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

October 15, 2026

Energy Code Compliance Verification (formerly HERS) – HVAC, DHW, IAQ

Jennifer Rennick – In Balance Green Consulting

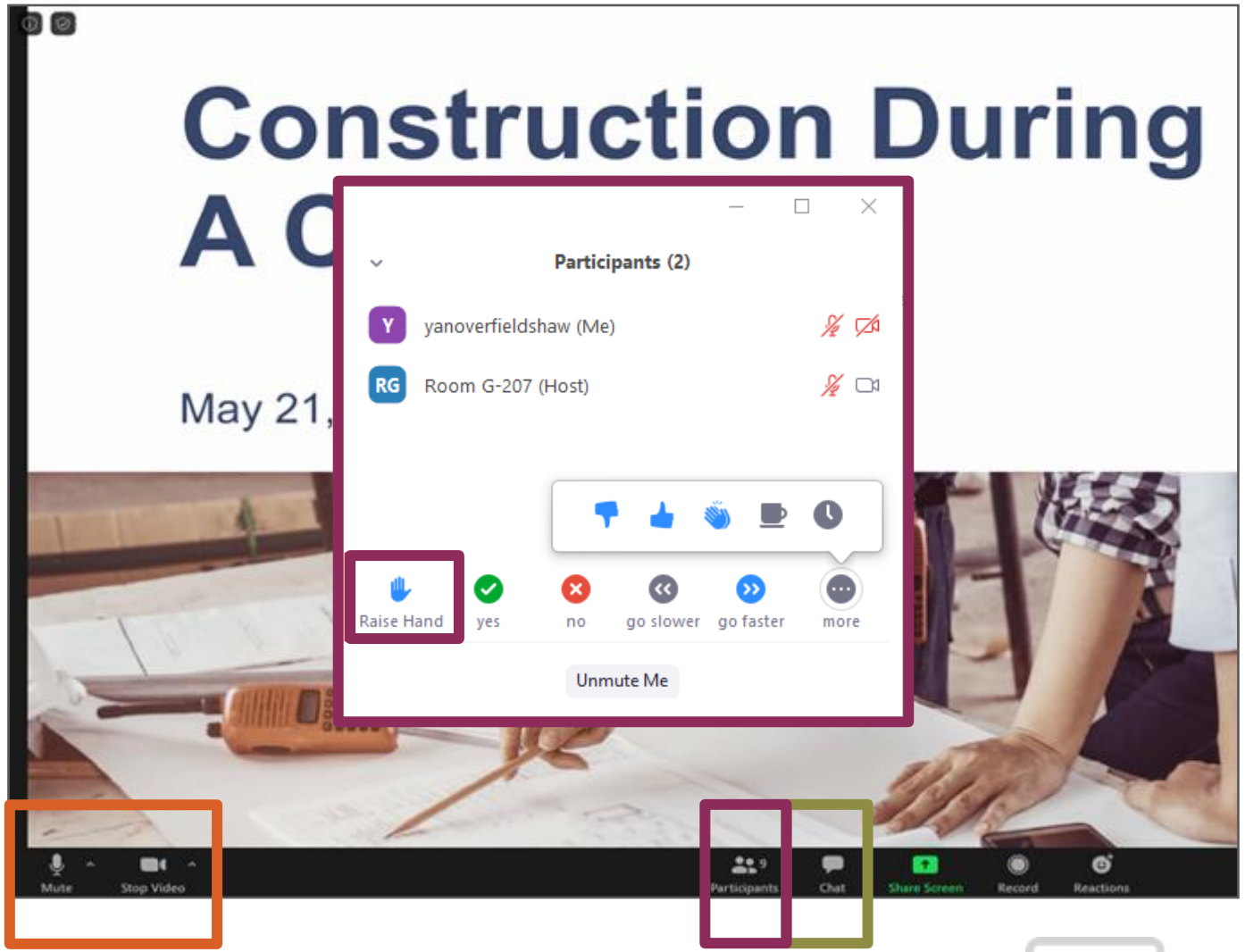
Paul Dunn – Central Coast Energy Compliance

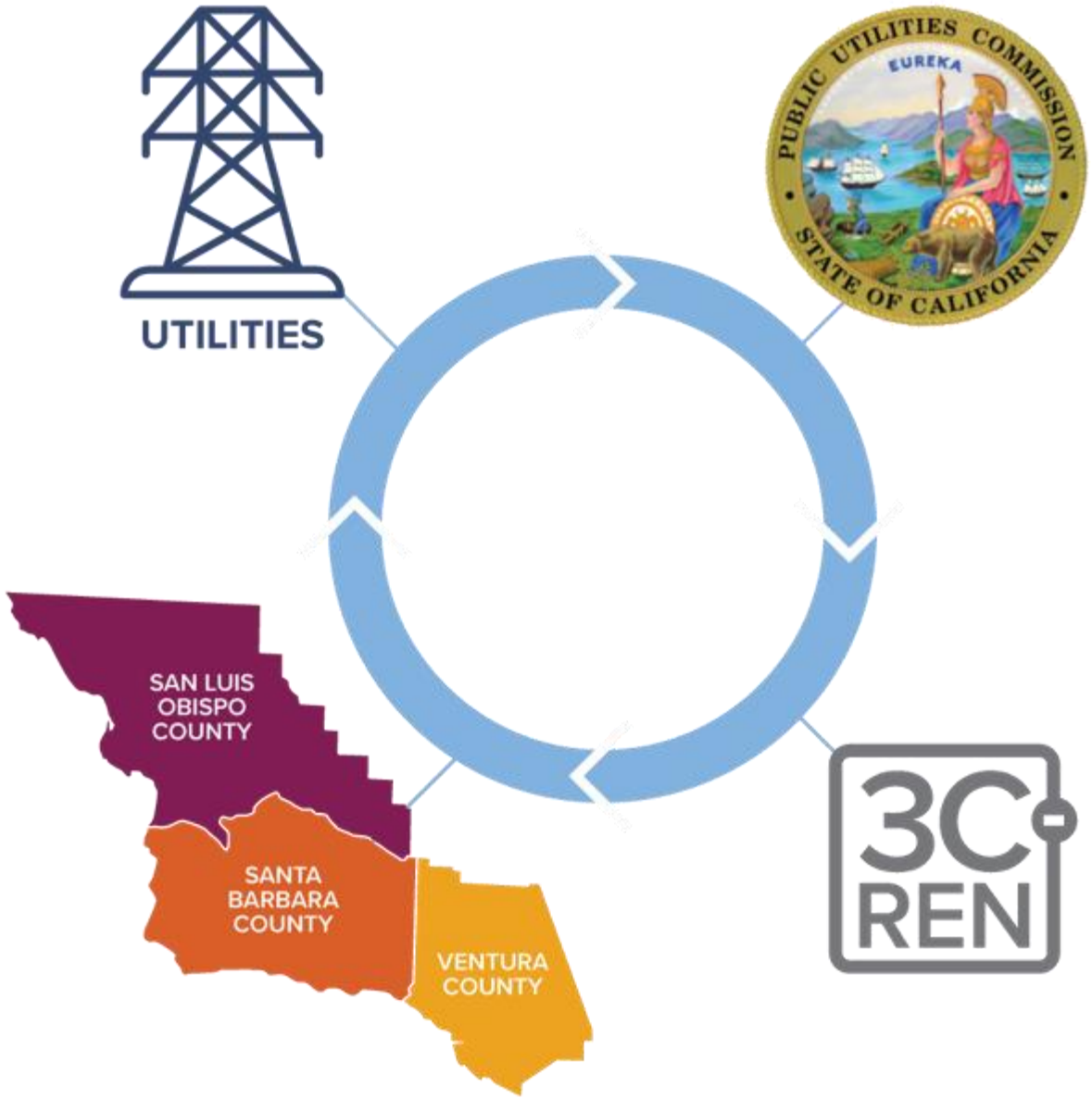


Before We Begin

Here are some quick reminders:

- Call in? Please **share** full name to confirm attendance
- To receive AIA LUs, you **must attend** at least 80% of the training. Attendance will be verified
- Use the "**Chat**“ to share questions or comments
- Slides/recording are **shared** after most events and can be found on 3C-REN's on-demand page
- 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
3c-ren.org/on-demand

Technical Assistance

AGRICULTURE ENERGY SOLUTIONS

3c-ren.org/agriculture

ENERGY ASSURANCE SERVICES

3c-ren.org/assurance

3C REN

Energy Code Compliance Verification (formerly HERS)

Under the new 2025 energy code, HERS rating is now called Energy Code Compliance (ECC), but regardless of the name change, the 3rd-party verification process is still a great way to improve energy performance and meet the Title 24 Energy code. In this two-part course, we'll cover what architects and builders need to know to successfully integrate ECC measures into residential design and construction.

Part 1 will provide an overview of ECC verification, show how it fits into the building code and address envelope-related ECC measures.

Part 2 will address ECC measures relating to mechanical and plumbing systems.

- Energy Code Compliance Verification —Overview and Envelope
- **Energy Code Compliance Verification —HVAC, DHW, and IAQ**

Today's Learning Objectives

- Review key roles and identify integration strategies for ECC measures related to mechanical systems
- Learn ECC measures related to heat pumps, refrigerant charge, and air handlers and which are the best fit for specific projects
- Understand ECC measures related to domestic hot water (DHW), including compact plumbing and pipe insulation
- Discuss ducted systems and options for improving performance and compliance through verification.

