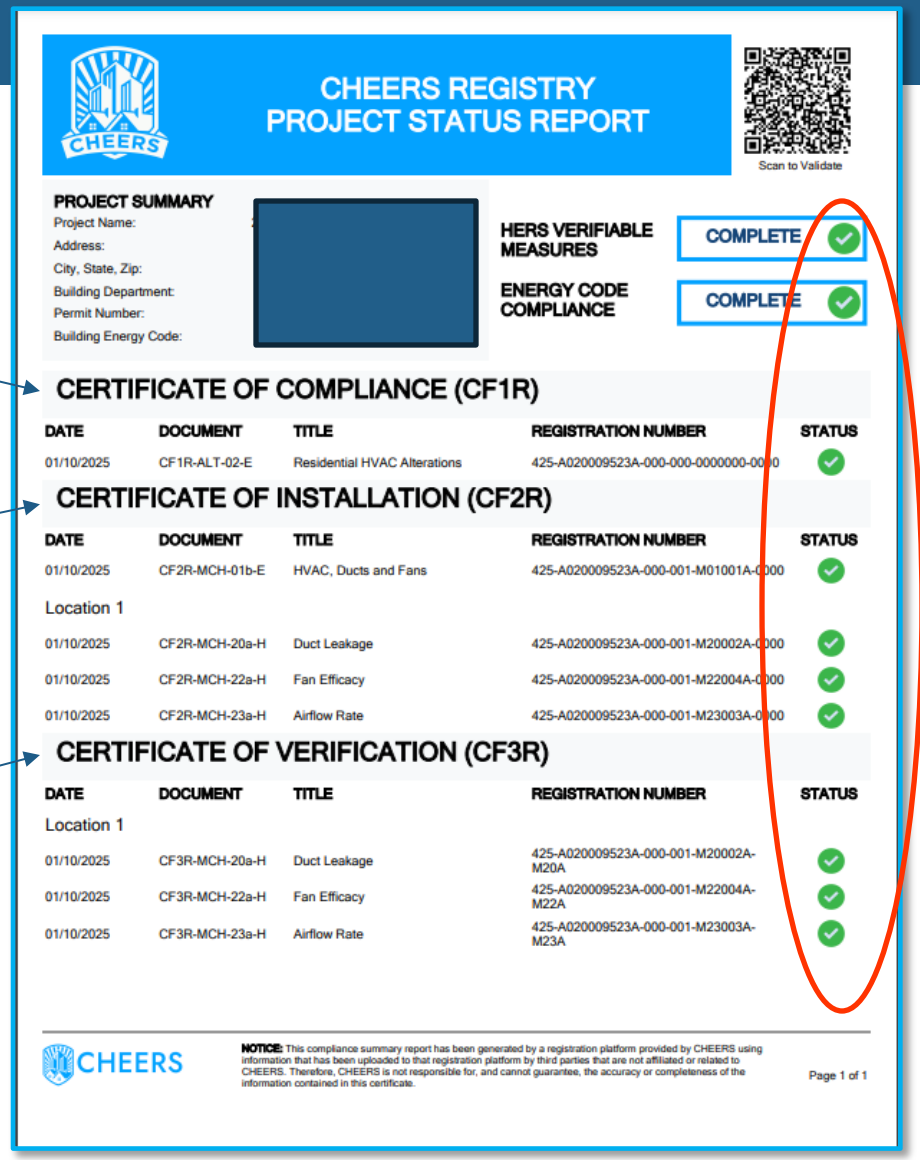
means project documents are incomplete or do not meet requirements for California Energy Code compliance.

CHEERS Registry

CF1Rs

CF2Rs

CF3Rs



CHEERS REGISTRY
PROJECT STATUS REPORT

Scan to Validate

PROJECT SUMMARY
Project Name:
Address:
City, State, Zip:
Building Department:
Permit Number:
Building Energy Code:

[redacted]

HERS VERIFIABLE MEASURES — COMPLETE

ENERGY CODE COMPLIANCE — COMPLETE

CERTIFICATE OF COMPLIANCE (CF1R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
01/10/2025	CF1R-ALT-02-E	Residential HVAC Alterations	425-A020009523A-000-000-0000000-0000	

CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
01/10/2025	CF2R-MCH-01b-E	HVAC, Ducts and Fans	425-A020009523A-000-001-M01001A-0000	
Location 1				
01/10/2025	CF2R-MCH-20a-H	Duct Leakage	425-A020009523A-000-001-M20002A-0000	
01/10/2025	CF2R-MCH-22a-H	Fan Efficacy	425-A020009523A-000-001-M22004A-0000	
01/10/2025	CF2R-MCH-23a-H	Airflow Rate	425-A020009523A-000-001-M23003A-0000	

CERTIFICATE OF VERIFICATION (CF3R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
Location 1				
01/10/2025	CF3R-MCH-20a-H	Duct Leakage	425-A020009523A-000-001-M20002A-M20A	
01/10/2025	CF3R-MCH-22a-H	Fan Efficacy	425-A020009523A-000-001-M22004A-M22A	
01/10/2025	CF3R-MCH-23a-H	Airflow Rate	425-A020009523A-000-001-M23003A-M23A	

CHEERS

NOTICE: This compliance summary report has been generated by a registration platform provided by CHEERS using information that has been uploaded to that registration platform by third parties that are not affiliated or related to CHEERS. Therefore, CHEERS is not responsible for, and cannot guarantee, the accuracy or completeness of the information contained in this certificate.

Page 1 of 1

All Green!

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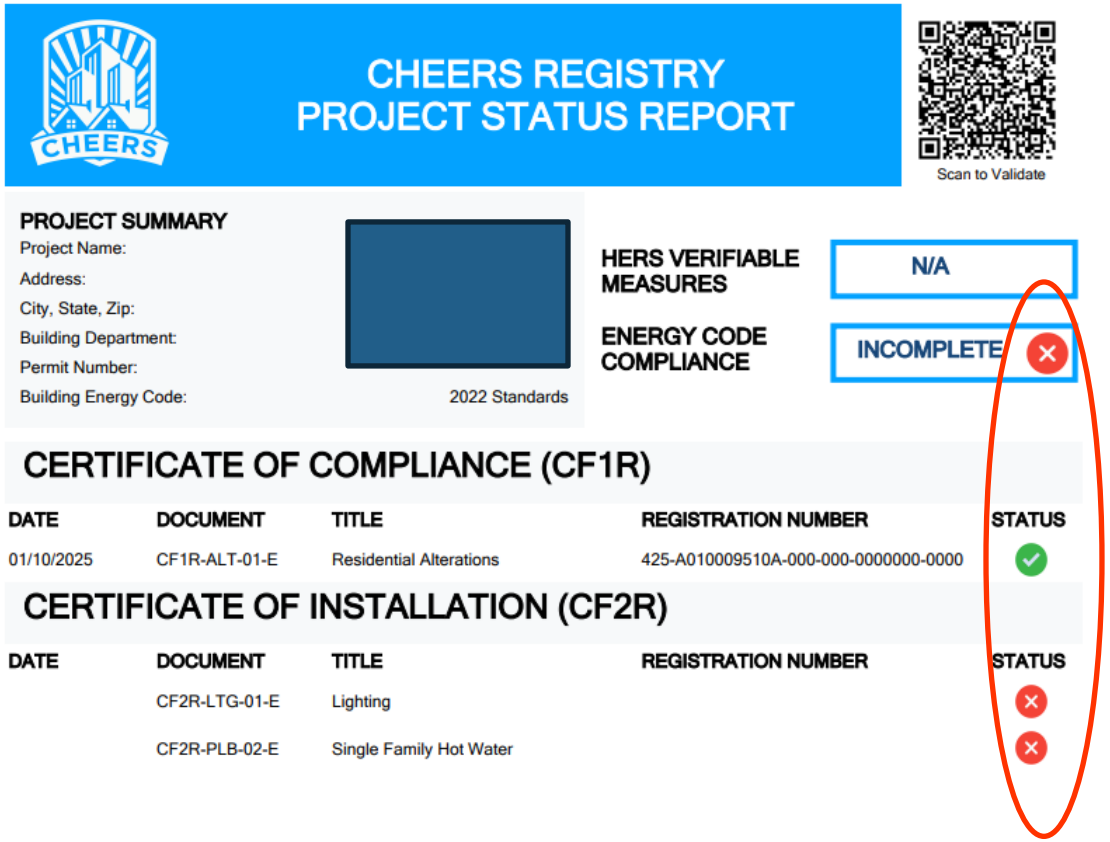
CHEERS Registry



CHEERS REGISTRY
PROJECT STATUS REPORT

Scan to Validate

PROJECT SUMMARY

Project Name:
Address:
City, State, Zip:
Building Department:
Permit Number:
Building Energy Code: 2022 Standards

HERS VERIFIABLE MEASURES N/A

ENERGY CODE COMPLIANCE INCOMPLETE

CERTIFICATE OF COMPLIANCE (CF1R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
01/10/2025	CF1R-ALT-01-E	Residential Alterations	425-A010009510A-000-000-0000000-0000	

CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
	CF2R-LTG-01-E	Lighting		
	CF2R-PLB-02-E	Single Family Hot Water		

If not, you can send them a message.

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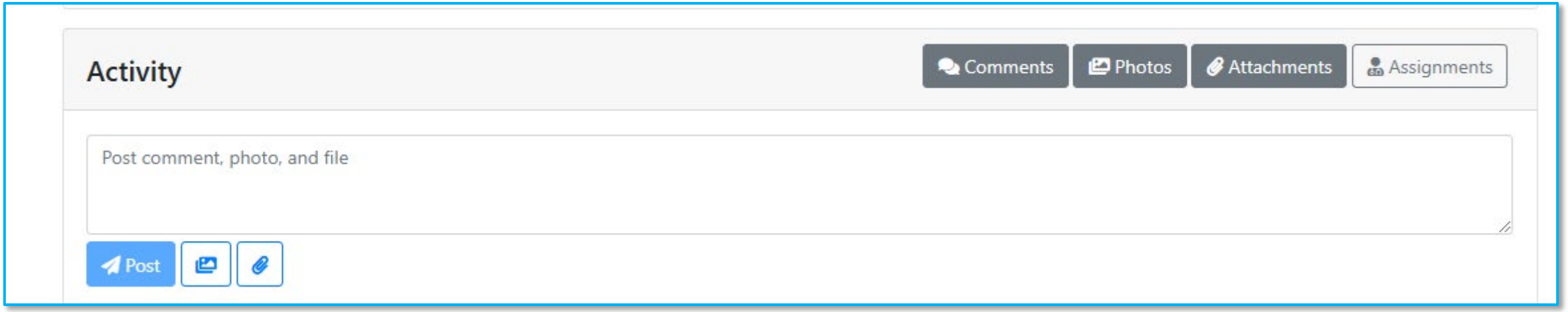
CHEERS Registry

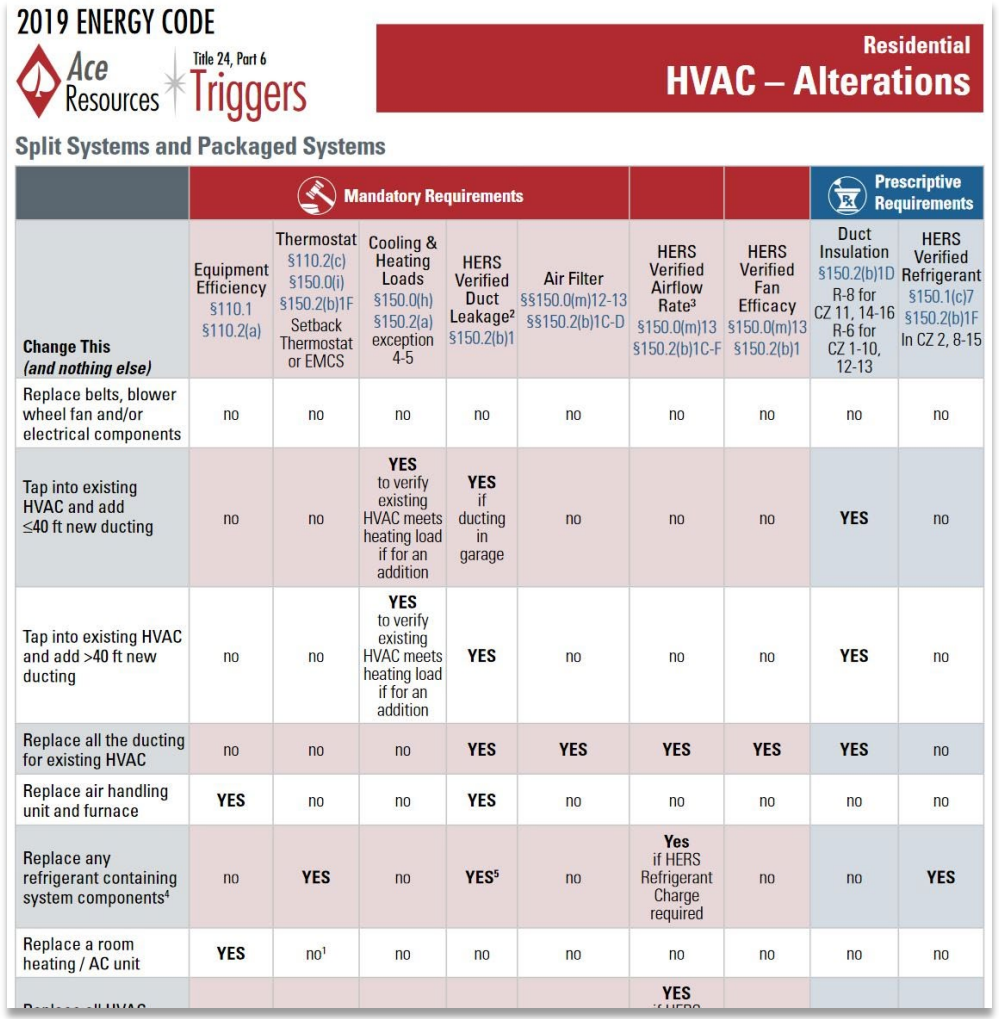


If not, you can send them a message.

Additional Resources

Additional Resources

www.energycodeace.com/resources



2019 ENERGY CODE

Ace Resources | Title 24, Part 6 Triggers

Residential

HVAC – Alterations

Split Systems and Packaged Systems

	Mandatory Requirements							Prescriptive Requirements	
Change This ***(and nothing else)***	Equipment Efficiency §110.1 §110.2(a)	Thermostat §110.2(c) §150.0(i) §150.2(b)1F Setback Thermostat or EMCS	Cooling & Heating Loads §150.0(h) §150.2(a) exception 4-5	HERS Verified Duct Leakage[2] §150.2(b)1	Air Filter §§150.0(m)12-13 §§150.2(b)1C-D	HERS Verified Airflow Rate[3] §150.0(m)13 §150.2(b)1C-F	HERS Verified Fan Efficacy §150.0(m)13 §150.2(b)1	Duct Insulation §150.2(b)1D R-8 for CZ 11, 14-16 R-6 for CZ 1-10, 12-13	HERS Verified Refrigerant §150.1(c)7 §150.2(b)1F In CZ 2, 8-15
Replace belts, blower wheel fan and/or electrical components	no	no	no	no	no	no	no	no	no
Tap into existing HVAC and add ≤40 ft new ducting	no	no	**YES** to verify existing HVAC meets heating load if for an addition	**YES** if ducting in garage	no	no	no	**YES**	no
Tap into existing HVAC and add >40 ft new ducting	no	no	**YES** to verify existing HVAC meets heating load if for an addition	**YES**	no	no	no	**YES**	no
Replace all the ducting for existing HVAC	no	no	no	**YES**	**YES**	**YES**	**YES**	**YES**	no
Replace air handling unit and furnace	**YES**	no	no	**YES**	no	no	no	no	no
Replace any refrigerant containing system components[4]	no	**YES**	no	**YES**[5]	no	**Yes** if HERS Refrigerant Charge required	no	no	**YES**
Replace a room heating / AC unit	**YES**	no[1]	no	no	no	no	no	no	no
						YES			

- Refer to the handout for footnotes and details.
- These Trigger Sheets offer a quick look at code references and HERS requirements.
- Note: This is the 2019 version. A 2022 version will be out soon.

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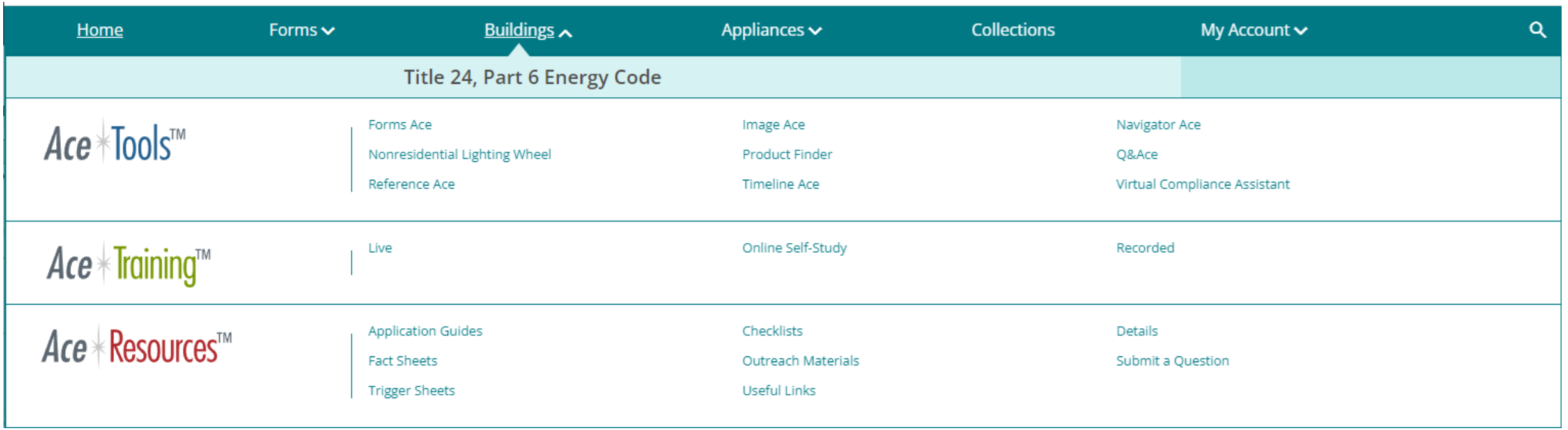
Additional Resources: Energy Code Ace



www.energycodeace.com

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Additional Training

BayREN Trainings: https://www.bayren.org/code-compliance/training

- Free, in-person or live online sessions for building department staff
- Usually, 60-90 minutes to fit with a staff meeting or lunch
- Topics include: Navigating the Energy Code, Residential Alterations, Nonresidential New Construction, Heat Pump Water Heaters, and more

Energy Code Ace Trainings: https://energycodeace.com/training

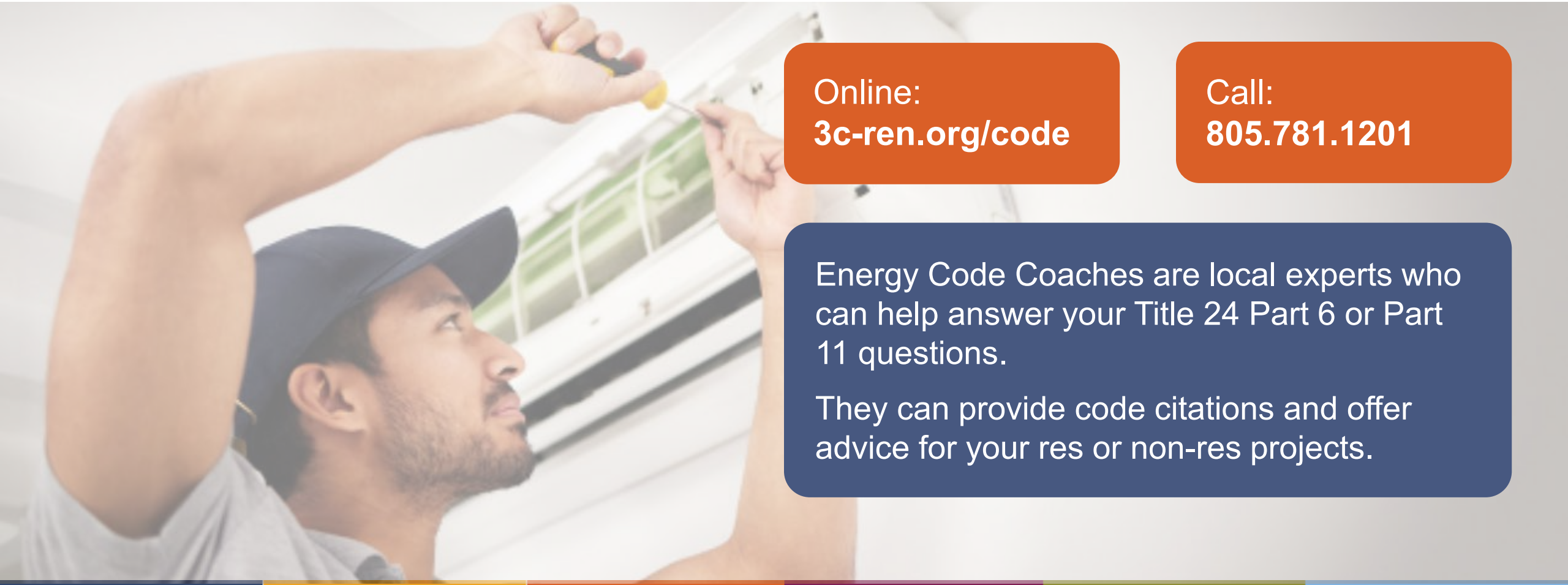
- Free training at the Pacific Energy Center or on-site
- Usually half-day or full-day in-depth classes for different audiences
- Includes full day trainings for Plans Examiners and Building Inspectors on the Residential Standards and Nonresidential Standards

Thank you for attending!

- Final Questions

Questions about Title 24?

3C-REN offers a *free* Code Coach Service



Online:
3c-ren.org/code

Call:
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 Part 6 or Part 11 questions.

They can provide code citations and offer advice for your res or non-res projects.

Closing

Continuing Education Units Available

- Contact dresurreccion@co.slo.ca.us for AIA and ICC LUs

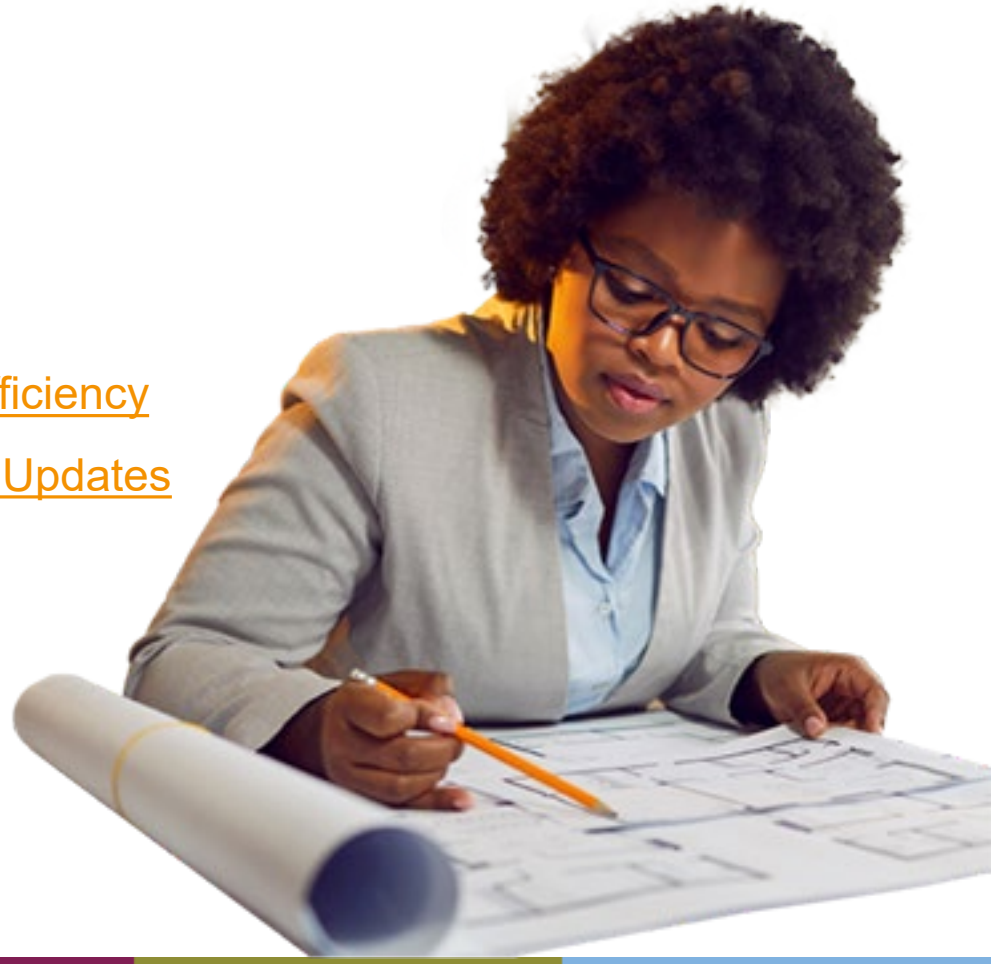
Coming to Your Inbox Soon!

- Slides & Recording

Upcoming Courses this Month:

- 6/17 - Optimizing Heat Pump Zoning for Maximum Comfort and Efficiency
- 6/25 - ADU: Energy Code Implementation Series, with 2025 Code Updates
- 6/26 - Mechanical Systems in Detail
- 6/27 - Ask the Experts: Heat Pump Water Heater Installations

Any phone numbers who joined? Please share your name!



Thank you!

More info: **3c-ren.org**

Questions: **info@3c-ren.org**

Email updates: **3c-ren.org/newsletter**

3C-REN

TRI-COUNTY REGIONAL ENERGY NETWORK

SAN LUIS OBISPO • SANTA BARBARA • VENTURA

Home Energy Rating System (HERS) Registry

BayREN Training

Handouts

1. 2022 Single-Family Residential Mandatory Requirements Summary
2. Compliance Process for Residential New Construction and Additions (Flow chart)
3. 2022 Energy Code Fact Sheet: Single-family Buildings – Just the Basics: HERS Verification
4. 2022 Energy Code Fact Sheet: Single-family Buildings – HVAC Additions and Alterations
5. Suggested Guidelines for Building Departments to Handle Permit Submittals for HVAC Alterations (Change-outs)

Home Energy Rating System (HERS) Registry

BayREN Training

Handout 1:

2022 Single-Family Residential Mandatory Requirements Summary

2022 Single-Family Residential Mandatory Requirements Summary

NOTE: Single-family residential buildings subject to the Energy Codes must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information.
(04/2022)

Building Envelope:

§ 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 § 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 § 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):	**Roof Deck, Ceiling and Rafter Roof Insulation.** Roof decks in newly constructed attics in climate zones 4 and 8-16 area-weighted average U-factor not exceeding U-0.184. Ceiling and rafter roofs minimum R-22 insulation in wood-frame ceiling; or area-weighted average U-factor must not exceed 0.043. Rafter roof alterations minimum R-19 or area-weighted average U-factor of 0.054 or less. 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 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. Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102. Masonry walls must meet Tables 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 percent; 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 0.45; or area-weighted average U-factor of all fenestration must not exceed 0.45. *

Fireplaces, Decorative Gas Appliances, and Gas Log:

§ 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:

§ 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 California Energy Commission. *
§ 110.2(a):	**HVAC Efficiency.** Equipment must meet the applicable efficiency requirements in Table 110.2-A through Table 110.2-N. *
§ 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)3:	**Insulation.** Unfired service water heater storage tanks and solar water-heating backup tanks must have adequate insulation, or tank surface heat loss rating.
§ 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 (except appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu per hour); 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.
§ 150.0(h)3A:	**Clearances.** Air conditioner and heat pump outdoor condensing units must have a clearance of at least five feet from the outlet of any dryer.
§ 150.0(h)3B:	**Liquid Line Drier.** Air conditioners and heat pump systems must be equipped with liquid line filter driers if required, as specified by the manufacturer's instructions.
§ 150.0(j)1:	**Water Piping, Solar Water-heating System Piping, and Space Conditioning System Line Insulation.** All domestic hot water piping must be insulated as specified in § 609.11 of the California Plumbing Code. *
§ 150.0(j)2:	**Insulation Protection.** Piping insulation must be protected from damage, including that due to sunlight, moisture, equipment` maintenance, and wind as required by §120.3(b). Insulation exposed to weather must be water retardant and protected from UV light (no adhesive tapes). Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space must include, or be protected by, a Class I or Class II vapor retarder. Pipe insulation buried below grade must be installed in a waterproof and non-crushable casing or sleeve.
§ 150.0(n)1:	**Gas or Propane Water Heating Systems.** Systems using gas or propane water heaters to serve individual dwelling units must designate a space at least 2.5' x 2.5' x 7' suitable for the future installation of a heat pump water heater, and meet electrical and plumbing requirements, based on the distance between this designated space and the water heater location; and a condensate drain no more than 2" higher than the base of the water heater
§ 150.0(n)3:	**Solar Water-heating Systems.** Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC), the International Association of Plumbing and Mechanical Officials, Research and Testing (IAPMO R&T), or by a listing agency that is approved by the executive director.

Ducts and Fans:

§ 110.8(d)3:	**Ducts.** Insulation installed on an existing space-conditioning duct must comply with § 604.0 of the California Mechanical Code (CMC). If a contractor installs the insulation, the contractor must certify to the customer, in writing, that the insulation meets this requirement.
§ 150.0(m)1:	**CMC Compliance.** All air-distribution system ducts and plenums must meet CMC §§ 601.0-605.0 and ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition. Portions of supply-air and return-air ducts and plenums must be insulated to R-6.0 or higher; ducts located entirely in conditioned space as confirmed through field verification and diagnostic testing (RA3.1.4.3.8) do not require insulation. Connections of metal ducts and inner core of flexible ducts must be mechanically fastened. Openings must be sealed with mastic, tape, or other duct-closure system that meets the applicable UL requirements, or aerosol sealant that meets UL 723. The combination of mastic and either mesh or tape must be used to seal openings greater than ¼", If mastic or tape is used. Building cavities, air handler support platforms, and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct must not be used to convey conditioned air. Building cavities and support platforms may contain ducts; ducts installed in these spaces must not be compressed. *
§ 150.0(m)2:	**Factory-Fabricated Duct Systems.** Factory-fabricated duct systems must comply with applicable requirements for duct construction, connections, and closures; joints and seams of duct systems and their components must not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.
§ 150.0(m)3:	**Field-Fabricated Duct Systems.** Field-fabricated duct systems must comply with applicable requirements for: pressure-sensitive tapes, mastics, sealants, and other requirements specified for duct construction.
§ 150.0(m)7:	**Backdraft Damper.** Fan systems that exchange air between the conditioned space and outdoors must have backdraft or automatic dampers.
§ 150.0(m)8:	**Gravity Ventilation Dampers.** Gravity ventilating systems serving conditioned space must have either automatic or readily accessible, manually operated dampers in all openings to the outside, except combustion inlet and outlet air openings and elevator shaft vents.
§ 150.0(m)9:	**Protection of Insulation.** Insulation must be protected from damage due tosunlight, moisture, equipment maintenance, and wind. Insulation exposed to weather must be suitable for outdoor service (e.g., protected by aluminum, sheet metal, painted canvas, or plastic cover). Cellular foam insulation must be protected as above or painted with a water retardant and solar radiation-resistant coating.
§ 150.0(m)10:	**Porous Inner Core Flex Duct.** Porous inner cores of flex ducts must have a non-porous layer or air barrier between the inner core and outer vapor barrier.
§ 150.0(m)11:	**Duct System Sealing and Leakage Test.** When space conditioning systems use forced air duct systems to supply conditioned air to an occupiable space, the ducts must be sealed and duct leakage tested, as confirmed through field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.1.
§ 150.0(m)12:	**Air Filtration.** Space conditioning systems with ducts exceeding 10 feet and the supply side of ventilation systems must have MERV 13 or equivalent filters. Filters for space conditioning systems must have a two inch depth or can be one inch if sized per Equation 150.0-A. Clean-filter pressure drop and labeling must meet the requirements in §150.0(m)12. Filters must be accessible for regular service. Filter racks or grilles must use gaskets, sealing, or other means to close gaps around the inserted filters to and prevents air from bypassing the filter. *

§ 150.0(m)13:	**Space Conditioning System Airflow Rate and Fan Efficacy.** Space conditioning systems that use ducts to supply cooling must have a hole for the placement of a static pressure probe, or a permanently installed static pressure probe in the supply plenum. Airflow must be ≥ 350 CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy ≤ 0.45 watts per CFM for gas furnace air handlers and ≤ 0.58 watts per CFM for all others. Small duct high velocity systems must provide an airflow ≥ 250 CFM per ton of nominal cooling capacity, and an air-handling unit fan efficacy ≤ 0.62 watts per CFM. Field verification testing is required in accordance with Reference Residential Appendix RA3.3. *