Learning Units:

- 1.5 AIA HSW LUs
- 0.15 ICC CEUs

Agenda

1. 2025 Energy Code and ECC (formerly HERS) Overview
2. Supporting Forms –Mechanical and Plumbing
3. HVAC –Duct Leakage Testing and other Credits
4. Mechanical Measures – IAQ and Exhaust Fans
5. Plumbing –Hot Water Distribution





2025 Energy Code and ECC Overview

ECC Rater's Work

- Duct Leakage Testing
- Blower Door / Envelope Leakage Testing
- QII –Quality Insulation Installation
- Field Verifications:
  - Refrigerant Charge
  - Exhaust Fan and Kit Hood Fans
  - HVAC Efficiency and Capacity
- Assist/Complete: CF-2R and CF-3R, etc



HVAC Design Air Flow. Rater testing proper air flow of a wall register with a flow hood.

And so much more!!!

Residential and Multifamily – *HERS* will be replaced by *ECC*

OLD

HERS

- Title 20 (Ch 4, Art 8, Sec 1670)
- 2022 and Prior Code Cycles
- HERS –Home Energy Rating System
- HERS Rater
  - HERS Field Verification and Diagnostic Testing

NEW

ECC Program

- Title 24, Art 1, Sec 10-103.3
- 2025 Code
- ECC –Energy Code Compliance
- ECC-Rater
  - **FV&DT** –Field Verification and Diagnostic Testing

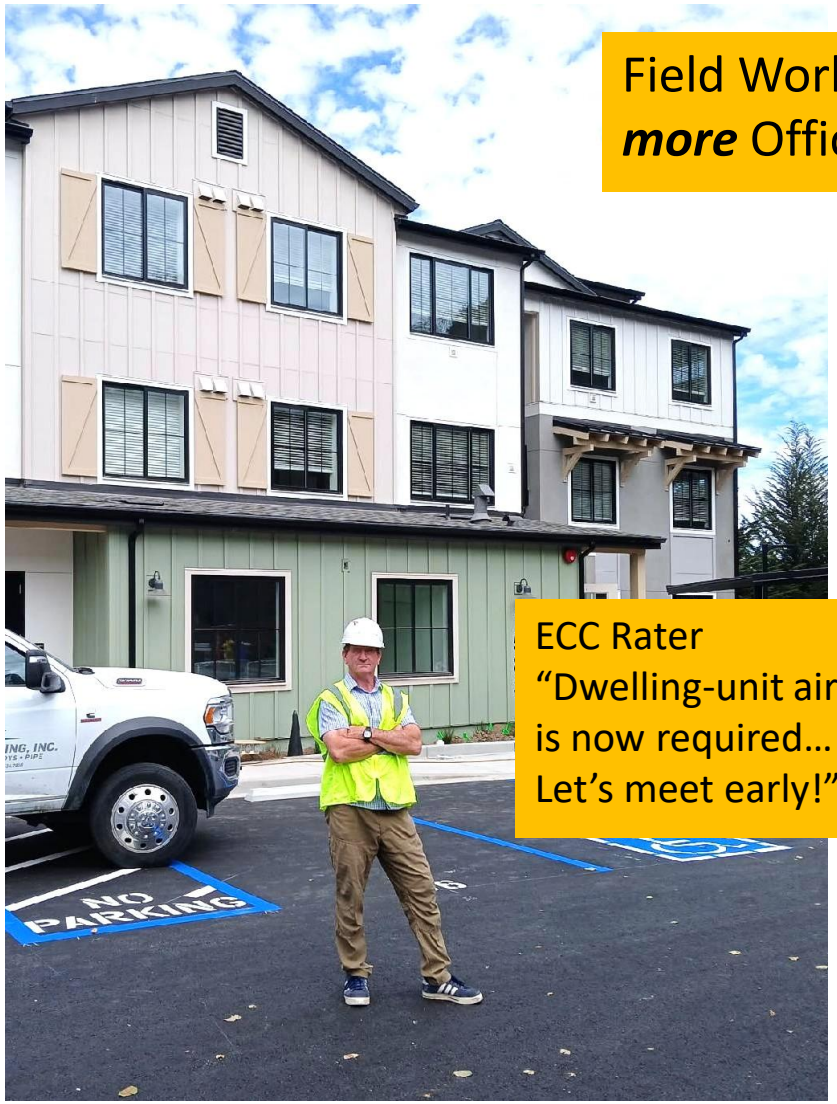
How will a ECC Rater's Work Change Under 2025?

Procedural:

- Participation in Quality Assurance Program
- New Photo Documentation Requirements
- New CEC Annual Reporting Requirements

Potentially, New Scope of Work:

- Multifamily Compartmentalization Testing – Now Mandatory
- Fault Indicator Display Verification for ERV/HRV –New Prescriptive Component
- Heat Pumps Refrigerant Charge Verification – New Prescriptive Component
- Consumer Summary Report



Field Work and…
more Office Work

ECC Rater
"Dwelling-unit air-leakage is now required…
Let's meet early!"

Overview of Forms for Residential Single Family and Low-Rise Multifamily Construction

Single Family (Duplexes and Townhouses)

- **CF1R** – Forms used to show ***Compliance*** with the energy code at initial plan submittal
- **CF2R** – Forms used during construction to demonstrate that the energy code features met ***Installation*** requirements
- **CF3R** – Forms used after installation to confirm that the energy code features met the ***Verification*** requirements

Low-Rise Multifamily (3 Stories or Less)

- **LMCC** – Forms used to show ***Compliance*** with the energy code at initial plan submittal
- **LMCI** – Forms used during construction to demonstrate that the energy code features met ***Installation*** requirements
- **LMCV** – Forms used after installation to confirm that the energy code features met the ***Verification*** requirements

Review: Current Process for Residential Permitting



CF-1R Compliance created and uploaded to California's Data Registry

CF-2R Installation completed and signed on California's Data Registry

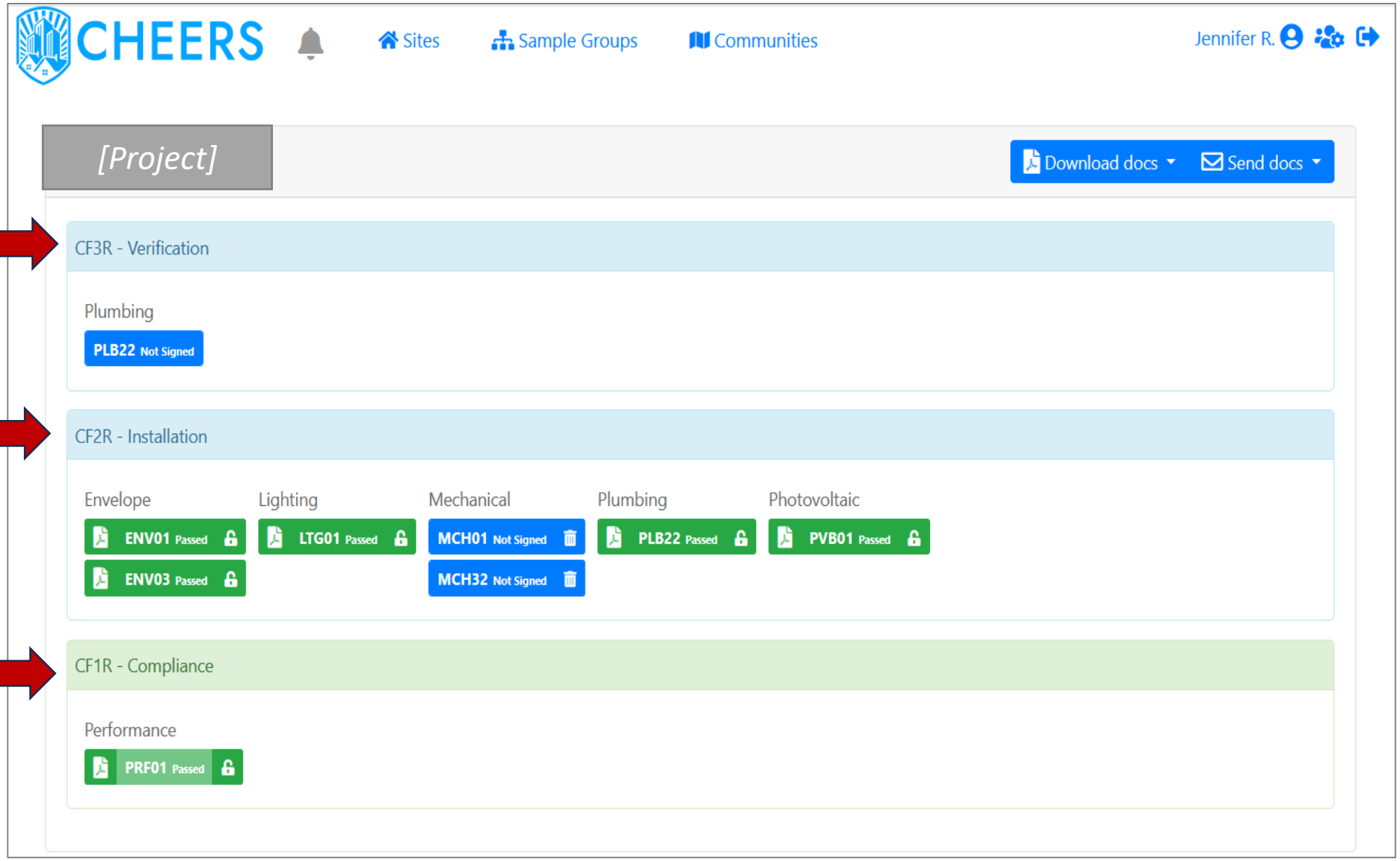
CF-3R Verification completed signed on California's Data Registry