Ventilation and Indoor Air Quality:

§ 150.0(o)1:	**Requirements for Ventilation and Indoor Air Quality**. All dwelling units must meet the requirements of ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified in § 150.0(o)1. *
§ 150.0(o)1B:	**Central Fan Integrated (CFI) Ventilation Systems.** Continuous operation of CFI air handlers is not allowed to provide the whole-dwelling unit ventilation airflow required per §150.0(o)1C. A motorized damper(s) must be installed on the ventilation duct(s) that prevents all airflow through the space conditioning duct system when the damper(s) is closed andcontrolled per §150.0(o)1Biii&iv. CFI ventilation systems must have controls that track outdoor air ventilation run time, and either open or close the motorized damper(s) for compliance with §150.0(o)1C.
§ 150.0(o)1C:	**Whole-Dwelling Unit Mechanical Ventilation for Single-Family Detached and townhouses .** Single-family detached dwelling units, and attached dwelling units not sharing ceilings or floors with other dwelling units, occupiable spaces, public garages, or commercial spaces must have mechanical ventilation airflow specified in § 150.0(o)1Ci-iii.
§ 150.0(o)1G:	**Local Mechanical Exhaust.** Kitchens and bathrooms must have local mechanical exhaust; nonenclosed kitchens must have demand-controlled exhaust system meeting requirements of §150.0(o)1Giii,enclosed kitchens and bathrooms can use demand-controlled or continuous exhaust meeting §150.0(o)1Giii-iv. Airflow must be measured by the installer per §150.0(o)1Gv, and rated for sound per §150.0(o)1Gvi. *
§ 150.0(o)1H&I:	**Airflow Measurement and Sound Ratings of Whole-Dwelling Unit Ventilation Systems.** The airflow required per § 150.0(o)1C must be measured by using a flow hood, flow grid, or other airflow measuring device at the fan's inlet or outlet terminals/grilles per Reference Residential Appendix RA3.7. Whole-Dwelling unit ventilation systems must be rated for sound per ASHRAE 62.2 §7.2 at no less than the minimum airflow rate required by §150.0(o)1C.
§ 150.0(o)2:	**Field Verification and Diagnostic Testing.** Whole-Dwelling Unit ventilation airflow, vented range hood airflow and sound rating, and HRV and ERV fan efficacy must be verified in accordance with Reference Residential Appendix RA3.7. Vented range hoods must be verified per Reference Residential Appendix RA3.7.4.3 to confirm if it is rated by HVI or AHAM to comply with the airflow rates and sound requirements per §150.0(o)1G

Pool and Spa Systems and Equipment:

§ 110.4(a):	**Certification by Manufacturers.** Any pool or spa heating system or equipment must be certified to have all of the following: compliance with the Appliance Efficiency Regulations and listing in MAEDbS; an on-off switch mounted outside of the heater that allows shutting off the heater without adjusting the thermostat setting; a permanent weatherproof plate or card with operating instructions; and must not use electric resistance heating. *
§ 110.4(b)1:	**Piping.** Any pool or spa heating system or equipment must be installed with at least 36 inches of pipe between the filter and the heater, or dedicated suction and return lines, or built-in or built-up connections to allow for future solar heating.
§ 110.4(b)2:	**Covers.** Outdoor pools or spas that have a heat pump or gas heater must have a cover.
§ 110.4(b)3:	**Directional Inlets and Time Switches for Pools.** Pools must have directional inlets that adequately mix the pool water, and a time switch that will allow all pumps to be set or programmed to run only during off-peak electric demand periods.
§ 110.5:	**Pilot Light.** Natural gas pool and spa heaters must not have a continuously burning pilot light.
§ 150.0(p):	**Pool Systems and Equipment Installation.** Residential pool systems or equipment must meet the specified requirements for pump sizing, flow rate, piping, filters, and valves. *

Lighting:

§ 110.9:	**Lighting Controls and Components.** All lighting control devices and systems, ballasts, and luminaires must meet the applicable requirements of § 110.9. *
§ 150.0(k)1A:	**Luminaire Efficacy.** All installed luminaires must meet the requirements in Table 150.0-A, except lighting integral to exhaust fans, kitchen range hoods, bath vanity mirrors, and garage door openers; navigation lighting less than 5 watts; and lighting internal to drawers, cabinets, and linen closets with an efficacy of at least 45 lumens per watt.
§ 150.0(k)1B:	**Screw based luminaires.** Screw based luminaires must contain lamps that comply with Reference Joint Appendix JA8. *
§ 150.0(k)1C:	**Recessed Downlight Luminaires in Ceilings.** Luminaires recessed into ceilings must not contain screw based sockets, must be airtight, and must be sealed with a gasket or caulk. California Electrical Code § 410.116 must also be met.
§ 150.0(k)1D:	**Light Sources in Enclosed or Recessed Luminaires.** Lamps and other separable light sources that are not compliant with the JA8 elevated temperature requirements, including marking requirements, must not be installed in enclosed or recessed luminaires.
§ 150.0(k)1E:	**Blank Electrical Boxes.** The number of electrical boxes that are more than five feet above the finished floor and do not contain a luminaire or other device shall be no more than the number of bedrooms. These boxes must be served by a dimmer, vacancy sensor control, low voltage wiring, or fan speed control.
§ 150.0(k)1F:	**Lighting Integral to Exhaust Fans.** Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) must meet the applicable requirements of § 150.0(k). *

2022 Single-Family Residential Mandatory Requirements Summary

§ 150.0(k)1G:	**Screw based luminaires.** Screw based luminaires must contain lamps that comply with Reference Joint Appendix JA8. *
§ 150.0(k)1H:	**Light Sources in Enclosed or Recessed Luminaires.** Lamps and other separable light sources that are not compliant with the JA8 elevated temperature requirements, including marking requirements, must not be installed in enclosed or recessed luminaires.
§ 150.0(k)1I:	**Light Sources in Drawers, Cabinets, and Linen Closets.** Light sources internal to drawers, cabinetry or linen closets are not required to comply with Table 150.0-A or be controlled by vacancy sensors provided that they are rated to consume no more than 5 watts of power, emit no more than 150 lumens, and are equipped with controls that automatically turn the lighting off when the drawer, cabinet or linen closet is closed.
§ 150.0(k)2A:	**Interior Switches and Controls.** All forward phase cut dimmers used with LED light sources must comply with NEMA SSL 7A.
§ 150.0(k)2B:	**Interior Switches and Controls.** Exhaust fans must be controlled separately from lighting systems. *
§ 150.0(k)2A:	**Accessible Controls.** Lighting must have readily accessible wall-mounted controls that allow the lighting to be manually turned on and off. *
§ 150.0(k)2B:	**Multiple Controls.** Controls must not bypass a dimmer, occupant sensor, or vacancy sensor function if the dimmer or sensor is installed to comply with § 150.0(k).
§ 150.0(k)2C:	**Mandatory Requirements.** Lighting controls must comply with the applicable requirements of § 110.9.
§ 150.0(k)2D:	**Energy Management Control Systems.** An energy management control system (EMCS) may be used to comply with dimming, occupancy, and control requirements if it provides the functionality of the specified control per § 110.9 and the physical controls specified in § 150.0(k)2A.
§ 150.0(k)2E:	**Automatic Shutoff Controls.** In bathrooms, garages, laundry rooms, utility rooms and walk-in closets, at least one installed luminaire must be controlled by an occupancy or vacancy sensor providing automatic-off functionality. Lighting inside drawers and cabinets with opaque fronts or doors must have controls that turn the light off when the drawer or door is closed.
§ 150.0(k)2F:	**Dimmers.** Lighting in habitable spaces (e.g., living rooms, dining rooms, kitchens, and bedrooms) must have readily accessible wall-mounted dimming controls that allow the lighting to be manually adjusted up and down. Forward phase cut dimmers controlling LED light sources in these spaces must comply with NEMA SSL 7A.
§ 150.0(k)2K:	**Independent controls.** Integrated lighting of exhaust fans shall be controlled independently from the fans. Lighting under cabinets or shelves, lighting in display cabinets, and switched outlets must be controlled separately from ceiling-installed lighting.
§ 150.0(k)3A:	**Residential Outdoor Lighting.** For single-family residential buildings, outdoor lighting permanently mounted to a residential building, or to other buildings on the same lot, must have a manual on/off switch and either a photocell and motion sensor or automatic time switch control) or an astronomical time clock. An energy management control system that provides the specified control functionality and meets all applicable requirements may be used to meet these requirements.
§ 150.0(k)4:	**Internally illuminated address signs.** Internally illuminated address signs must either comply with § 140.8 or consume no more than 5 watts of power.
§ 150.0(k)5:	**Residential Garages for Eight or More Vehicles.** Lighting for residential parking garages for eight or more vehicles must comply with the applicable requirements for nonresidential garages in §§ 110.9, 130.0, 130.1, 130.4, 140.6, and 141.0.

Solar Readiness:

§ 110.10(a)1:	**Single-family Residences.** Single-family residences located in subdivisions with 10 or more single-family residences and where the application for a tentative subdivision map for the residences has been deemed complete and approved by the enforcement agency, which do not have a photovoltaic system installed, must comply with the requirements of § 110.10(b)-(e).
§110.10(b)1A:	**Minimum Solar Zone Area.** The solar zone must have a minimum total area as described below. The solar zone must comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area must be comprised of areas that have no dimension less than 5 feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet. For single-family residences, the solar zone must be located on the roof or overhang of the building and have a total area no less than 250 square feet. *
§ 110.10(b)2:	**Azimuth.** All sections of the solar zone located on steep-sloped roofs must have an azimuth between 90-300° of true north.
§ 110.10(b)3A:	**Shading.** The solar zone must not contain any obstructions, including but not limited to: vents, chimneys, architectural features, and roof mounted equipment. *
§ 110.10(b)3B:	**Shading.** Any obstruction located on the roof or any other part of the building that projects above a solar zone must be located at least twice the horizontal distance of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane. *
§ 110.10(b)4:	**Structural Design Loads on Construction Documents.** For areas of the roof designated as a solar zone, the structural design loads for roof dead load and roof live load must be clearly indicated on the construction documents.
§ 110.10(c):	**Interconnection Pathways.** The construction documents must indicate: a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service; and for single-family residences and central water-heating systems, a pathway reserved for routing plumbing from the solar zone to the water-heating system.
§ 110.10(d):	**Documentation.** A copy of the construction documents or a comparable document indicating the information from § 110.10(b)-(c) must be provided to the occupant.
§ 110.10(e)1:	**Main Electrical Service Panel.** The main electrical service panel must have a minimum busbar rating of 200 amps.
§ 110.10(e)2:	**Main Electrical Service Panel.** The main electrical service panel must have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space must be permanently marked as "For Future Solar Electric."

Electric and Energy Storage Ready:

2022 Single-Family Residential Mandatory Requirements Summary

§ 150.0(s)	**Energy Storage System (ESS) Ready.** All single-family residences must meet all of the following: Either ESS-ready interconnection equipment with backed up capacity of 60 amps or more and four or more ESS supplied branch circuits, *or* a dedicated raceway from the main service to a subpanel that supplies the branch circuits in § 150.0(s); at least four branch circuits must be identified and have their source collocated at a single panelboard suitable to be supplied by the ESS, with one circuit supplying the refrigerator, one lighting circuit near the primary exit, and one circuit supplying a sleeping room receptacle outlet; main panelboard must have a minimum busbar rating of 225 amps; sufficient space must be reserved to allow future installation of a system isolation equipment/transfer switch within 3' of the main panelboard, with raceways installed between the panelboard and the switch location to allow the connection of backup power source.
§ 150.0(t)	**Heat Pump Space Heater Ready.** Systems using gas or propane furnaces to serve individual dwelling units must include: A dedicated unobstructed 240V branch circuit wiring installed within 3' of the furnace with circuit conductors rated at least 30 amps with the blank cover identified as "240V ready;" and a reserved main electrical service panel space to allow for the installation of a double pole circuit breaker permanently marked as "For Future 240V use."
§ 150.0(u)	**Electric Cooktop Ready.** Systems using gas or propane cooktop to serve individual dwelling units must include: A dedicated unobstructed 240V branch circuit wiring installed within 3' of the cooktop with circuit conductors rated at least 50 amps with the blank cover identified as "240V ready;" and a reserved main electrical service panel space to allow for the installation of a double pole circuit breaker permanently marked as "For Future 240V use."
§ 150.0(v)	**Electric Clothes Dryer Ready.** Clothes dryer locations with gas or propane plumbing to serve individual dwelling units must include: A dedicated unobstructed 240V branch circuit wiring installed within 3' of the dryer location with circuit conductors rated at least 30 amps with the blank cover identified as "240V ready;" and a reserved main electrical service panel space to allow for the installation of a double pole circuit breaker permanently marked as "For Future 240V use."

*Exceptions may apply.

Home Energy Rating System (HERS) Registry

BayREN Training

Handout 2:

Compliance Process for Residential New Construction and Additions

(Flow chart)

Compliance Process for Residential New Construction and Additions

Start Here

1

What's *Required*:
CF1R
(Cert of *Compliance*)
and
Plans and Specs

Performance Approach

Compliance Approach (choose one)

Prescriptive Approach

Compliance Software

Required Energy Features determined by

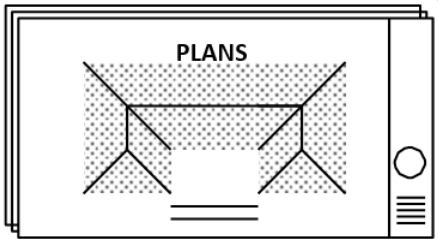
Table 150.1-A

CF1R-PRF-01

Certificate(s) of Compliance that document features

CF1R-ALT-01
CF1R-ALT-02
CF1R-ADD-01
CF1R-NCB-01

✓ Areas and orientations on plans need to match CF1R.



✓ Important Energy Features need to be on plans.

Plan Check

Permit Issued

2

What's *Installed*:
CF2R
(Cert of *Installation*)

3

What's *Verified*:
CF3R
(Cert of *Verification*)

HERS Measures
Verified by
HERS Rater

Non-HERS Measures
Verified by
Building Inspector

CF2R-XXX-##-**H**
Signed by installer
Given to Rater

CF2R-XXX-##-**E**
Signed by installer
Given to Inspector

CF3R-XXX-##-**H**
Signed by Rater
Given to Inspector

Inspected by Building Inspector

Field Inspection

Developed in partnership with the BayREN Codes & Standards Program
bayren.org/local-government-resources | codes@bayren.org

BAYREN
Local Governments Empowering Our Communities

Home Energy Rating System (HERS) Registry

BayREN Training

Handout 3:

2022 Energy Code Fact Sheet:

Single-family Buildings

Just the Basics: HERS Verification

Single-family Buildings

Just the Basics: HERS Verification

What's Included in this Fact Sheet?

The 2022 California Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) requires that third-party special inspectors called Home Energy Rating System (HERS) Raters perform field verification and diagnostic testing of certain installed building features and systems.

This fact sheet covers HERS verification and diagnostic testing required for single-family buildings, which include single-family homes, accessory dwelling units (ADUs), duplexes and townhomes of any height. New Construction, Additions and Alterations are covered. An Alteration is any change to an existing home that is regulated by the 2022 Energy Code. An Addition is any change to a building that increases both conditioned floor area and conditioned volume.

What Are HERS Raters?

The California Energy Commission (CEC) has delegated the responsibility for field verification and diagnostic testing to HERS Raters, who must be specially trained and certified to perform these services to help improve poor construction quality and equipment installation. In California's 2022 Energy Code, installed energy-related building features that trigger HERS verification are referred to as *HERS measures*. These cover a variety of features such as HVAC systems, plumbing systems and insulation installation for residential and some nonresidential projects. Certified HERS Raters perform on-site inspections and diagnostic tests, to ensure proper installation per verification protocols defined by the CEC in the Energy Code's Reference Appendices.

Why Should I Care about HERS Verification?

As a homeowner or building owner, you should expect your building features to be installed as designed and compliant with the Energy Code. The HERS verification process provides an extra level of quality assurance toward these goals.

As a contractor or developer, the HERS verification process helps to assure you that your sub-contractors are held responsible for compliance of the energy-related building features that they install.

For code enforcement personnel, HERS Raters provide specialized expertise on the diagnostic tests and tools so that building departments can focus on the other codes and inspections.

When Are HERS Raters Required?

Simply put, for single-family buildings, a HERS Rater is required when the Certificate of Compliance (CF1R) indicates that HERS measures are required.

- **New Construction, Additions > 1,000 ft² and accessory dwelling units (ADUs) that are Additions of any size:** These projects always require at least one HERS measure (verification of ventilation airflow) and usually several others, depending on the types of features installed.
- **Additions ≤ 1,000 ft² and any Alteration to an existing home:** HERS verification requirements depend on the building features being added. Required HERS measures are listed on the Certificate of Compliance (CF1R).

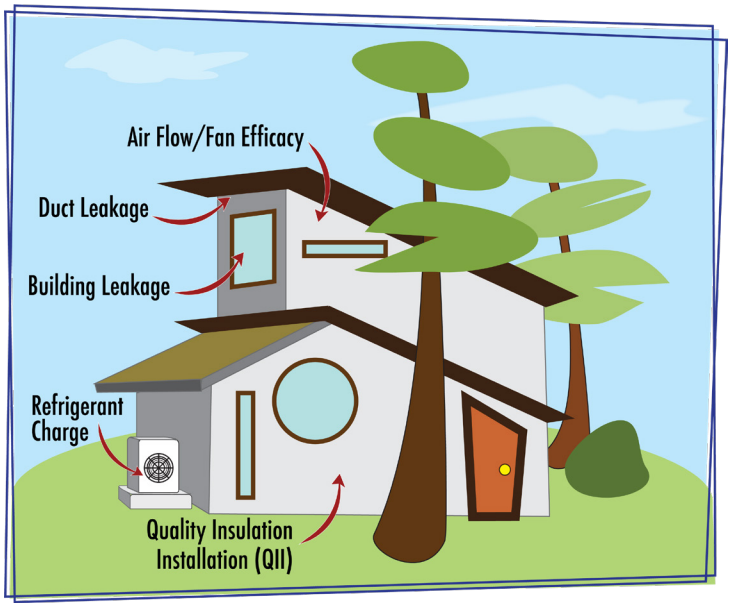


Figure 1. *Examples of HERS Measures in a Single-family Home*

Who Hires the HERS Rater and When?

For New Construction and Additions, the building owner or the general contractor typically hires the HERS Raters. For HVAC Alterations, HERS Raters are typically hired by the installing contractor. HERS Raters cannot be employees of the builder or contractor whose work they are verifying. Also, HERS Raters cannot have a financial interest in the builder's or contractor's business and cannot advocate or recommend the use of any product or service that they are verifying.

Typically, HERS Raters should be engaged at the beginning of a project so that they can coordinate with the contractor on when they need to perform inspections and testing. It is also important to coordinate with the energy consultant or documentation author when assigning a Rater to the project. This allows the Rater to have access to the registered compliance documentation associated with the project. HERS Raters can provide excellent advice to each installer on how best to simplify the process and comply with the requirements.

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Who Does What?

Energy Consultants

Energy consultants determine appropriate HERS Measures required for the project scope and include them in the Certificate of Compliance (CF1R).

HERS Raters

HERS Raters verify compliance of installed HERS measures with California's Energy Code. They are third-party special inspectors who perform field verification and diagnostic testing services for the benefit of the homeowner or building owner to ensure proper measure installation and systems operation. They document their verifications by completing and signing a Certificate of Verification (CF3R) for each HERS measure. HERS Raters are trained, tested and certified by a HERS Provider.

HERS Providers

HERS Providers are organizations approved by the CEC to train and certify HERS Raters and conduct quality assurance reviews to maintain consistency and integrity among HERS Raters. Providers also maintain a HERS registry, which contains an online database of projects that require HERS verification and provides easy access to all related compliance documents.

Building Inspectors

Building inspectors perform inspections for all building codes (structural, electrical, plumbing, etc.) throughout construction. HERS Raters are special inspectors assisting the building inspector and must demonstrate competence, to the satisfaction of the building official, for the visual inspections and diagnostic testing that they perform. Building inspectors are responsible for field verifying all of the non-HERS measures and make sure that all compliance documentation is completed by checking the online Project Status Report, accessible through the HERS registries.

Installers

Installers are the tradespeople who install the energy-related features in the home. They must take responsibility for the features that they install by completing and signing the Certificates of Installation (CF2Rs). If they install HERS measures, they must cooperate with the HERS Rater to ensure that all energy-related features pass HERS verification.

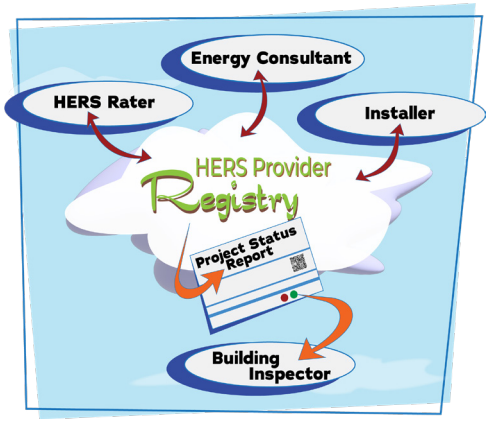

Figure 2. *Overview of the HERS Registry Information Pathway*

What Forms Are Used?

There are several documents that the building department needs to verify Energy Code compliance. The three types of Energy Code compliance documents required at different stages of construction include:

- **Certificate of Compliance (CF1R):** The CF1R documents the building features required to comply with the Energy Code. These features vary depending on the project and the compliance approach used and are submitted to the building department as part of the building permit application.
- **Certificate of Installation (CF2R):** CF2Rs document that the building products and features actually installed in the field match those required in the Certificate of Compliance. These forms must be completed and signed by the installer or contractor responsible for installing regulated building.
- **Certificate of Verification (CF3R):** CF3Rs document compliance with applicable HERS measures. Each CF3R form must be completed and signed by a HERS Rater.

How Are Documents Registered?

Registering compliance documents helps to ensure validity, accuracy and tracking of required energy compliance documents. If HERS measures are required by the Certificate of Compliance (CF1R), the building department requires a *registered* CF1R before issuing a permit.

The registration process is generally initiated by the energy consultant for newly constructed homes and by the homeowner or HVAC contractor for Alterations consisting of HVAC changeouts. However, the process can be started by anyone. The responsible party, owner, architect or contractor needs to establish password-protected access to the HERS Provider's registry to sign off and approve the required energy features before a *registered* CF1R may be generated. This approval is an important step in the process and should be completed to prevent delays in the completion of additional required documentation.

To establish an account with a HERS Provider, go to a Provider's website and follow its directions based on your role (homeowner, contractor or architect/designer). For security purposes, this process will require you to provide personal identification. Once your account is established, you will have access to either create or sign off on a project, whichever is applicable. Additional responsible parties can be given access to the project by whoever controls it.

After the CF1R has been approved and signed off by all responsible parties, it is ready to be submitted to the building department. The registered compliance documents contain a unique registration number, date and time stamp, watermark and name of the HERS Provider at the bottom of each page. This tells the building department that the documents are registered. If any changes occur to the scope of work, the CF1R will need to be revised, re-registered and re-submitted to the building department for approval. This can all be done electronically through the HERS Provider's registry.

Project Status Report

For code enforcement personnel, the most important tool for the Energy Code compliance process is the Project Status Report. This online tool is accessible through the HERS registries and is customized for each project. It shows all of the forms that are required for that specific project and what the status of each form is by a simple red dot (not complete) or green dot (complete). This greatly simplifies and streamlines the building inspector's job. A project should not be finalized until every form has a green dot.

What Is Sampling?

Sampling is a way to reduce the number of verifications needed when there is a lot of similarity between homes being inspected.

Homes are placed in small sample groups (up to five or seven homes per group, depending on sampling method) and self-tested by the installer, and then one house from the sample group is randomly selected and re-tested by the HERS Rater. Sampling is allowed in newly constructed tract homes (subdivisions) but not on custom homes. Sampling is also allowed on HVAC replacements.

To be in a sample group together, all homes must have been worked on by the same installing contractor(s) and have the same set of features that need to be tested.

Sampling is tracked by the HERS registry. Individual jurisdictions can choose to allow sampling or not on projects within their jurisdiction.

Energy Code Requirements

The Energy Code has three different types of requirements. See below for a description of each.

Mandatory Measures

All conditioned buildings must meet a set of Mandatory requirements for minimum envelope efficiencies and construction of assemblies. Examples of building envelope components addressed by Mandatory Measures include minimum insulation levels, infiltration controls and maximum fenestration U-factor. Some Mandatory Measures are HERS Measures, such as indoor air quality (IAQ) ventilation airflow measurement and duct leakage.

Prescriptive Approach

The Prescriptive Approach is considered the most direct path to compliance. It is a set of prescribed performance levels for various building components, where each component must meet or exceed the required minimum efficiency. There are different Prescriptive requirements for New Construction, Additions and Alterations. Some Prescriptive Measures are HERS Measures, including refrigerant charge verification and quality insulation installation (QII).

Performance Approach

The Performance Approach builds on the Prescriptive Approach by allowing energy allotments to be traded between building systems for buildings. There can be proposed energy use trade-offs between features of the building envelope, domestic water-heating, space-heating and cooling equipment. This compliance approach requires using energy analysis software that has been approved by the CEC. There are many "extra credit" measures available only through the Performance Approach that trigger HERS verification.

What HERS Verifications Are Required?

The following table lists the HERS measures associated with single family-homes for New Construction, Additions and Alterations. Note that some HERS measures are Mandatory, some are Prescriptive (required when using the Prescriptive Approach) and some are used only for Performance credits.

HERS Measures: Residential (based on Table RA2-1)	Mandatory	Prescriptive	Performance	Residential Reference Appendices	Compliance Form
DUCT MEASURES					
Duct Sealing: Diagnostic testing that ducts do not exceed maximum leakage rate based on project type (new or altered). Verification that approved materials are used.	§150.0(m)11 (new)	§150.2(b)1D (altered)	N/A	RA3.1.4.3	CF3R-MCH-20
Return Duct Design and Air Filter Device: Visual verification that the return duct design conforms to §150.0(m)13 and confirmation that the air filter devices conform to §150.0(m)12. Note: This is an alternative to the Cooling System Airflow and Fan Efficacy tests, below.	§150.0(m)12 §150.0(m)13	Exception to §150.1(c)7Aib Exception 2 to §150.2(b)1Fiia	N/A	RA3.1.4.4 RA3.1.4.5	CF3R-MCH-28
Bypass Ducts (Zonally Controlled Central Forced Air Unit [FAU]): Visual verification that zonally controlled systems comply with the bypass duct prohibition in §150.1(c)13. Note: Bypass ducts are only allowed with a Performance penalty.	N/A	§150.1(c)13	Res ACM 2.4.9 Res ACM 2.4.7	RA3.1.4.6	CF3R- MCH -23
Low Leakage Ducts Entirely in Conditioned Space: Visual verification that duct system location is entirely within conditioned space and tested for maximum leakage.	N/A	HPA Option B §150.1(c)9	Res ACM 2.4.7	RA3.1.4.3.8	CF3R- MCH -21
Duct Design, Buried Ducts, Deeply Buried Ducts: Visual verification that duct system is installed according to the design, including location, size and length of ducts, duct insulation R-value. Note: Duct sealing and verification of insulation are required.	N/A	N/A	Res ACM 2.4.7 Res ACM 2.4.7	RA3.1.4.1	CF3R- MCH -29
HEATING AND COOLING EQUIPMENT MEASURES					
Cooling System Airflow: Diagnostic testing and confirmation that system airflow is greater than or equal to a specified criterion (CFM/ton).	§150.0(m)13	§150.1(c)7Aib §150.2(b)Fiia	Credit for higher target Res ACM 2.4.6	RA3.3	CF3R- MCH -23
Cooling System Air-handling Fan Efficacy: Diagnostic testing and confirmation that fan efficacy is less than or equal to a specified criterion (W/CFM).	§150.0(m)13	N/A	Credit for lower target Res ACM 2.4.6	RA3.3	CF3R- MCH -22
Refrigerant Charge: Diagnostic testing of air-cooled air conditioners and air-source heat pumps to verify that the system has the correct refrigerant charge. Airflow testing. Note: "Fault Indicator Display" can be installed as an alternative.	N/A	§150.1(c)7A CZ 2,8-15	Credit in CZ 1,3-7,16 Res ACM 2.4.6	RA1.2 RA3.2 RA3.3 RA3.4.2	CF3R- MCH -25
Increased Air Conditioner/Heat Pump Efficiency: Visual verification of installation of specific air conditioner or heat pump equipment models when Performance credit for increased SEER/SEER2/EER/EER2/HSPF/HSPF2 is used. ***(Continued on next page)***	N/A	N/A	§150.1(b)3Bi Res ACM 2.4.6 Res ACM 2.4.6 Res ACM 2.4.1	RA3.4.4 RA3.4.4.1	CF3R- MCH -26

***CZ** = Climate Zone; **EER/EER2** = energy efficiency ratio; **ERV** = energy recovery ventilation; **FAU** = forced air unit; **HSPF/HSPF2** = heating seasonal performance factor; **HRV** = heat recovery ventilation; **SEER/SEER2** = seasonal energy efficiency ratio.*

(Continued)

(Continued)

HERS Measures: Residential (based on Table RA2-1)	Mandatory	Prescriptive	Performance	Residential Reference Appendices	Compliance Form
HEATING AND COOLING EQUIPMENT MEASURES *(continued)*					
Rated Heat Pump Capacity: Visual verification of the installed heating capacity values at 47°F and 17°F of heat pump systems when Performance compliance uses a heat pump system not using default values.	N/A	N/A	§150.1(b)3Bv Res ACM 2.4.1	RA3.4.4.2	CF3R- MCH -26
Low Leakage Air-Handling Units: Visual verification of the installation of a listed factory-sealed air-handling unit (tested by the manufacturer and listed with the CEC). Note: Allows Performance credit of a lower duct leakage rate.	N/A	N/A	§150.1(b)3Biii Res ACM 2.4.7	RA3.1.4.3.9	CF3R- MCH -26
Variable Capacity Heat Pump Compliance Option (VCHP): Field verification that installed system meets the eligibility requirements of the VCHP compliance option when used for Performance credit. Note: Requires other HERS measures and their associated CF3Rs.	N/A	N/A	§150.1(b)3Bii Res ACM 2.4.1	RA3.4.4.3	CF3R-MCH-33
Evaporatively Cooled Condensers: Field verification that installation of evaporatively cooled condensers meets the eligibility requirements. Duct leakage and refrigerant charge are required.	N/A	N/A	Res ACM 2.4.6	RA4.3.1	CF3R- MCH -26
MECHANICAL VENTILATION MEASURES					
Indoor Air Quality (IAQ): Diagnostic testing of whole-building mechanical ventilation. If central fan integrated system is used, verification of installation and intermittent controls.	§150.0(o)2A	N/A	N/A	RA3.7.4.1 RA3.7.4.2	CF3R- MCH -27
Kitchen Range Hood: Visual verification of airflow and sound ratings via certified rating data from the Home Ventilating Institute (HVI) Certified Home Ventilating Products Directory or another CEC-approved directory.	§150.0(o)2B	N/A	N/A	RA3.7.4.3	CF3R- MCH -32
Whole House Fan Ventilation Cooling: Diagnostic testing of the installed whole house fan airflow rate (CFM) and fan efficacy (W/CFM) when Performance compliance uses a whole house fan.	N/A	N/A	§150.1(b)3Bvi Res ACM 2.4.11	RA3.9	CF3R- MCH -31
ERV/HRV Rated Performance Verification: Visual verification that the installed ERV/HRV equipment meets the requirements for eligibility when a performance credit is taken. Airflow measurement for IAQ requirements.	§150.0(o)2C	N/A	Res ACM 2.4.10	RA3.7.4.4	CF3R- MCH -27
Central Fan Ventilation Cooling: Visual verification of central fan ventilation cooling system (CFVCS) and diagnostic testing of the installed CFVCS ventilation airflow rate (CFM) and fan efficacy (W/CFM).	N/A	N/A	§150.1(b)3Bvii Res ACM 2.4.11	RA3.3.4	CF3R- MCH -27

***CZ** = Climate Zone; **EER/EER2** = energy efficiency ratio; **ERV** = energy recovery ventilation; **FAU** = forced air unit; **HSPF/HSPF2** = heating seasonal performance factor; **HRV** = heat recovery ventilation; **SEER/SEER2** = seasonal energy efficiency ratio.*

(Continued)

(Continued)