Building Official Confirms CF-2R's and CF-3R's are finished and the Project Status Report (PSR) is 'complete'

Similar Process for Multifamily Permitting

CHEERS is the only approved Data Registry for the 2025 Energy Code

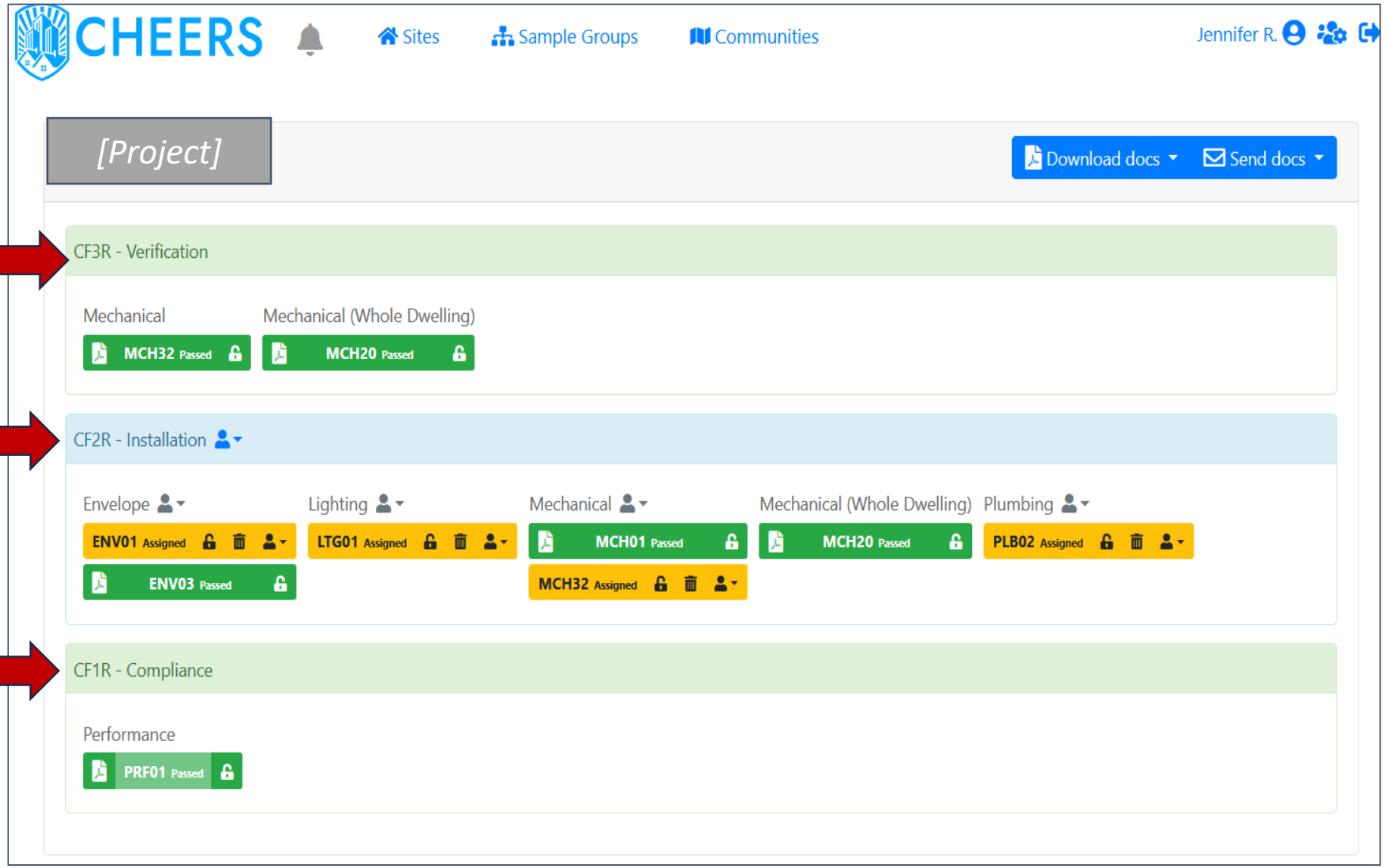
CHEERS Registry –Project in Progress



Blue:
The Form is incomplete, i.e. 'Not Signed' or 'Not Started'

Green:
The Form is Complete, Signed, and 'Passed'