HERS Measures: Residential (based on Table RA2-1)	Mandatory	Prescriptive	Performance	Residential Reference Appendices	Compliance Form
BUILDING ENVELOPE MEASURES					
Building Envelope Air Leakage: Diagnostic testing of air leakage when Performance compliance credit is taken for reduced building envelope air leakage.	N/A	N/A	§150.1(b)3Bviii Res ACM 2.2.4	RA3.8	CF3R-ENV-20
Quality Insulation Installation (QII): Visual verification of air barrier and insulation. Note: This is required Prescriptively on New Construction and Additions over 700 ft^2 unless a Performance penalty is taken for not meeting it.	N/A	§150.1(c)1E	§150.1(b)3Bix Res ACM 2.2.5	RA3.5	CF3R-ENV-21 CF3R-ENV-22
Spray Polyurethane Foam (SPF) QII: Visual verification of proper installation of SPF insulation product when R-values are better than the default used for compliance credit. (Default = open cell @ 3.6 per inch or closed cell @ 5.8 per inch)	N/A	N/A	Res ACM 2.3.3	RA3.5.6	CF3R- ENV-22
DOMESTIC HOT WATER MEASURES					
Pipe Insulation Compliance Credit: Visual verification that all hot water pipes in non-recirculating systems are insulated and that corners and tees are fully insulated.	N/A	N/A	Res ACM 2.9	RA3.6.3	CF3R-PLB-22
Parallel Piping Compliance Credit: Visual verification that the measured length of piping between the water heater and single central manifold does not exceed 5 ft.	N/A	N/A	Res ACM 2.9	RA3.6.4	CF3R- PLB -22
Compact Hot Water Distribution System Expanded Credit: Visual verification that the straight-line plan-view distance from the water heater to a hot water fixture does not exceed a calculated threshold distance length per RA3.6.5. Note: This is a Performance credit.	N/A	N/A	Res ACM 2.9	RA3.6.5	CF3R- PLB -22
Recirculation Pump Controls: Visual verification of controls and other features specified in Performance compliance documents and pipe insulation.	N/A	N/A	Res ACM 2.9	RA3.6.6 - RA3.6.7	CF3R- PLB -22
Drain Water Heat Recovery (DWHR): Visual verification that the DWHR unit(s) and installation configuration meet the eligibility requirements and the DWHR(s) is certified to the CEC and meet HERS eligibility requirements. Note: This is Prescriptively required in certain situations or a Performance credit.	N/A	§150.1(c)8A §150.1(c)8B	Res ACM 2.9	RA3.6.9	CF3R- PLB -22
PRE-EXISTING VERIFIED MEASURES					
Visual verification (prior to permit being pulled) that existing building energy features are "worse" than default values per Table 150.2-C. Note: Allows Performance credit for improving an existing building feature beyond defaults.	N/A	N/A	Res ACM 2.10.5	Single-family Residential Compliance Manual, Appendix G	CF3R-EXC-20

***CZ** = Climate Zone; **EER/EER2** = energy efficiency ratio; **ERV** = energy recovery ventilation; **FAU** = forced air unit; **HSPF/HSPF2** = heating seasonal performance factor; **HRV** = heat recovery ventilation; **SEER/SEER2** = seasonal energy efficiency ratio.*

For More Information

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov

Learn more about the California Energy Commission (CEC) and its programs on its website.

2022 Building Energy Efficiency Standards

bit.ly/CEC2022Standards

Explore the main CEC web portal for the 2022 Energy Code, including information, documents and historical information.

2022 Building Energy Efficiency Standards Summary

bit.ly/CEC2022Summary

View or download this visual summary of the Energy Code's purpose, current changes and impact.

2022 Single-family Residential Compliance Manual

bit.ly/CEC-2022-SF-residential-compliance-manual

Read the Compliance Manual for more indepth information on the Energy Code.

Energy Code Hotline

Call: 1-800-772-3300 (Free)

Email: Title24@energy.ca.gov

Online Resource Center

bit.ly/CEC-ORC

Use these online resources developed for building and enforcement communities to learn more about the Energy Code.

EnergyCodeAce™

www.energycodeace.com

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 24, Part 6 and Title 20.

Tools

www.energycodeace.com/tools

Explore this suite of interactive tools to understand the compliance process, required forms, installation techniques and energy efficiency regulations in California.

Reference Ace

www.energycodeace.com/content/tools-ace/

Navigate the Title 24, Part 6 Energy Code using an index, keyword search and hyperlinked text.

Q&Ace

www.energycodeace.com/QAndAce

Search our online knowledge base or submit your question to Energy Code Ace experts.

Training

www.energycodeace.com/training

On-demand, live in-person and online training alternatives are tailored to a variety of industry professionals and address key measures.

Of Special Interest:

- 2022 Title 24, Part 6 Essentials – Residential Standards: What's New
  bit.ly/ECA-training-2022-res-whats-new

Resources

www.energycodeace.com/resources

Downloadable materials provide practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.

Of Special Interest:

Fact Sheets

- Single-family Buildings: What's Changed in 2022

Check EnergyCodeAce.com for our latest 2022 tools, training and resources!

Create an account on the Energy Code Ace site and select an industry role for your profile in order to receive messages about all our offerings!

SCAN ME

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Home Energy Rating System (HERS) Registry

BayREN Training

Handout 4:

2022 Energy Code Fact Sheet:

Single-family Buildings

HVAC Additions and Alterations

Ace Resources | Title 24, Part 6 Fact Sheet

Single-family Buildings

HVAC Additions and Alterations

What's Included in this Fact Sheet?

In the 2022 California Building Energy Efficiency Standards (Energy Code or Title 24, Part 6), single-family buildings include single-family homes, accessory dwelling units (ADUs), duplexes and townhomes of any height.

A heating, ventilation and air conditioning (HVAC) Alteration is any change to an existing home's HVAC system that is regulated by the 2022 Energy Code. An Addition is any change to a building that increases conditioned floor area and conditioned volume.

How Does this Fact Sheet Apply to Your Project?

Use this fact sheet to answer these questions about an HVAC project in an existing home:

1. What requirements does your project need to meet to comply with the Energy Code?
2. Who's involved in the compliance process?
3. How should you document your project's compliance?

Importance of Compliance

The 2022 Energy Code is an important part of California's work to reduce carbon emissions and fight climate change. The Energy Code is updated every three years with the mandate to increase building energy efficiency while staying cost-effective for building owners over the lifespan of a building.

Increases in energy efficiency:

- Reduce utility bills
- Improve indoor comfort and air quality
- Increase market value
- Reduce greenhouse gas emissions

For single-family homes, the California Energy Commission (CEC) estimates that the 2022 Energy Code change from using natural gas furnaces to electric heat pumps to heat new homes for most climate zones reduce net CO2 emissions by 16,230 mTon/yr compared to the 2019 Energy Code, the equivalent of taking 3,641 gas cars off the road each year.

Table of Contents

Where to Find Certified Products

§§110.1, 110.2(a)

Mandatory Requirements

The National Appliance Efficiency Conservation Act (NAECA) and/or the California Appliance Efficiency Regulations (Title 20) regulate most heating and cooling equipment installed in California homes.

Installers should confirm and document that only certified products are installed. Use the Product Finder and Modernized Appliance Efficiency Database System (MAEDbS) tools to find certified products.

ECA Product Finder bit.ly/eca-product-finder (MAEDbS) bit.ly/MAEDbS

Heating and Cooling Systems

Key Terms

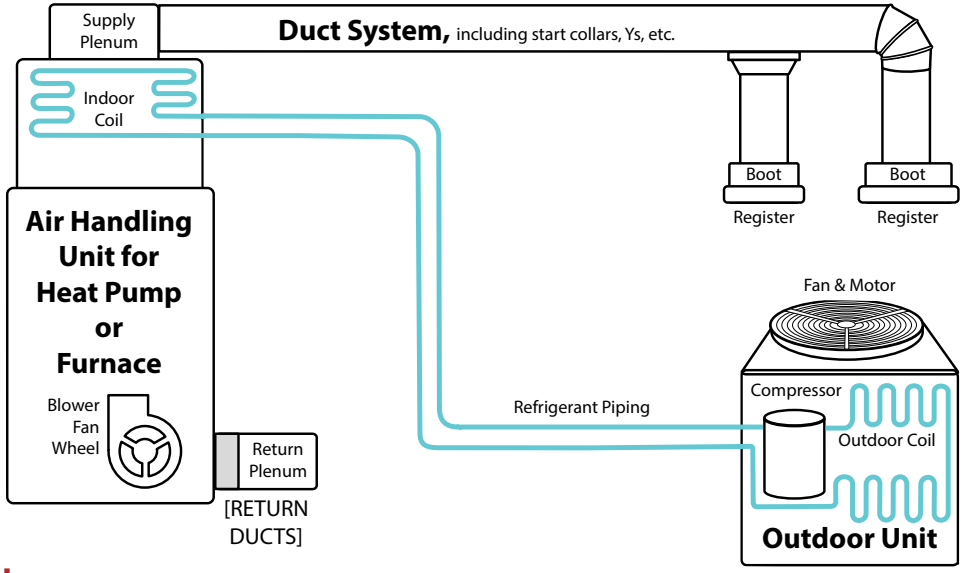


Figure 1. *Split System: Heat Pump or Gas Furnace*

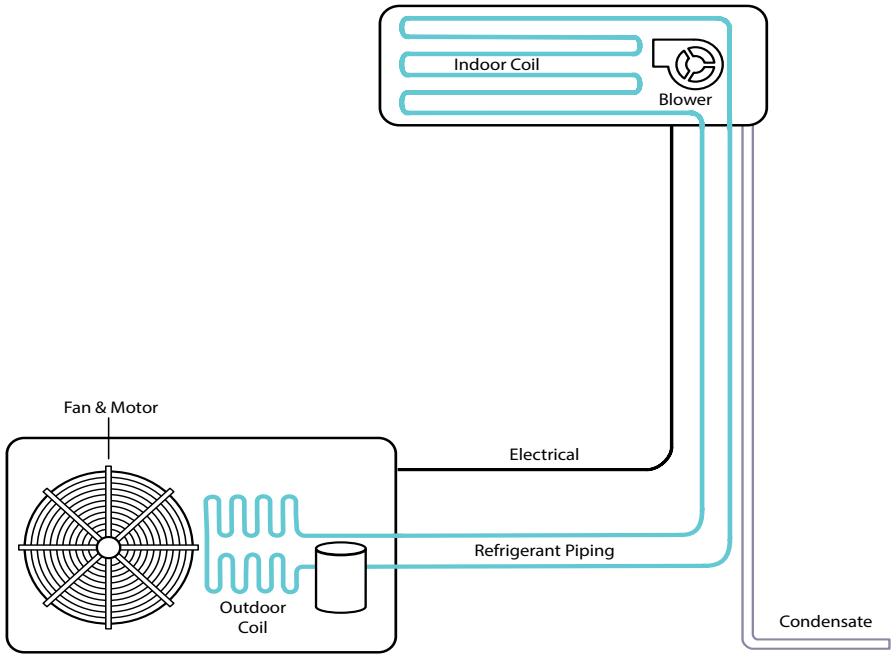


Figure 2. *Split System: Ductless Mini-split System, Heat Pump or Cooling Only*

Addition, Alteration or Repair?

An Addition adds new conditioned floor area and conditioned volume.

Alterations make changes to existing systems that may trigger Energy Code requirements, but Repairs do not.

Replacing some components may be considered a Repair instead of an Alteration. For example, replacing the fan blower wheel or fan blower motor in an air handler are considered Repairs, so those changes do not trigger the Energy Code.

Key Terms (continued)

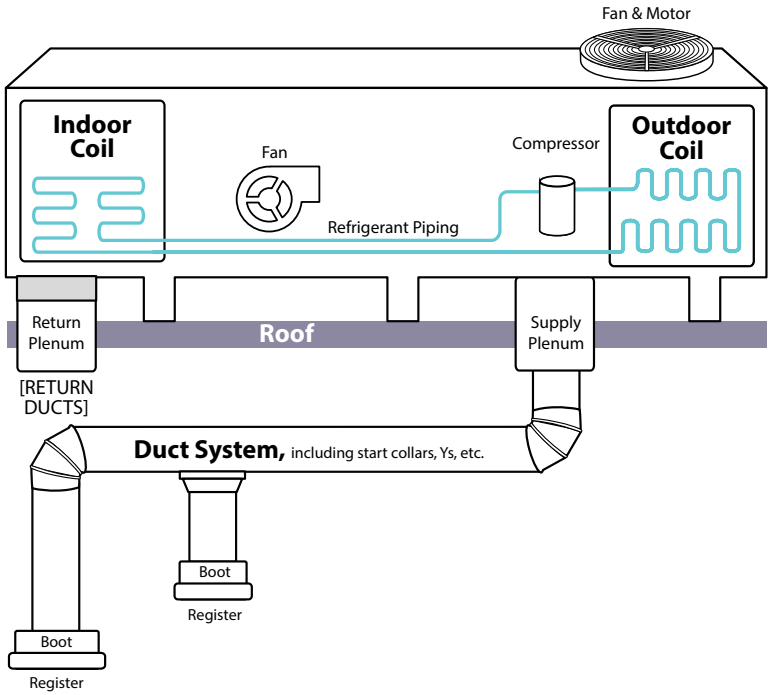


Figure 3. *Packaged System: Heat Pump or Gas Furnace*

Energy Code and Common Terms for HVAC Systems

Energy Code Term	Common Term	Definition
New or Replacement Space-conditioning System	Cut-in (dry wall work, framing construction work)	When all of a system's heating and cooling components are installed or replaced and ≥ 75% of the duct system is entirely new or replaced
Altered Space-conditioning System	Change-out	When one or more of the following components is installed or replaced: ✦ Air handler (includes furnaces and package units) ✦ Outdoor condensing unit ✦ Cooling or heating coil ✦ Any refrigerant-containing component, including a condenser coil, compressor, refrigerant piping or refrigerant-metering device (e.g., TXV)
Entirely New or Replacement Duct System	Re-duct	When ≥ 75% of a duct system is new or replaced and all existing ducts are accessible and can be sealed
Altered Duct System	Change, replace, add or alter ducts	When < 75% of a duct system is new or replaced

Table 1. *Energy Code and Common Terms for HVAC Systems*

Trigger Table

Requirement Type	Heating and Cooling Equipment			Distribution System						Controls
	Mandatory	Prescriptive		Mandatory				Prescriptive		Mandatory
For details, click a requirement title or code section → **Project Scope: Change this and nothing else**	Cooling & Heating Load §150.0(h) §150.2(a)	HERS-verified Refrigerant Charge §150.1(c)7 §150.2(b)1F	Heat Pump Space Heater §150.1(c)6	HERS-verified Airflow Rate① §150.0(m)13 §150.2(b)1C-F	HERS-verified Fan Efficacy §150.0(m)13 §150.2(b)1	HERS-verified Duct Leakage② §150.2(b)1	Air Filter §§150.0(m) 12-13 §§150.2(b) 1C-D	Duct Insulation §150.2(b)1D	Ceiling Insulation §150.2(b)1J	Setback Thermostat §110.2(c) §150.0(i) §150.2(b)1F
Install an entirely new or replacement space-conditioning system, including air conditioning and ducting③	**YES**	**YES** if AC	No	**YES** if AC	**YES** if AC	**YES**	**YES**	**YES**	**YES**④	**YES**
Replace all HVAC equipment but no new ductwork (for example, a furnace could be changed out for a heat pump)	No	**YES** if AC	No	**YES** if HERS Refrigerant Charge required	No	**YES**	No	No	No	**YES** if AC or heat pump
Add a ductless mini-split system, heat pump or cooling only	No	**YES**	No	No	No	No	No	No	No	**YES**
Replace an air handler (for example, a furnace or fan coil)	No	No	No	No	No	**YES**	No	No	**YES**④	No
Replace any refrigerant-containing system components (compressor, condensing coil, evaporator coil, refrigerant-metering device or refrigerant piping)⑤	No	**YES**	No	**YES** if HERS Refrigerant Charge required	No	**YES**⑥	No	No	No	**YES**
Replace belts, fan blower wheel and/or electrical components (Repair)	No	No	No	No	No	No	No	No	No	No
Replace or add a room heating or air-conditioning unit	No	No	No	No	No	No	No	No	No	No⑦

Table 2. *Energy Code Triggers in Heating and Cooling System Additions and Alterations in Single-family Buildings (continued)*

Continued on next page →

Trigger Table (continued)

Requirement Type	Heating and Cooling Equipment			Distribution System						Controls
	Mandatory	Prescriptive		Mandatory				Prescriptive		Mandatory
For details, click a requirement title or code section → **↓ Project Scope: Change this and nothing else**	Cooling & Heating Load §150.0(h) §150.2(a)	HERS-verified Refrigerant Charge §150.1(c)7 §150.2(b)1F	Heat Pump Space Heater §150.1(c)6	HERS-verified Airflow Rate① §150.0(m)13 §150.2(b)1C-F	HERS-verified Fan Efficacy §150.0(m)13 §150.2(b)1	HERS-verified Duct Leakage② §150.2(b)1	Air Filter §§150.0(m) 12-13 §§150.2(b) 1C-D	Duct Insulation §150.2(b)1D	Ceiling Insulation §150.2(b)1J	Setback Thermostat §110.2(c) §150.0(i) §150.2(b)1F
Install an entirely new or replacement duct system⑧	No	No	No	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**④	No
Add or replace < 75% and > 25 ft of ducting for an existing system	**YES** to verify existing HVAC meets heating load if for an Addition	No	No	No	No	**YES**	No	**YES**	No	No
Add < 25 ft of new ducting to an existing system	**YES** to verify existing HVAC meets heating load if for an Addition	No	No	No	No	**YES** if ducts in garage, otherwise no	No	**YES**	No	No

✦ Replacing the fan blower wheel and similar repairs are considered Repairs and do NOT trigger the Energy Code.

✦ All new HVAC equipment must meet minimum federal efficiency requirements.

✦ Refrigerant line insulation requirements are triggered if the line set (cooling system, suction line) is replaced or repaired. Line sets ≤ 1.5" in diameter must have 0.75" thick insulation.

Table 2. *Energy Code Triggers in Heating and Cooling System Additions and Alterations in Single-family Buildings (continued)*

Continued on next page →

Trigger Table (continued)

Trigger Table Notes

① HERS verification applies to new forced air ducted systems with cooling and altered systems in which refrigerant charge is required. Completely new systems (equipment and ducting) can use the return grille option per Table 150.0-B or C or be verified per HERS verification of airflow: 0.45 W/CFM for gas furnace air-handling units (manufactured as of July 3, 2019) and 0.58 W/CFM for air-handling units that are not gas furnaces (i.e., heat pumps).

② A new or complete replacement duct system in a single-family building must demonstrate a leakage rate of ≤ 5% of the system air handler airflow. Extension of an existing duct system > 25 ft or Alterations (partial replacements) must demonstrate a leakage rate of ≤ 10%. If the sealing requirements cannot be met, all accessible leaks must be sealed and verified by a HERS Rater. HERS duct testing is not required when asbestos is present. If any portion of the HVAC system (including ducts, air-handling units, cooling or heating coils, or plenums) is located in a garage space, the ducts must be sealed and have HERS verified leakage of ≤ 6%.

③ An Alteration is considered an "entirely new or replacement duct system" when an "entirely new or replacement duct system" is combined with all new equipment.

④ Ceiling insulation and sealing requirements are triggered when both an air handler and ducting are completely replaced within a vented attic in Climate Zones 1-4, 6 or 8-16.

⑤ Refrigerant-containing system components include the compressor, condensing coil, evaporator coil, refrigerant metering device or refrigerant piping.

⑥ Duct leakage testing for refrigerant-containing systems applies only to the installation or replacement of an air handler, outdoor condensing unit of a split-system air conditioner or heat pump, or cooling or heating coil.

⑦ Setback thermostats are not required for gravity gas wall heaters, gravity floor heaters, gravity room heaters, non-central electric heaters, fireplaces or decorative gas appliances, wood stoves, room air conditioners and room air-conditioner heat pumps.

⑧ An Alteration is considered an "entirely new or replacement duct system" when 75% or more of the ducts are new or replaced and the existing ducts are accessible and can be sealed. If the existing ducts are not accessible, it does not meet the definition. The ceiling insulation requirements of §150.2(b)1J may be triggered when ducts are installed in a vented ceiling. See §150.2(b)1Diia.

Additional Requirements

Electric resistance heating is allowed to be added to a home as a supplemental heating unit that is installed in a space served directly or indirectly by a primary heating system only when the unit has a thermal capacity ≤ 2 kW or ≤ 7,000 Btuh and a timer limiting operation to 30 minutes or less. Ducted electric resistance heating can be left in place if existing but cannot be added or replaced. Heat pump equipment can always replace gas or electric resistance heating equipment. §150.1(c)6

All HVAC equipment must be certified through Title 20 Appliance Efficiency Standards or Title 24 Part 6, §§110.1 or 110.2 that they meet the minimum efficiency requirements at either the time of purchase or installation as called out by federal regulations which are updating January 1, 2023.

When an entirely new or complete replacement duct system is installed (ducts with or without new equipment) **and has > 10 ft of ducting,** air filters must be 2" MERV-13. Alternative filter options may be applied with careful duct design sizing methodologies. §§150.0(m)12, 150.2(b)1C and 150.2(b)1Diia

Condensers must have a minimum 5 ft clearance from dryer vent outlets. §150.0(h)3

Refrigerant pipe insulation and protection is required of all new piping. §150.0(j)

When HERS refrigerant charge verification is required Prescriptively, a demand-responsive HVAC control (Wi-Fi thermostat that can be accessed remotely) may be required if outdoor temperatures are less than 55°F and the weigh-in method is used for verification. This should be confirmed with HERS Rater. §150.2(b)1Fiib

Factory-charged packaged systems for which the manufacturer has verified the correct system refrigerant charge prior to shipment from the factory do not require HERS verification of refrigerant charge. §150.1(c)7A

When the duct system is entirely inside conditioned space and confirmed by a HERS Rater, the Performance Method allows uninsulated duct for new ducting minimum insulation. Portions of the duct that are completely exposed to and surrounded by directly conditioned space are not required to be insulated. §150.0(m)

New ducting in unconditioned spaces is Prescriptively required to have minimum insulation of R-8 in Climate Zones 2, 4 and 8-16 and R-6 in Climate Zones 3 and 5-7. §150.2(b)1D

Heat pump equipment must use controls so that supplementary electric resistance strip heating is secondary to the heat pump operation. §110.2(b)

Furnaces ≥ 225,000 Btuh, including electric furnaces, which are not located within the conditioned space must have jacket losses not exceeding 0.75% of the input rating. They must also have an intermittent ignition or interrupted device (IID) and have either power venting or a flue damper. A combustion air intake vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. A setback thermostat or an energy management control system (EMCS) must be programmed to provide, at a minimum, functionality required of a setback thermostat. §110.2(d)

Table 2. *Energy Code Triggers in Heating and Cooling System Additions and Alterations in Single-family Buildings (continued)*

Heating and Cooling Equipment

Heating and Cooling Load Calculations

§§150.0(h), 150.2(a)

Mandatory Requirements

Commonly Applicable Project Scopes

Heating and cooling calculations are required when:

- Ducts are added to or replaced in an existing system for an Addition.
- All of a system's heating and cooling components and ≥ 75% of a duct system are installed or replaced, and the equipment serves an existing home and Addition.

Non-applicable Projects and Exceptions

Load calculations are not required when replacement equipment is the same size as that being removed and is not associated with an Addition.

Requirements

To determine heating and cooling loads, use a method based on any one of the following:

- ASHRAE Handbook, Equipment Volume, Applications Volume and Fundamentals Volume
- SMACNA Residential Comfort System Installation Standards Manual
- ACCA Manual J

Heat Pump Space Heater

§§150.1(c)6; 150.2(a) Exception #7; 150.2(b)1C

Prescriptive Requirements

Commonly Applicable Project Scopes

Heat pump space heaters are required for new single-family homes, townhomes or New Construction detached ADUs in Climate Zones 3, 4, 13 and 14.

Non-applicable Projects and Exceptions

A heat pump space heater will not be required for altered or replacement equipment, for new equipment serving an Addition, or for projects when compliance has been achieved using the Performance Approach.

Requirements

Heat pump space heaters must meet applicable minimum efficiency requirements.

When a supplemental electric resistance heater is used within the heat pump heater, the §110.2(b) control requirements must also be met.

Ace Tips

Best Practice for Verifying Refrigerant Charge

Coordinate with the HERS Rater to ensure that the HERS Rater is present to witness when you at start up the system.

If the HERS Rater is not present, you will need to run through the manufacturer's charge procedure twice, once at start-up with the wet condenser and again for the HERS Rater starting with a dry system.

HERS-verified Refrigerant Charge

§§150.1(c)7, 150.2(b)1F

Prescriptive Requirements

Commonly Applicable Project Scopes

Home Energy Rating System (HERS) Rater-verified refrigerant charge is required in Climate Zones 2 and 8-15 when:

- Any refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant-metering device or refrigerant piping are replaced.
- All HVAC equipment is new or replaced or has altered or replaced refrigerant containing parts, including ductless air-conditioning systems.
- A ductless mini-split equipment is added or replaced.

Non-applicable Projects and Exceptions

The following systems do not require HERS verification of the refrigerant charge:

- Packaged systems for which the manufacturer has verified the refrigerant charge prior to shipment from the factory are not required to have refrigerant charge confirmed through field verification and diagnostic testing.
- The HVAC system is in Climate Zone 1, 3-7 or 16.

Continued on next page

HERS-verified Refrigerant Charge (continued)

Requirements

A HERS Rater must verify that the system contains the correct amount of refrigerant as specified by the manufacturer following the instructions in §150.1(c)7A.

Ducted DX split systems can use either of the approved methods for refrigerant charge verification:

- RA3.2.2 Standard Charge Verification Procedure
- RA3.2.3 Weigh-In Charging Procedure

Ductless mini-splits can be verified using only the weigh-in method. Coordinate with your HERS Rater to witness the start-up to verify that the manufacturer's instructions were followed for the charge adjustment based on the condenser charge and adjustments for line set length. If the HERS Rater is not present to witness the entire process at start-up, then additional steps have to be taken to verify the charge. This process includes recovering all of the refrigerant from the system and having the HERS Rater witness the entire process for charging a dry system according to the manufacturer's instructions.

Distribution System

HERS-verified Airflow Rate

§§150.0(m)13, 150.2(b)1C-F

Mandatory Requirements

Commonly Applicable Project Scopes

HERS verification of airflow rate is required for ducted, mechanical cooling systems when:

- HERS verification of the refrigerant charge is required because either
- Any refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant-metering device or refrigerant piping is replaced.

  --or--
- All HVAC equipment, including air-conditioning equipment, is replaced, with or without adding or replacing ductwork.
- An entirely new or replacement duct system is installed in which ≥ 75% of the duct system is new or replaced.

Non-applicable Projects and Exceptions

Residential Appendix RA3.3.3.1.5 provides remedial actions as an alternative to compliance with minimum airflow for alerted systems.

Requirements

A HERS Rater must verify that the airflow rate meets the requirements in Table 3 following the procedures in Reference Residential Appendix RA3.3:

- RA3.3.3.1.1 Airflow Measurement Using Plenum Pressure Matching Method (duct blaster air flow test)
- RA3.3.3.1.2 Airflow Measurement Using Flow Grid
- RA3.3.3.1.3 Airflow Measurement Using Powered Flow Capture Hood
- RA3.3.3.1.4 Airflow Measurement Using Traditional Flow Capture Hood

System Type	Required Airflow Rate
Single Zone Central Forced Air System	≥ 350 CFM per ton of nominal cooling capacity through the return grilles
Zonally Controlled Central Forced Air System	≥ 350 CFM per ton of nominal cooling capacity
Small Duct High-velocity Forced Air System	≥ 250 CFM per ton of nominal cooling capacity through the return grilles

Table 3. *Required Airflow Rates by HVAC System Type in Single-family Building Additions and Alterations*

HERS-verified Fan Efficacy

§§150.0(m)13, 150.2(b)1

Mandatory Requirements

Commonly Applicable Project Scopes

HERS verification of air-handling unit fan efficacy is required for ducted, mechanical cooling systems when:

- An entirely new or replacement duct system is installed in which ≥ 75% of the duct system is new or replaced.
- All HVAC equipment, including air-conditioning equipment, is replaced, including an entirely new or replacement duct system in which ≥ 75% of the duct system is new or replaced.

Non-applicable Projects and Exceptions

Fan efficacy is not required to be HERS verified for:

- Alterations that are not new or replacement
- Ductless systems

Requirements

A HERS Rater must verify that the air-handling unit fan efficacy meets the requirements in Table 4 following the procedures in Reference Residential Appendix RA3.3:

- RA3.3.3.2.1 Air Handler Watt Draw Measurement Using Portable Watt Meter
- RA3.3.3.2.2 Air Handler Watt Draw Measurement Using Utility Revenue Meter
- RA3.3.3.2.3 Air Handler Watt Draw Measurement Using Digital Utility Revenue Meter

System Type	Fan Efficacy
Single Zone Central Forced Air System	
Gas Furnace Air-handling Unit	≤ 0.45 W/CFM
Other Air-handling Unit	≤ 0.58 W/CFM
Zonally Controlled Central Forced Air System	
Gas Furnace Air-handling Unit	≤ 0.45 W/CFM
Other Air-handling Unit	≤ 0.58 W/CFM
Small Duct High-velocity Forced Air System	≤ 0.62 W/CFM

Table 4. *Required Air-handling Unit Fan Efficacy by HVAC System Type in Single-family Building Additions and Alterations*

HERS-verified Duct Leakage

§150.2(b)1

Mandatory Requirements

Commonly Applicable Project Scopes

Duct leakage testing may be required for altered HVAC systems when:

- A new, ducted HVAC system with ducting of any length is added to an existing home.
- Any new or replaced ducts are installed in garage spaces.
- > 25 ft of ductwork is replaced or added to an existing system.
- An entirely new or replacement duct system is installed in which ≥ 75% of the duct system is new or replaced and all existing ducts are accessible and can be sealed.
- Certain refrigerant-containing components are installed or replaced, limited to the air handler, outdoor condensing unit of a split-system air conditioner or heat pump, or cooling or heating coil.

Non-applicable Projects and Exceptions

Although not explicitly excepted in the Energy Code, duct leakage testing requirements do not apply to ductless air-conditioning systems.

Requirements

A HERS Rater must verify that measure duct leakage meets the requirements in Table 5 as verified with the following procedures from the Reference Residential Appendix RA3.1:

- RA3.1.4.3.2.1 Air handling unit Installed and Connected Total Leakage Test
- RA3.1.4.3.4 Duct Leakage to Outside
- RA3.1.4.3.5 Sealing of All Accessible Leaks
- RA3.1.4.3.6 Smoke-Test of Accessible Duct Leak Sealing (for existing ducts that cannot pass)

Projects that trigger HERS-verified duct leakage testing requirements may trigger additional Energy code requirements. See Table 5 below for these additional requirements.

For these Project Scopes	Measured Leakage Is Limited to	Additional Energy Code Requirements
Extension of Existing Ducts: **> 25 ft of new or replacement ducts installed to extend an existing system**	≤ 10% of system air handler air flow For exceptions or alternatives, consult your Building Department or §150.2(b)1Diib.	
Altered Space-conditioning System	≤ 10% of system air handler air flow For exceptions or alternatives, consult your Building Department or §150.2(b)1Diib.	**HERS-verified Airflow Rate** **HERS-verified Refrigerant Charge** for ducted, mechanical cooling systems in Climate Zones 2 and 8-15
New/Replacement Duct System	≤ 5% of the system air handler airflow	**HERS-verified Airflow Rate** **HERS-verified Fan Efficacy** **HERS-verified Refrigerant Charge** for ducted, mechanical cooling systems in Climate Zones 2 and 8-15
Altered Ducts in Garage Spaces	≤ 6% of system air handler air flow	
If measuring leakage is not possible: §150.2(b)1Eiii *specifies that all accessible leaks must be sealed and verified through a visual inspection and smoke test by a certified HERS Rater using the methods specified in Reference Residential Appendix RA3.1.4.3.5.*		

Table 5. *Duct Leakage Limits and Additional Requirements for Single-family Building Additions and Alterations*

Air Filter

§§150.0(m)12-13, 150.2(b)1C-D, 150.2(b)1Diia

Mandatory Requirements

Commonly Applicable Project Scopes

Heating and cooling systems have air filtration requirements when:

- An entirely new or replacement duct system is installed in which ≥ 75% of the duct system is new or replaced.
- All HVAC equipment is replaced, including an entirely new or replacement duct system in which ≥ 75% of the duct system is new or replaced.
- Any new, ducted system has ducting > 10 linear feet.

Non-applicable Projects and Exceptions

Although not explicitly excepted in the Energy Code, air filter requirements do not apply to the following systems:

- Ductless systems
- HVAC systems with < 10 ft of ducting

Requirements

Air filtration must be installed as described in §150.0(m)12.
Take special note of these two requirements:

- Filter racks or grilles must use gaskets, sealing or other means to close gaps around inserted filters.
- Air filters must have either:
  - ◊ Designated ≥ MERV 13 efficiency, when tested in accordance with ASHRAE Standard 52.2
    --or--
  - ◊ Particle size efficiency rating ≥ 50% in the 0.30-1.0 µm range and ≥ 85% in the 1.0-3.0 µm range, when tested in accordance with AHRI Standard 680

Air filters must be 2" MERV-13 when an entirely new or complete replacement duct system is installed (ducts with or without new equipment) and has > 10 ft of ducting. Alternative filter options may be applied with careful duct design sizing methodologies. §§150.0(m)12, 150.2(b)1C and 150.2(b)1Diia

Duct Insulation

§150.2(b)1D

Prescriptive Requirements

Commonly Applicable Project Scopes

Duct insulation requirements are triggered when:

- Any length of ductwork is replaced or added to an existing system.
- An entirely new or replacement duct system is installed in which ≥ 75% of the duct system is new or replaced and all existing ducts are accessible and can be sealed.
- An entirely new or replacement heating and cooling system is installed in which ≥ 75% of the duct system is new or replaced and all existing ducts are accessible and can be sealed.