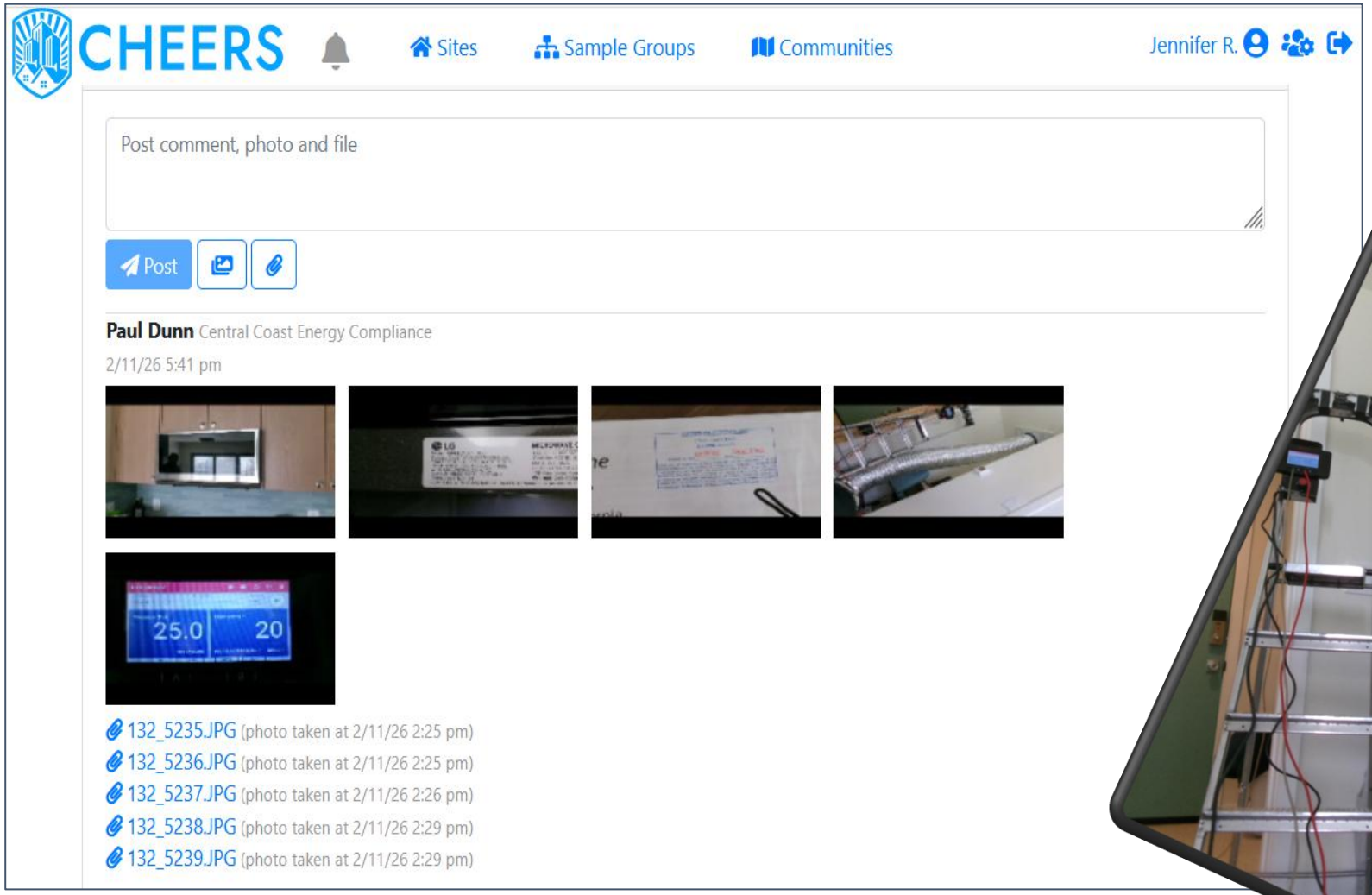
CHEERS Registry –Project in Progress

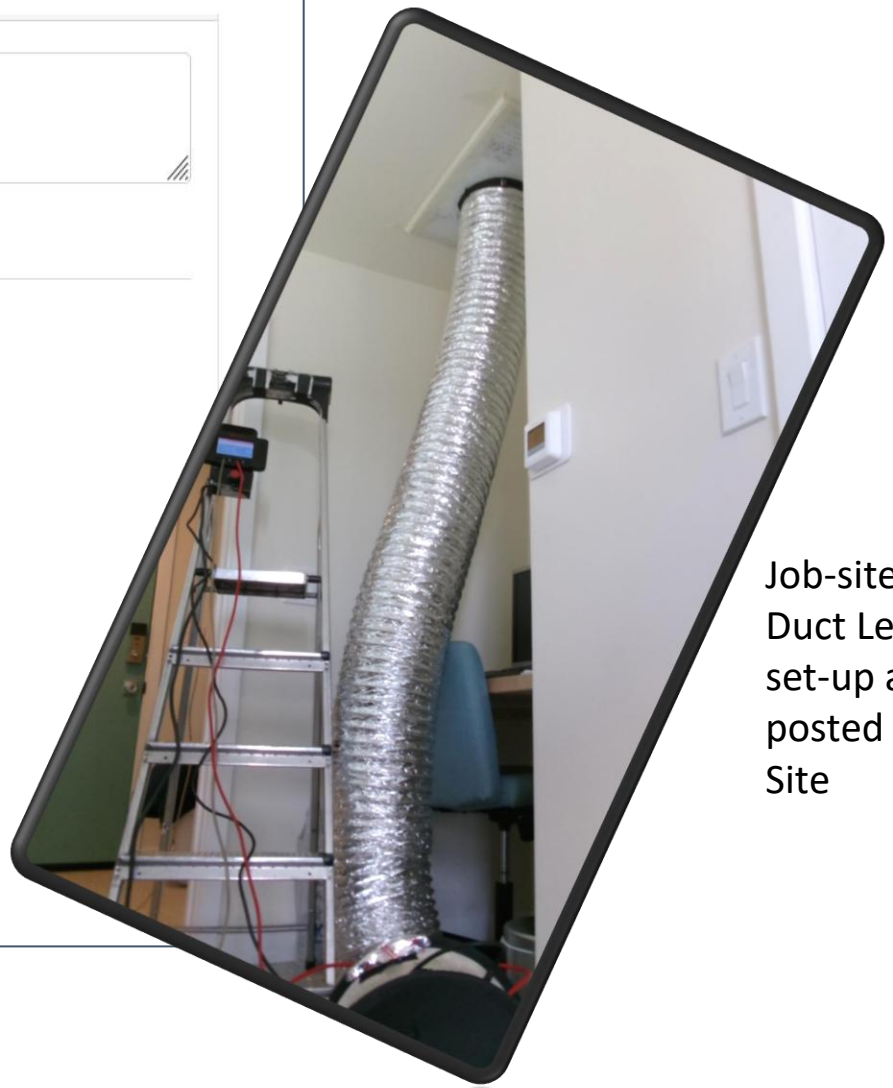


Goldenrod:
The Form is 'Assigned', but not yet accepted

Green:
The Form is Complete, Signed, and 'Passed'

ECC Rater can Post Comments and Photos of the Project



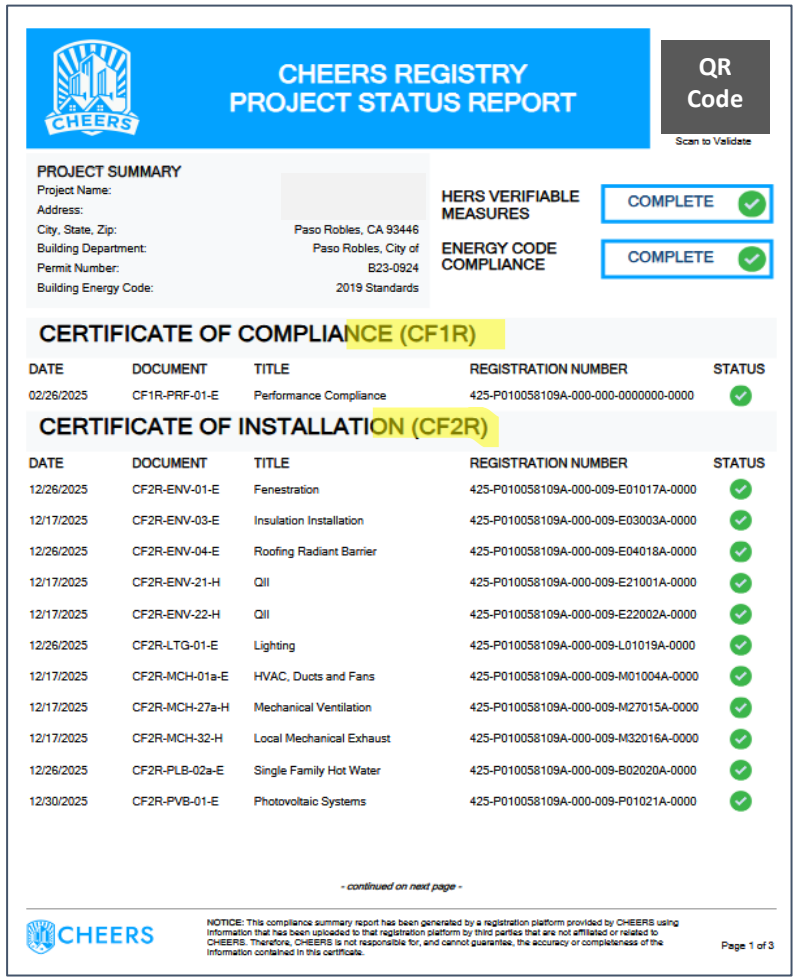


Job-site photos of Duct Leakage Testing set-up and results are posted to the Project Site

Project Status Report (PSR) –For AHJ's

Green Checkmarks:

- The Measures are Complete
- Forms are Signed, and
- Everything Passes



CHEERS REGISTRY
PROJECT STATUS REPORT

QR Code
Scan to Validate

PROJECT SUMMARY

Project Name:	
Address:	
City, State, Zip:	Paso Robles, CA 93446
Building Department:	Paso Robles, City of
Permit Number:	B23-0924
Building Energy Code:	2019 Standards

HERS VERIFIABLE MEASURES — COMPLETE

ENERGY CODE COMPLIANCE — COMPLETE

CERTIFICATE OF COMPLIANCE (CF1R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
02/26/2025	CF1R-PRF-01-E	Performance Compliance	425-P010058109A-000-000-0000000-0000	✓

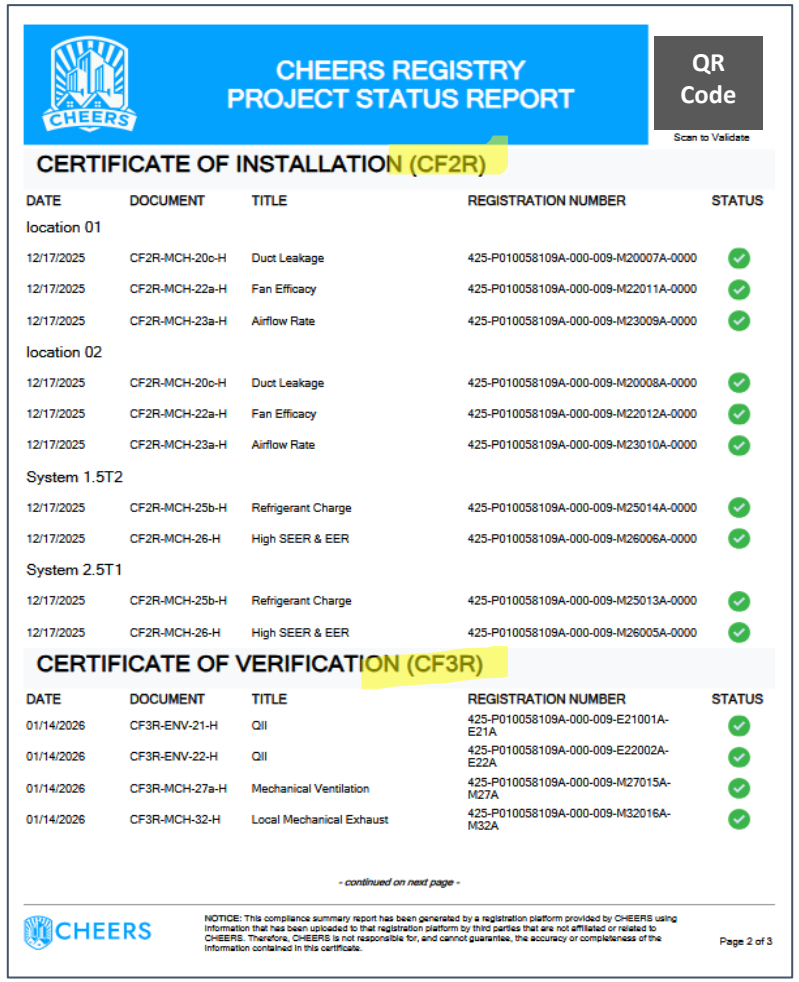
CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
12/26/2025	CF2R-ENV-01-E	Fenestration	425-P010058109A-000-009-E01017A-0000	✓
12/17/2025	CF2R-ENV-03-E	Insulation Installation	425-P010058109A-000-009-E03003A-0000	✓
12/26/2025	CF2R-ENV-04-E	Roofing Radiant Barrier	425-P010058109A-000-009-E04018A-0000	✓
12/17/2025	CF2R-ENV-21-H	QII	425-P010058109A-000-009-E21001A-0000	✓
12/17/2025	CF2R-ENV-22-H	QII	425-P010058109A-000-009-E22002A-0000	✓
12/26/2025	CF2R-LTG-01-E	Lighting	425-P010058109A-000-009-L01019A-0000	✓
12/17/2025	CF2R-MCH-01a-E	HVAC, Ducts and Fans	425-P010058109A-000-009-M01004A-0000	✓
12/17/2025	CF2R-MCH-27a-H	Mechanical Ventilation	425-P010058109A-000-009-M27015A-0000	✓
12/17/2025	CF2R-MCH-32-H	Local Mechanical Exhaust	425-P010058109A-000-009-M32016A-0000	✓
12/26/2025	CF2R-PLB-02a-E	Single Family Hot Water	425-P010058109A-000-009-B02020A-0000	✓
12/30/2025	CF2R-PVB-01-E	Photovoltaic Systems	425-P010058109A-000-009-P01021A-0000	✓