Non-applicable Projects and Exceptions

There are no exceptions.

Requirements

All altered ducts must meet the insulation and construction requirements of Table 6, below.

Climate Zone	Duct R-value
3, 5, 6, 7	R-6
1, 2, 4, 8-16	R-8
Copied from Table 150.2-A	

Table 6. *Duct Insulation R-value by Climate Zone*

Ace Tips

Duct Insulation Pro Tip

Many businesses have discovered it is better to stock only R-8 insulation for all ducted jobs.

Reducing how many items you have to stock, track and order reduces administrative overhead costs. Most Climate Zones prescriptively require R-8, and your clients in the other Climate Zones will appreciate having a higher performing system than the minimum would require.

Controls

Ceiling Insulation

§150.2(b)1Diia and 150.2(b)1J

Mandatory Requirements

Commonly Applicable Project Scopes

A project triggers ceiling insulation and sealing requirements of §150.2(b)1J when:

- **Both** an air handler **and** ducting complete replacement are done within a vented attic in Climate Zone 1-4, 6 or 8-16.

Non-applicable Projects and Exceptions

- This requirement does not apply to Climate Zones 5 and 7.
- In Climate Zones 1, 3 and 6, ceiling Alterations do not need to meet the requirements of §150.2(b)1J if there is existing R-19 insulation verified at the ceiling.

Requirements

In Climate Zones 1-4, 6 and 8-16, ceiling Alterations to vented attics must have an overall weighted U-factor of maximum 0.020 or R-49 insulation at the ceiling.

A project may have additional requirements to meet, based on its Climate Zone. See Table 7 for these additional requirements and exceptions to them.

Projects in these Climate Zones	Must Meet these Additional Requirements	Unless these Exceptions Apply
2, 4 and 8-16	§150.2(b)1Jii: Air seal all accessible areas of the ceiling plane between the attic and the conditioned space in accordance with §110.7.	The ceiling level has existing R-19 insulation. Vented space- or water-heating combustion appliances are located inside the dwelling unit.
1-4 and 8-16	§150.2(b)1Jiii: Cover recessed downlight luminaires in the ceiling with insulation to the same depth as the rest of the ceiling. Replace or retrofit luminaires not rated for insulation contact with a fire-proof cover that allows for insulation to be installed directly over the cover.	The ceiling level has verified R-19 or greater insulation in Climate Zones 1-4 or 8-10.
1-16	§150.2(b)1Jiv: Ensure that attic ventilation complies with California Building Code requirements.	The ceiling level has existing R-19 or greater insulation. There is an asbestos disturbance risk. Knob and tube wiring are present in the vented attic. Accessible attic space is too small to insulate to the required R-value without violating Section 806.3 of Title 24, Part 2.5. The attic space is shared with other dwelling units that are not triggered for §150.2(b)1J.

Table 7. *Additional Requirements for Altered Ceiling Insulation in Single-family Building Additions and Alterations*

Setback Thermostat

§§110.2(c), 150.0(i), 150.2(b)1F

Mandatory Requirements

Commonly Applicable Project Scopes

- Only altered or new/replacement cooling systems trigger installation of setback thermostats.
- A setback thermostat is required when:
  - Any refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant-metering device or refrigerant piping is replaced.
  - All HVAC equipment is replaced, without adding or replacing ductwork.

Non-applicable Projects and Exceptions

A setback thermostat is not required for the following:

- A project replaces a room heating or cooling unit, such as a gravity gas wall heater, gravity floor heater, gravity room heater, non-central electric heater, fireplace or decorative gas appliance, wood stove, room air conditioner and room air-conditioner heat pump.
- A heating system is controlled by a central energy management control system (EMCS). §150.0(i)

Requirements

For heating or cooling systems which require a setback thermostat, the requirements are provided in detail in §110.2(c).

Ventilation Systems

Key Terms

The Energy Code ventilation requirements for single-family buildings are based on ASHRAE 62.2. For whole-building dwelling-unit ventilation, ASHRAE 62.2 Section 4 dictates a minimum airflow, control and sound rating requirements.

ASHRAE 62.2 Section 5 Local Exhaust requires that local mechanical exhaust must be installed in each kitchen and bathroom meeting minimum airflow, control and sound rating requirements.

Term	Definition
Whole-house Mechanical Ventilation	An exhaust system, supply system or combination of those systems that is designed to mechanically exchange indoor air for outdoor air where operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rate
Local Exhaust	An exhaust system that uses one or more fans to exhaust air from a specific room within a dwelling
Exhaust Air	Air discharged from any space to the outside by an exhaust system
Indoor Air Quality (IAQ)	The air quality within and around buildings related to pollutant levels, odors, temperature, humidity and other factors affecting the health and comfort of occupants
ASHRAE 62.2	American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.2 "Ventilation and Acceptable Indoor Air Quality in Residential Buildings," 2019

Table 8. *Energy Code and Common Terms for Ventilation Systems*

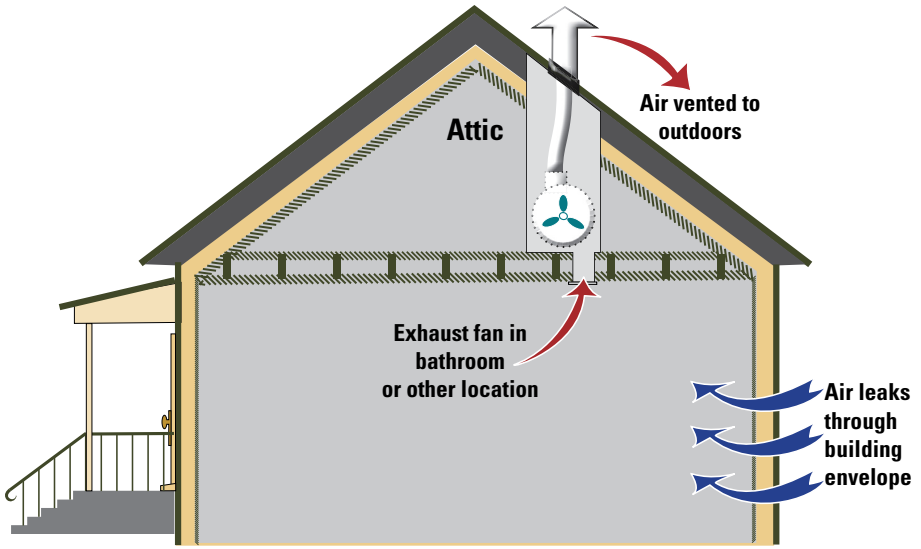


Figure 4. *Exhaust Ventilation Example*

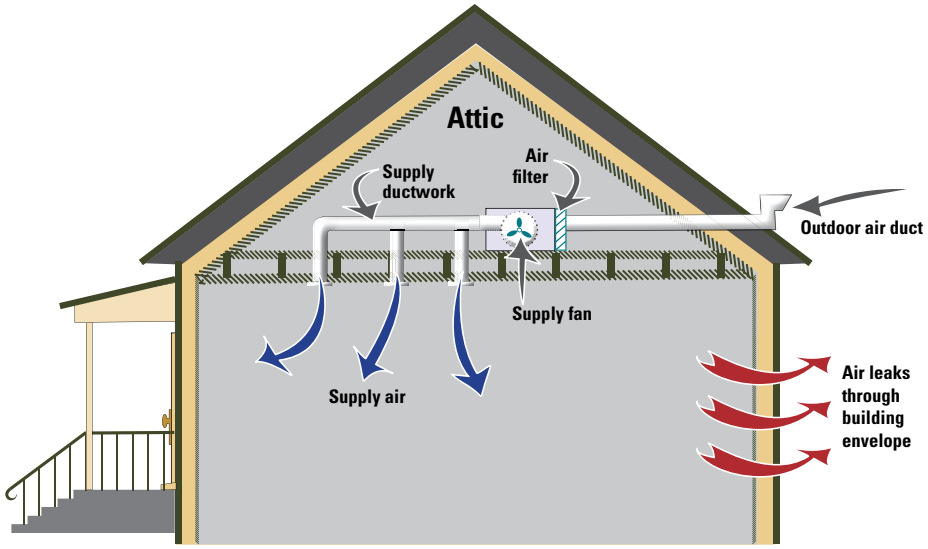


Figure 5. *Supply Ventilation Example*

Ventilation Systems

Trigger Table

Requirement Type	Whole-building Systems		Local Exhaust			
	Mandatory		Mandatory			
For details, click a requirement title or code section → **↓ Project Scope: Change this and nothing else**	**HERS-verified Whole-building IAQ** §150.0(o) §150.2(a)2C	**Air Filter** §150.0(m)12	**Kitchen Local Exhaust** §150.0(o)	**Bathroom Local Exhaust** §150.0(o)	**Clothes Dryer Local Exhaust** §150.0(o)	**HERS-verified Kitchen Hood** §150.0(o)
Remodeling a bathroom	No	No	No	**YES**	No	No
Remodeling a kitchen and adding a kitchen hood	No	No	**YES**	No	No	**YES**
Adding a new dwelling unit that is considered an Addition or new residential building (a detached New Construction habitable building) in an existing home, such as a new accessory dwelling unit (ADU)	**YES** Unless a junior ADU	**YES**	**YES**	**YES**	If applicable	If applicable
Addition to a home > 1,000 ft²	**YES**	If applicable	If applicable	If applicable	If applicable	If applicable
Addition to a home ≤ 1,000 ft²	No	If applicable	If applicable	If applicable	If applicable	If applicable

Table 9. *Energy Code Triggers for Ventilation System Additions and Alterations in Single-family Buildings*

Whole-building Systems

HERS-verified Whole-building Indoor Air Quality

§§150.0(o), 150.2(a)2C

Mandatory Requirements

Commonly Applicable Project Scopes

Airflow for the whole dwelling unit must be verified to meet the requirements of §150.0(o)1C by a HERS Rater when:

- An accessory dwelling unit (ADU) that is considered an Addition or new residential building (a detached New Construction habitable building) is added to the site.
- An Addition to an existing home is > 1,000 ft².

Non-applicable Projects and Exceptions

Additions ≤ 1,000 ft² are not required to provide indoor air quality (IAQ) systems. An ADU created from existing conditioned space (not an Addition or New Construction) is not subject to the IAQ requirements. Altered or replacement IAQ systems that were not required to meet Energy Code IAQ requirements in previous permitted work to the home are not subject to the 2022 Energy Code IAQ requirements.

Requirements

All applicable dwelling units must meet the requirements of ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings as amended in §150.0(o)1. The installing contractor is required to test and document everything installed on an installation certificate. For a list of recommended HVAC testing equipment and supplies, refer to Table 14.

Following the procedures in Reference Residential Appendix RA3.7, a HERS Rater must verify that the airflow meets Energy Code requirements by measuring airflow using a flow hood, flow grid or other airflow measuring device at the mechanical ventilation fan's inlet terminals/grilles or outlet terminals/grilles. Balanced mechanical ventilation system airflow is the average of the supply fan and exhaust fan flows.

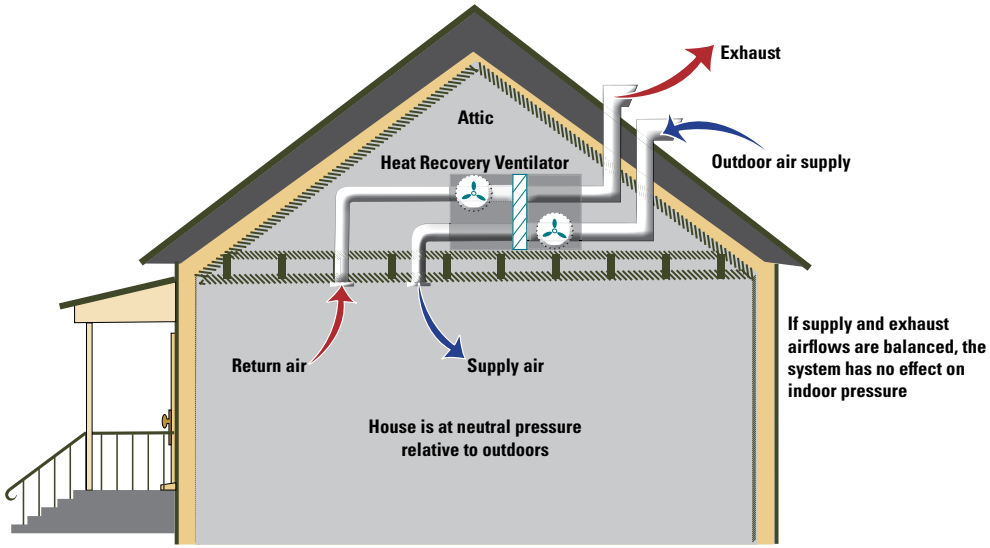


Figure 6. *Balanced Ventilation Example 1 - Heat Recovery Ventilation (HRV) or Energy Recovery Ventilation (ERV)*

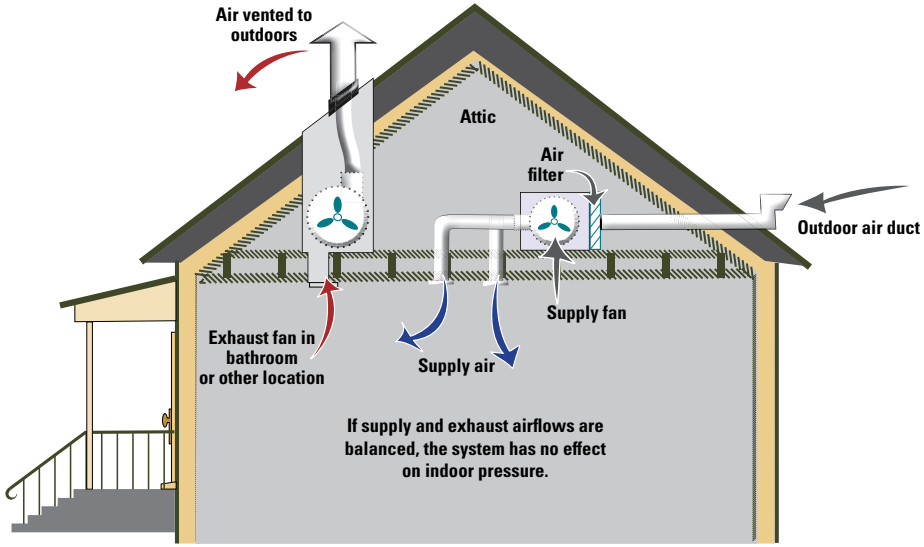


Figure 7. *Balanced Ventilation Example 2 - Separate Supply and Exhaust Fan*

Local Exhaust Systems

Local Exhaust

§150.0(o)

Mandatory Requirements

Commonly Applicable Project Scopes

Energy Code requirements for local exhaust are triggered in the following project scopes in Table 10.

Change this (and nothing else)	Kitchen Local Exhaust	Bathroom Local Exhaust	Clothes Dryer Local Exhaust
Remodeling a bathroom		**YES**	
Remodeling a kitchen and adding a kitchen [range] hood	**YES**		
Adding a dwelling unit to an existing home or property (i.e., ADU)	**YES**	**YES**	If applicable

Table 10. *Local Exhaust Requirements by Project Scope in Single-family Buildings*

Non-applicable Projects and Exceptions

Altered or replacement kitchen hoods or local kitchen exhaust systems that were not required to meet Energy Code kitchen hood and exhaust requirements in previous permitted work to the home are not subject to the 2022 Energy Code kitchen hood and exhaust requirements.

Requirements

Demand-controlled exhaust fans must meet the requirements for airflow rates and capture efficiency in Table 11.

Continuous local ventilation systems must meet the requirements for airflow rates in Table 12.