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CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
location 01				
12/17/2025	CF2R-MCH-20c-H	Duct Leakage	425-P010058109A-000-009-M20007A-0000	✓
12/17/2025	CF2R-MCH-22a-H	Fan Efficacy	425-P010058109A-000-009-M22011A-0000	✓
12/17/2025	CF2R-MCH-23a-H	Airflow Rate	425-P010058109A-000-009-M23009A-0000	✓
location 02				
12/17/2025	CF2R-MCH-20c-H	Duct Leakage	425-P010058109A-000-009-M20008A-0000	✓
12/17/2025	CF2R-MCH-22a-H	Fan Efficacy	425-P010058109A-000-009-M22012A-0000	✓
12/17/2025	CF2R-MCH-23a-H	Airflow Rate	425-P010058109A-000-009-M23010A-0000	✓
System 1.5T2				
12/17/2025	CF2R-MCH-25b-H	Refrigerant Charge	425-P010058109A-000-009-M25014A-0000	✓
12/17/2025	CF2R-MCH-26-H	High SEER & EER	425-P010058109A-000-009-M26006A-0000	✓
System 2.5T1				
12/17/2025	CF2R-MCH-25b-H	Refrigerant Charge	425-P010058109A-000-009-M25013A-0000	✓
12/17/2025	CF2R-MCH-26-H	High SEER & EER	425-P010058109A-000-009-M26005A-0000	✓

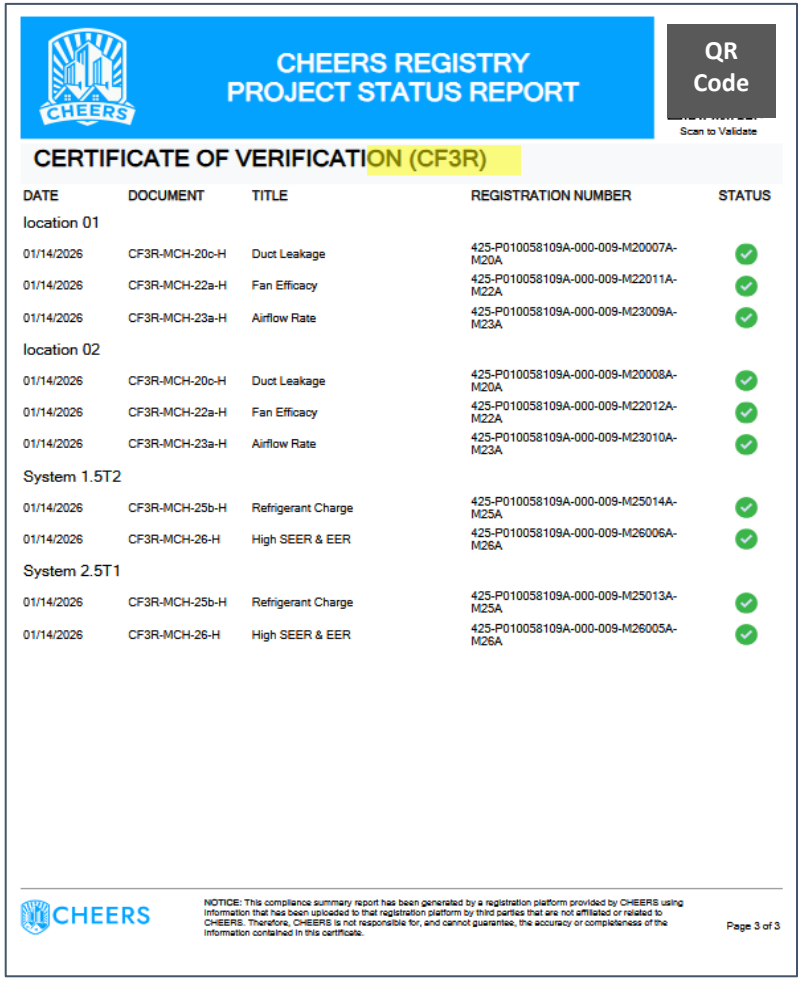
CERTIFICATE OF VERIFICATION (CF3R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
01/14/2026	CF3R-ENV-21-H	QII	425-P010058109A-000-009-E21001A-E21A	✓
01/14/2026	CF3R-ENV-22-H	QII	425-P010058109A-000-009-E22002A-E22A	✓
01/14/2026	CF3R-MCH-27a-H	Mechanical Ventilation	425-P010058109A-000-009-M27015A-M27A	✓
01/14/2026	CF3R-MCH-32-H	Local Mechanical Exhaust	425-P010058109A-000-009-M32016A-M32A	✓

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CERTIFICATE OF VERIFICATION (CF3R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
location 01				
01/14/2026	CF3R-MCH-20c-H	Duct Leakage	425-P010058109A-000-009-M20007A-M20A	✓
01/14/2026	CF3R-MCH-22a-H	Fan Efficacy	425-P010058109A-000-009-M22011A-M22A	✓
01/14/2026	CF3R-MCH-23a-H	Airflow Rate	425-P010058109A-000-009-M23009A-M23A	✓
location 02				
01/14/2026	CF3R-MCH-20c-H	Duct Leakage	425-P010058109A-000-009-M20008A-M20A	✓
01/14/2026	CF3R-MCH-22a-H	Fan Efficacy	425-P010058109A-000-009-M22012A-M22A	✓
01/14/2026	CF3R-MCH-23a-H	Airflow Rate	425-P010058109A-000-009-M23010A-M23A	✓
System 1.5T2				
01/14/2026	CF3R-MCH-25b-H	Refrigerant Charge	425-P010058109A-000-009-M25014A-M25A	✓
01/14/2026	CF3R-MCH-26-H	High SEER & EER	425-P010058109A-000-009-M26006A-M26A	✓
System 2.5T1				
01/14/2026	CF3R-MCH-25b-H	Refrigerant Charge	425-P010058109A-000-009-M25013A-M25A	✓
01/14/2026	CF3R-MCH-26-H	High SEER & EER	425-P010058109A-000-009-M26005A-M26A	✓

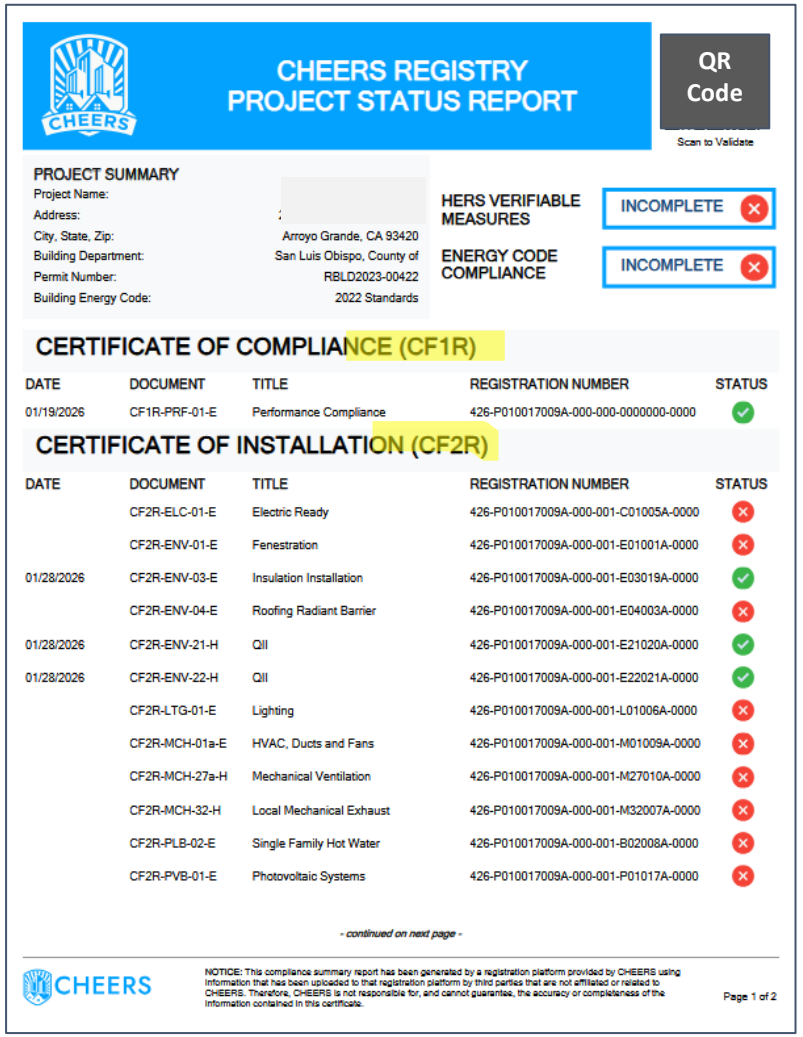
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Project Status Report (PSR) –For AHJ's