Dwelling Unit Space	Compliance Criteria
Enclosed Kitchen	Non-range hood kitchen exhaust fans, including downdraft: 300 CFM (150 L/s) or a capacity of 5 ACH
Nonenclosed Kitchen	Non-range hood kitchen exhaust fans, including downdraft: 300 CFM (150 L/s)
Bathroom	50 CFM (25 L/s)
Excerpt from Table 150.0-E Demand-Controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency	

Table 11. *Demand-controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency*

Dwelling Unit Space	Compliance Criteria
Enclosed Kitchen	**5 ACH, based on kitchen volume**
Nonenclosed Kitchen	**Not specified**
Bathroom	**20 CFM (10 L/s)**
Excerpt from Table 150.0-F Continuous Local Ventilation Exhaust Airflow Rates	

Table 12. *Continuous Local Ventilation Exhaust Airflow Rates*

HERS-verified Kitchen Range Hood

§150.0(o)

Mandatory Requirements

Commonly Applicable Project Scopes

Energy Code requirements are triggered when a kitchen range hood is added. For the kitchen hood airflow and capture efficiency requirements, see Table 13.

Check the Local Exhaust subtopic above to see whether your project's scope triggers any local exhaust requirements for other fans in the kitchen and dwelling unit.

Non-applicable Projects and Exceptions

See the Local Exhaust subtopic above.

Requirements

The contractor must install a kitchen range hood with an HVI or AHAM listing that shows that the unit can move 100 CFM while not making more than 3 sones of noise. Kitchen range hood fans must meet the ratings for airflow rates and capture efficiency in Table 13.

Dwelling Unit Floor Area (ft^2)	Hood over Electric Range	Hood over Natural Gas Range
> 1,500	50% CE or 110 CFM	70% CE or 180 CFM
> 1,000-1,500	50% CE or 110 CFM	80% CE or 250 CFM
750-1000	55% CE or 130 CFM	85% CE or 280 CFM
< 750	65% CE or 160 CFM	85% CE or 280 CFM

Excerpt from Table 150.0-G Kitchen Range Hood Airflow Rates (cfm) and ASTM E3087 Capture Efficiency (CE) Ratings According to Dwelling Unit Floor Area and Kitchen Range Fuel Type

Table 13. *Kitchen Range Hood Airflow Rates (CFM) and Capture Efficiency (CE) Ratings*

Required Testing Equipment for Installers

HVAC Testing Equipment	Requirements	Other Equipment and Supplies
Digital refrigerant gauge	± 7.0 psi liquid line pressure ± 3.5 psi suction pressure	**Data Collection Tools** ✦ Digital camera ✦ Data collection sheet or tool ✦ HERS register credentials ✦ PC, tablet or phone ✦ Body-worn camera **Consumables** ✦ Masking tape ✦ Register seal ✦ Approved mastic ✦ UL 181 tape **Standard Field Equipment** ✦ Ladder ✦ Flashlight and head lamp ✦ Radios or walkie talkies ✦ Drop cloth ✦ Drill with 5/8" bit (to drill measurement access holes) ✦ Black marker or pre-printed labels for air filter, MAH holes, etc. **Personal Protective Equipment** ✦ Dust mask ✦ Safety glasses ✦ Gloves ✦ Bump hat ✦ Hard hat ✦ Carbon monoxide monitor ✦ Combustible gas detector
Digital thermometer	Wet bulb ◊ ± 2°F Accuracy ◊ 0.2°F Resolution Dry bulb ◊ ± 2°F Accuracy ◊ 0.2°F Resolution	
Thermocouple (to measure refrigerant line pipe temperature)	± 2°F Accuracy 0.2°F Resolution	
Thermistors-K-couple or RMS		
Duct blaster	± 3 percent of reading or ± 1 CFM (whichever is greater)	
Manometer	± 1% or ± 0.2 Pa. (0.0008 inches water) (whichever is greater)	
Fog machine		
Flow hood	Accuracy of ± 7% of reading or ± 5 CFM (whichever is greater)	
Flow grids		
Blower door		
Static pressure probe		
Portable watt meter (plug in)	Accuracy of ± 2% of reading or ± 10 watts (whichever is greater)	
Portable watt meter (clamp on)	Accuracy of ± 2% of reading or ± 10 watts (whichever is greater)	
Refrigerant scale		
Vacuum pump		
Vacuum gauge		
Recovery bottle		
Tape measure	Actual tape measure, not measuring tape	

Table 14. *HVAC Testing Equipment Needed*

Forms for Single-family Building HVAC Additions and Alterations

In addition to permits, HVAC Additions and Alterations in single-family homes require the following forms, called certificates, for compliance, installation and HERS verification, if that is required. The forms are available on the Energy Code Ace Get Forms landing page: https://www.energycodeace.com/content/get-forms.

1. To determine if your project has any HERS verification requirements, complete and register the appropriate CF1R form.

   The Energy Code Ace Forms Ace™ tool will also help to determine which forms are required.

2. When you complete the Certificate of Compliance for your project, it will inform you which Certificates of Installation and Verification are required.
3. To register your CF1R and other forms and find a HERS Rater, use one of the HERS Providers.

Many building departments require the contractor to register projects that have no HERS verification with a HERS Provider in order to have a registered document stating that the project is exempt from HERS verification.

HERS Providers and Raters

To find a HERS Rater, contact one of the HERS Providers shown below. Each Provider is approved to perform specific services. **Check the CEC website to see if new providers have been approved bit.ly/CEC-HERS-Providers**.

CalCERTS

www.calcerts.com/

Approved for field verification on:

- Newly constructed buildings
- Additions
- Alterations of residential and nonresidential buildings
- California whole-house home energy ratings
- HERS building performance contractors

CHEERS

www.cheers.org/

Approved for field verification on:

- Newly constructed buildings
- Additions
- Alterations of residential and nonresidential buildings

HERS Requirements	Project Type	Certificates of Compliance These forms must be completed and signed by the installing contractor.	Certificates of Installation These forms must be completed and signed by the installing contractor and made available for the building department's final inspection.	Certificates of Verification These forms must be completed by the HERS Rater and made available for the building department's final inspection.
No HERS Verifications Required	**Additions**	**CF1R-ADD-02-E**	**CF2R-ADD-02-E**	Not applicable
	Alterations	**CF1R-ALT-05-E**	**CF2R-ALT-05-E**	
HERS Verifications Required	**Additions**	**CF1R-ADD-01-E** This form must be registered with a HERS Provider prior to permit application.	**CF2R-MCH-##-H** These forms must be registered with a HERS Provider prior to final inspection. See the completed CF1R form for the required installation certificates based on the project	**CF3R-MCH-##-H** These forms must be registered with a HERS Provider prior to final inspection. See the completed CF1R form for the required installation certificates based on the project.
	Alterations	**CF1R-ALT-01-E** This form must be registered with a HERS Provider prior to permit application.		

Table 15. *Required Forms for HVAC Additions and Alterations Using the Prescriptive Method in Single-family Buildings*

For More Information

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov

Learn more about the California Energy Commission (CEC) and its programs on its website.

2022 Building Energy Efficiency Standards

bit.ly/CEC2022Standards

Explore the main CEC web portal for the 2022 Energy Code, including information, documents and historical information.

2022 Building Energy Efficiency Standards Summary

bit.ly/CEC2022Summary

View or download this visual summary of the Energy Code's purpose, current changes and impact.

2022 Reference Appendices

bit.ly/ECA-2022-reference-appendices

View the Joint, Residential and Nonresidential Appendices here.

2022 Energy Code Residential Compliance Manual, Chapter 4 – HVAC Building Requirements

https://bit.ly/CEC-2022-SF-residential-compliance-manual

Modernized Appliance Efficiency Database System (MAEDbS)

bit.ly/MAEDbS

Search this database to find products that comply with the Energy Code

Energy Code Hotline

Call: 1-800-772-3300 (Free)

Email: Title24@energy.ca.gov

Online Resource Center

bit.ly/CEC-ORC

Use these online resources developed for building and enforcement communities to learn more about the Energy Code.

ADDITIONAL RESOURCES

Air Conditioning Contractors of America (ACCA)

www.acca.org

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

www.ashrae.org

Association of Plumbing and Mechanical Officials (IAPMO)

www.iapmo.org

CalCERTS (HERS Provider)

www.calcerts.com

CHEERS (HERS Provider)

www.cheers.org

Energy Star

www.energystar.gov

International Code Council (ICC)

www.iccsafe.org

The Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

www.smacna.org

United States Department of Energy (US DOE)

https://www.energy.gov

Continued on next page

For More Information *(continued)*

EnergyCodeAce™

www.energycodeace.com

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 24, Part 6 and Title 20.

Tools

www.energycodeace.com/tools

Explore this suite of interactive tools to understand the compliance process, required forms, installation techniques and energy efficiency regulations in California.

Reference Ace

www.energycodeace.com/content/reference-ace-2022-tool

Navigate the Title 24, Part 6 Energy Code using an index, keyword search and hyperlinked text.

Forms Ace

www.energycodeace.com/content/tools-ace/tool=forms-ace

Find the forms that apply to your specific project.

Energy Code Product Finder

www.energycodeace.com/content/product-finder

Find Title 24, Part 6-compliant products.

Q&Ace

www.energycodeace.com/QAndAce

Search our online knowledge base or submit your question to Energy Code Ace experts.

Training

www.energycodeace.com/training

On-demand, live in-person and online training alternatives are tailored to a variety of industry professionals and address key measures.

Of Special Interest:

◊ 2022 Title 24, Part 6 Essentials –Residential Standards: What's New
bit.ly/ECA-training-2022-res-whats-new

Resources

www.energycodeace.com/resources

Downloadable materials provide practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.

Of Special Interest:

Fact Sheets for Buildings

bit.ly/building-fact-sheets

◊ Single-family Buildings Just the Basics: HERS Verification

Fact Sheets for Appliances

bit.ly/appliance-fact-sheets

◊ MAEDbS 101

◊ T20 Basics – Retailers, Distributors & Installers

Create an account on the Energy Code Ace site and select an industry role for your profile in order to receive messages about all our offerings!

Check EnergyCodeAce.com for our latest 2022 tools, training and resources!

SCAN ME

This program is funded by California utility customers and administered by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E®), and Southern California Edison Company (SCE) under the auspices of the California Public Utilities Commission.

Home Energy Rating System (HERS) Registry

BayREN Training

Handout 5:

Suggested Guidelines for Building Departments to Handle Permit Submittals for HVAC Alterations

(Change-outs)

Suggested Guidelines for Building Departments to Handle Permit Submittals for HVAC Alterations (Change-outs)

Whether or not a HERS rater is required on the project needs to be determined as early as possible to prevent problems later. It is not required to be known prior to issuing a permit, or even performing the work, **but because it can have a substantial impact on cost and scope of the project**, it should be done ASAP. Note that for alterations, a CF1R is not required to issue a permit, but is required to close a permit.

The HERS Providers' Registries do an excellent job walking people through the process (like "Turbo-Tax") and it is *recommended* that all HVAC alterations start there. It will help the applicant determine whether or not HERS verification is required, what HERS tests and compliance forms are required, and it provides on-line tracking of the process for all parties. It will also generate a CF1R appropriate to the project, however, the HERS Provider charges a small fee and not all projects are required to be registered with a HERS provider.

Only projects that require HERS verification are *required* to be registered with a HERS Provider. Typically, this includes any alteration that involves the installation or replacement of the following:

- A/C condenser
- A/C coil
- Package unit
- Air handler (furnace, fan coil, etc.)
- Any refrigerant containing component
- More than 25' of ducts

Exceptions to the requirement for duct sealing and HERS duct testing include:

- Duct systems that are insulated or sealed with asbestos
- Duct systems that have been previously tested for duct leakage
- Duct systems with less than 25 feet of ducts outside of the insulated shell of the building

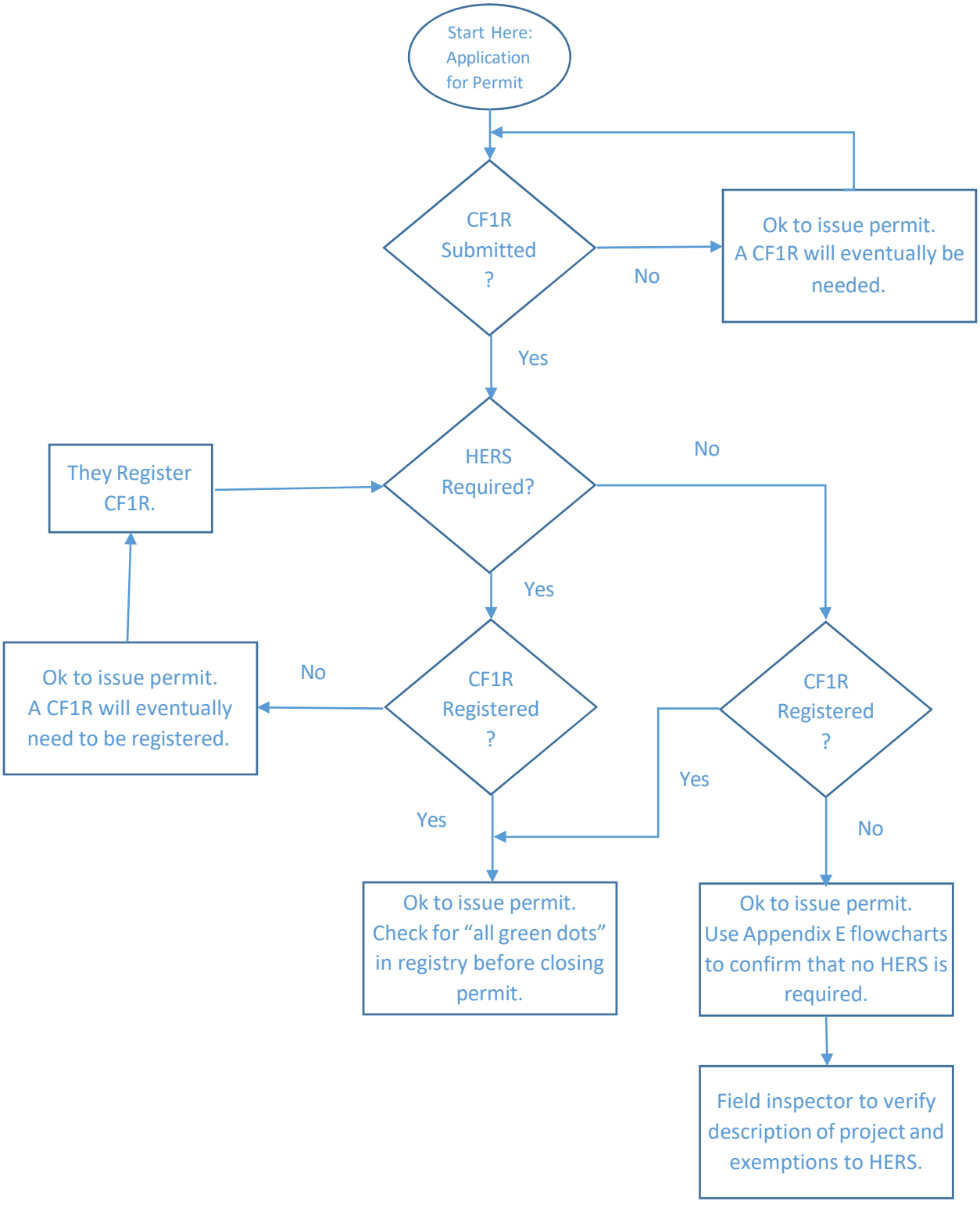
Exceptions to the requirement for refrigerant charge verification by a HERS rater include:

- Project is not in climate zones 2, 8-15.
- Factory charged package units

Determining whether a project needs a HERS rater or not can be quite complex, which is why using the registry is always recommended, however, it can be done without the registry and if a HERS rater is not required, the registry is not needed at all.

When a permit applicant submits a handwritten CF1R-ALT-04 for an HVAC alteration, first determine if the CF1R indicates that HERS verification is needed. If it does, then they will eventually have to register the project and the registry will guide the process. If it does not, some effort should go into determining if the project is correctly described, and the Residential Compliance Manual Appendix E flow charts should be used (attached) to determine if no HERS rater is truly required. **Note that if a HERS rater is not required the exceptions shown above must be field verified by the building inspector.**

Use the following flow chart to guide you through this process. Once a project has been registered, use the HERS Registry to track the completion of all the necessary compliance documentation. Look for "All Green Dots".


Start Here: Application for Permit
CF1R Submitted ?
No
Ok to issue permit. A CF1R will eventually be needed.
Yes
HERS Required?
No
They Register CF1R.
Yes
CF1R Registered ?
No
Ok to issue permit. A CF1R will eventually need to be registered.
CF1R Registered ?
Yes
Yes
No
Ok to issue permit. Check for "all green dots" in registry before closing permit.
Ok to issue permit. Use Appendix E flowcharts to confirm that no HERS is required.
Field inspector to verify description of project and exemptions to HERS.