Red 'X':

- Measures is not complete
- Form is not signed, and/or
- Measure not passing



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PROJECT STATUS REPORT

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PROJECT SUMMARY

Project Name:	
Address:	
City, State, Zip:	Arroyo Grande, CA 93420
Building Department:	San Luis Obispo, County of
Permit Number:	RBLD2023-00422
Building Energy Code:	2022 Standards

HERS VERIFIABLE MEASURES: INCOMPLETE

ENERGY CODE COMPLIANCE: INCOMPLETE

CERTIFICATE OF COMPLIANCE (CF1R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
01/19/2026	CF1R-PRF-01-E	Performance Compliance	426-P010017009A-000-000-0000000-0000	✓

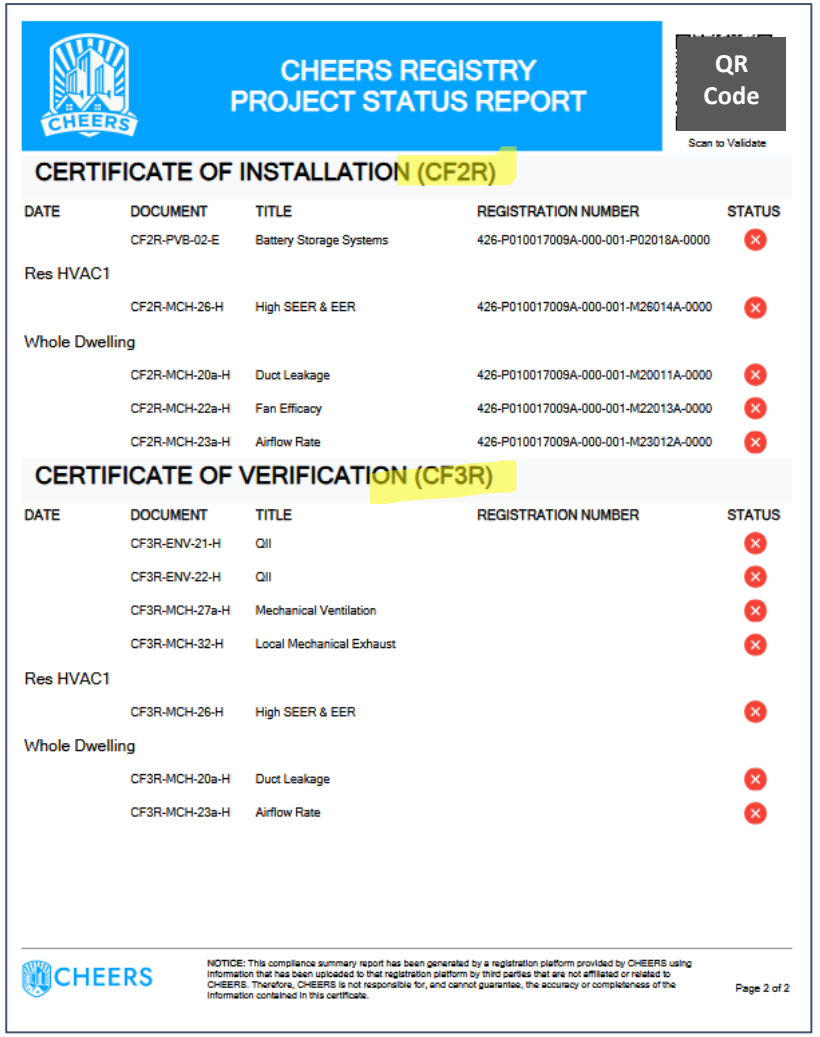
CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
	CF2R-ELC-01-E	Electric Ready	426-P010017009A-000-001-C01005A-0000	✗
	CF2R-ENV-01-E	Fenestration	426-P010017009A-000-001-E01001A-0000	✗
01/28/2026	CF2R-ENV-03-E	Insulation Installation	426-P010017009A-000-001-E03019A-0000	✓
	CF2R-ENV-04-E	Roofing Radiant Barrier	426-P010017009A-000-001-E04003A-0000	✗
01/28/2026	CF2R-ENV-21-H	QII	426-P010017009A-000-001-E21020A-0000	✓
01/28/2026	CF2R-ENV-22-H	QII	426-P010017009A-000-001-E22021A-0000	✓
	CF2R-LTG-01-E	Lighting	426-P010017009A-000-001-L01006A-0000	✗
	CF2R-MCH-01a-E	HVAC, Ducts and Fans	426-P010017009A-000-001-M01009A-0000	✗
	CF2R-MCH-27a-H	Mechanical Ventilation	426-P010017009A-000-001-M27010A-0000	✗
	CF2R-MCH-32-H	Local Mechanical Exhaust	426-P010017009A-000-001-M32007A-0000	✗
	CF2R-PLB-02-E	Single Family Hot Water	426-P010017009A-000-001-B02008A-0000	✗
	CF2R-PVB-01-E	Photovoltaic Systems	426-P010017009A-000-001-P01017A-0000	✗

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CERTIFICATE OF INSTALLATION (CF2R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
	CF2R-PVB-02-E	Battery Storage Systems	426-P010017009A-000-001-P02018A-0000	✗
Res HVAC1				
	CF2R-MCH-26-H	High SEER & EER	426-P010017009A-000-001-M26014A-0000	✗
Whole Dwelling				
	CF2R-MCH-20a-H	Duct Leakage	426-P010017009A-000-001-M20011A-0000	✗
	CF2R-MCH-22a-H	Fan Efficacy	426-P010017009A-000-001-M22013A-0000	✗
	CF2R-MCH-23a-H	Airflow Rate	426-P010017009A-000-001-M23012A-0000	✗

CERTIFICATE OF VERIFICATION (CF3R)

DATE	DOCUMENT	TITLE	REGISTRATION NUMBER	STATUS
	CF3R-ENV-21-H	QII		✗
	CF3R-ENV-22-H	QII		✗
	CF3R-MCH-27a-H	Mechanical Ventilation		✗
	CF3R-MCH-32-H	Local Mechanical Exhaust		✗
Res HVAC1				
	CF3R-MCH-26-H	High SEER & EER		✗
Whole Dwelling				
	CF3R-MCH-20a-H	Duct Leakage		✗
	CF3R-MCH-23a-H	Airflow Rate		✗

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Under the 2025 Energy Code:

The ECC Rater will remain as the "Rater of Record" even if the Rater 'fails' the project's required energy measures or features.

3C REN

Recap…

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD CF1R-PRF-01-E

Project Name: [redacted] **Calculation Date/Time:** 2026-05-29T16:18:23-07:00 **(Page 1 of 16)**

Calculation Description: Title 24 Analysis **Input File Name:** [redacted].ribd25x

GENERAL INFORMATION					
01	Project Name	Armendariz-Macias Residence			
02	Run Title	Title 24 Analysis			
03	Project Location	[redacted]			
04	City	San Luis Obispo	05	Standards Version	2025
06	Zip code	93401	07	Software Version	EnergyPro 10.1
08	Climate Zone	5	09	Front Orientation (deg/ Cardinal)	45
10	Building Type	Single family	11	Number of Dwelling Units	1
12	Project Scope	Newly Constructed	13	Number of Bedrooms	3
14	Addition Cond. Floor Area (ft^2)	0	15	Number of Stories	2
16	Existing Cond. Floor Area (ft^2)	n/a	17	Fenestration Average U-factor	0.16
18	Total Cond. Floor Area (ft^2)	4099	19	Glazing Percentage (%)	26.72%
20	ADU Bedroom Count	n/a	21	ADU Conditioned Floor Area	n/a
22	Fuel Type	Natural gas	23	No Dwelling Unit:	No

COMPLIANCE RESULTS

Building Complies with Computer Performance

This building incorporates features that require field testing and/or verification by a certified ECC rater under the supervision of a CEC-approved ECC provider.

This building incorporates one or more Special Features shown below

REQUIRED SPECIAL FEATURES

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

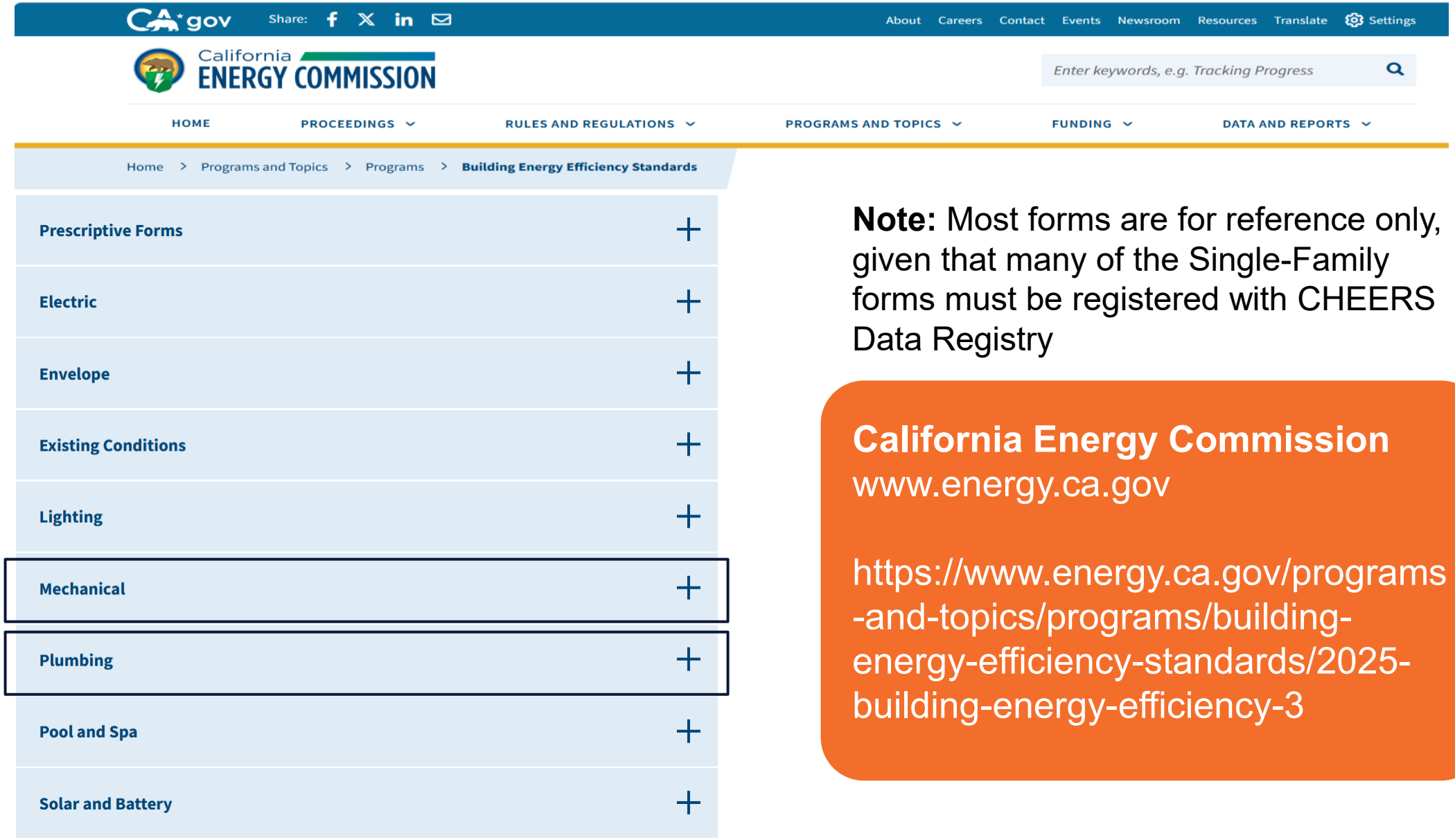
- Indoor air quality, balanced fan
- IAQ Ventilation System: as low as 0.266667 W/CFM
- IAQ Ventilation System Heat Recovery: minimum 80 SRE and 80 ASRE
- IAQ Ventilation System: supply outside air inlet, filter, and H/ERV cores accessible per RACM Reference Manual
- IAQ Ventilation System: fault indicator display
- Ducts with high level of insulation
- Insulation above roof deck
- Insulation below roof deck
- Recirculating with non-demand control (continuous pumping)

Approval Process

- CF1R on ECC Registry
- CF2R on ECC Registry
- CF3R on ECC Registry
- Enforcement Agency (AHJ) can access the **Watermarked Forms**
- AHJ will see “PASS” on List of Required Forms

Supporting Forms – Mechanical and Plumbing

CEC – 2025 Energy Code Compliance Documents - Forms



Note: Most forms are for reference only, given that many of the Single-Family forms must be registered with CHEERS Data Registry

California Energy Commission
www.energy.ca.gov

https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency-3

2025 Supporting Docs CF2R & CF3R –Mechanical

Mechanical

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)

Certificates of Installation

01

- CF2R-MCH-01a-E Space Conditioning Systems Ducts and Fans - Performance New Construction
- CF2R-MCH-01b-E Space Conditioning System Ducts and Fans - Prescriptive Alterations
- CF2R-MCH-01c-E Space Conditioning System Ducts and Fans - Prescriptive New Construction
- CF2R-MCH-01d-E Space Conditioning System Ducts and Fans - Performance Existing + Addition and/or Alteration
- CF2R-MCH-02-E Whole House Fan
- CF2R-MCH-04-E Evaporative Coolers
- CF2R-MCH-20-H Duct Leakage Diagnostic Test
- CF2R-MCH-21-H Duct Location
- CF2R-MCH-22-H Space Conditioning System Fan Efficacy
- CF2R-MCH-23-H Space Conditioning System Airflow Rate
- CF2R-MCH-24-H Building Air Leakage Diagnostic Test Worksheet - Building Enclosures and Dwelling Unit Enclosures

Certificates of Verification

- CF3R-MCH-20-H Duct Leakage Diagnostic Test
- CF3R-MCH-21-H Duct Location
- CF3R-MCH-22-H Space Conditioning System Fan Efficacy
- CF3R-MCH-23-H Space Conditioning System Airflow Rate
- CF3R-MCH-24-H Building Air Leakage Diagnostic Test Worksheet - Building Enclosures and Dwelling Unit Enclosures

Note: Air Leakage Testing - MCH-24-H forms are the second part of Envelope QII – ENV-21-H and ENV-22-H forms.

2025 Supporting Docs CF2R & CF3R –con't

Mechanical

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)

Certificates of Installation

- CF2R-MCH-25-H Refrigerant Charge Verification
- CF2R-MCH-26-H Rated Space Conditioning System Equipment Verification
- CF2R-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- CF2R-MCH-28-H Return Duct Design and Air Filter Device Sizing According to Tables 150.0-B or C
- CF2R-MCH-29-H Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
- CF2R-MCH-30-H Central Fan Ventilation Cooling System (CFVCS)
- CF2R-MCH-31-H Whole House Fan Airflow and Fan Efficacy
- CF2R-MCH-32-H Local Mechanical Exhaust
- CF2R-MCH-33-H Variable Capacity Heat Pump Compliance Credit
- CF2R-MCH-34-E Pre-Cooling

Certificates of Verification

- CF3R-MCH-25-H Refrigerant Charge Verification
- CF3R-MCH-26-H Rated Space Conditioning System Equipment Verification
- CF3R-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- CF3R-MCH-28-H Return Duct Design and Air Filter Device Sizing According to Tables 150.0-B or C
- CF3R-MCH-29-H Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
- CF3R-MCH-30-H Central Fan Ventilation Cooling System (CFVCS)
- CF3R-MCH-31-H Whole House Fan Airflow and Fan Efficacy
- CF3R-MCH-32-H Local Mechanical Exhaust
- CF3R-MCH-33-H Variable Capacity Heat Pump Compliance Credit

2025 Supporting Docs LMCI & LMCV –Mechanical

Mechanical

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)

Certificates of Compliance

- LMCC-MCH-01-E Mechanical Systems
- LMCC-MCH-02-E-Prescriptive Alterations of Space Conditioning Systems

Certificates of Installation

- LMCI-MCH-E Mechanical Systems
- LMCI-MCH-01a-E Space Conditioning Systems Ducts and Fans - Performance New Construction
- LMCI-MCH-01b-E Space Conditioning System Ducts and Fans - Prescriptive Alterations
- LMCI-MCH-01c-E Space Conditioning System Ducts and Fans - Prescriptive New Construction
- LMCI-MCH-01d-E Space Conditioning System Ducts and Fans - Existing + Addition and/or Alteration
- LMCI-MCH-20-H Duct Leakage Diagnostic Test
- LMCI-MCH-21-H Duct Location
- LMCI-MCH-22-H Space Conditioning System Fan Efficacy
- LMCI-MCH-23-H Space Conditioning System Airflow Rate
- LMCI-MCH-24-H Building Air Leakage Diagnostic Test - Building Enclosures and Dwelling Unit Enclosures

Certificates of Verification

- LMCV-MCH-20-H Duct Leakage Diagnostic Test
- LMCV-MCH-21-H Duct Location
- LMCV-MCH-22-H Space Conditioning System Fan Efficacy
- LMCV-MCH-23-H Space Conditioning System Airflow Rate
- LMCV-MCH-24-H Building Air Leakage Diagnostic Test - Building Enclosures and Dwelling Unit Enclosures

2025 Supporting Docs LMCI & LMCV –con't

Mechanical

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)

Certificates of Installation

- LMCI-MCH-25-H Refrigerant Charge Verification
- LMCI-MCH-26-H Rated Space Conditioning System Equipment Verification
- LMCI-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- LMCI-MCH-28-H Return Duct Design and Air Filter Device Sizing According to Tables 160.3-A or B
- LMCI-MCH-29-H Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
- LMCI-MCH-32-H Local Mechanical Exhaust
- LMCI-MCH-33-H Variable Capacity Heat Pump Compliance Credit

Certificates of Verification

- LMCV-MCH-25-H Refrigerant Charge Verification
- LMCV-MCH-26-H Rated Space Conditioning System Equipment Verification
- LMCV-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- LMCV-MCH-28-H Return Duct Design and Air Filter Device Sizing According to Tables 160.3-A or B
- LMCV-MCH-29-H Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
- LMCV-MCH-32-H Local Mechanical Exhaust
- LMCV-MCH-33-H Variable Capacity Heat Pump Compliance Credit

2025 Supporting Docs CF2R & CF3R –Plumbing

Plumbing

Certificates of Installation

- CF2R-PLB-02-E Single Dwelling Unit Hot Water System Distribution
- CF2R-PLB-22-H Verified Single Dwelling Unit Hot Water System Distribution

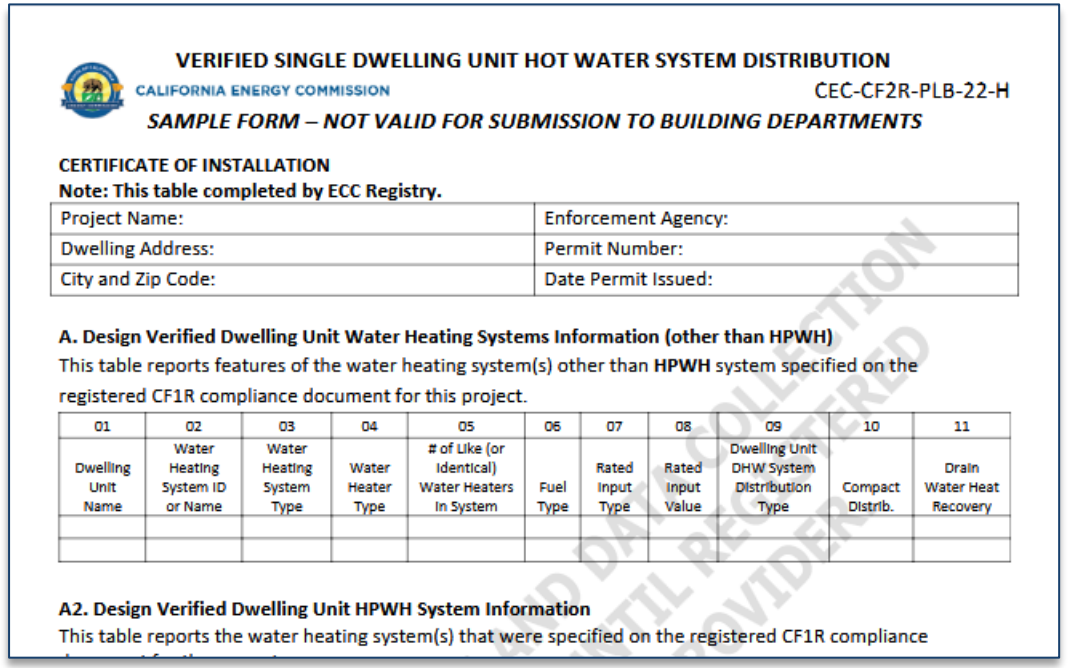
Certificate of Verification

- CF3R-PLB-22-H Verified Single Dwelling Unit Hot Water System Distribution

Key Takeaway –one form with many measures:

- Make and Model for NEEA HPWH units
- All pipes insulated
- Compact plumbing
- Point of use plumbing,
- Mandatory Measures for HPWH from Section 110.3
- Etc.

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)



VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION CEC-CF2R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by ECC Registry.

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

A. Design Verified Dwelling Unit Water Heating Systems Information (other than HPWH)

This table reports features of the water heating system(s) other than **HPWH** system specified on the registered CF1R compliance document for this project.

01	02	03	04	05	06	07	08	09	10	11
Dwelling Unit Name	Water Heating System ID or Name	Water Heating System Type	Water Heater Type	# of Like (or Identical) Water Heaters In System	Fuel Type	Rated Input Type	Rated Input Value	Dwelling Unit DHW System Distribution Type	Compact Distrib.	Drain Water Heat Recovery

A2. Design Verified Dwelling Unit HPWH System Information

This table reports the water heating system(s) that were specified on the registered CF1R compliance

2025 Supporting Docs LMCI & LMCV –Plumbing

Plumbing

Certificate of Compliance

- LMCC-PLB-01-E Domestic Water Heating System

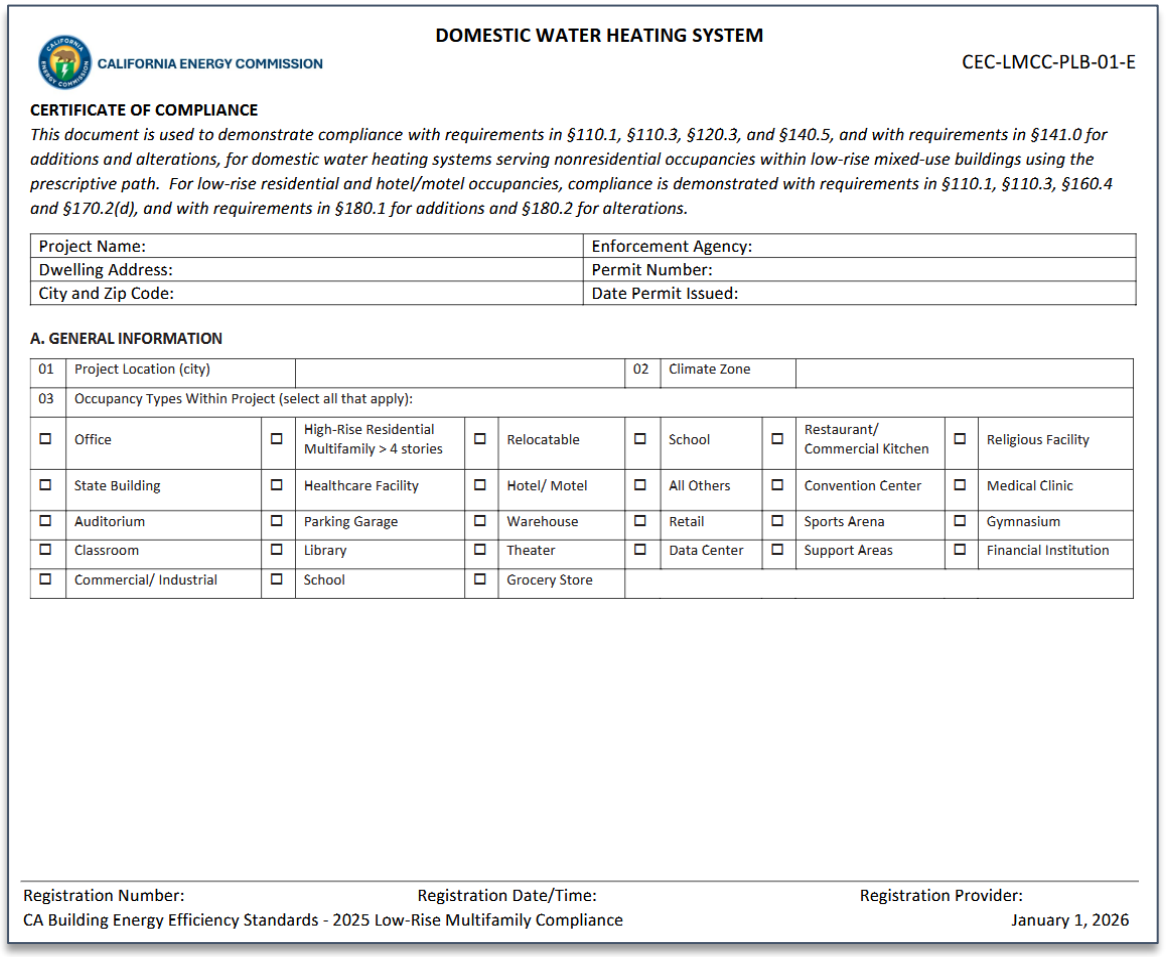
Certificates of Installation

- LMCI-PLB-E Domestic Water Heating System
- LMCI-PLB-01-E Multifamily Central Hot Water System Distribution
- LMCI-PLB-02-E Individual Dwelling Unit Hot Water System Distribution
- LMCI-PLB-21-H Verified Multifamily Central Hot Water System Distribution
- LMCI-PLB-22-H Verified Individual Dwelling Unit Hot Water System Distribution

Certificate of Verification

- LMCV-PLB-21-H Verified Multifamily Central Hot Water System Distribution
- LMCV-PLB-22-H Verified Individual Dwelling Unit Hot Water System Distribution

Reminder:
E – Enforcement Agency
H – ECC (formerly HERS)



DOMESTIC WATER HEATING SYSTEM

CALIFORNIA ENERGY COMMISSION

CEC-LMCC-PLB-01-E

CERTIFICATE OF COMPLIANCE

This document is used to demonstrate compliance with requirements in §110.1, §110.3, §120.3, and §140.5, and with requirements in §141.0 for additions and alterations, for domestic water heating systems serving nonresidential occupancies within low-rise mixed-use buildings using the prescriptive path. For low-rise residential and hotel/motel occupancies, compliance is demonstrated with requirements in §110.1, §110.3, §160.4 and §170.2(d), and with requirements in §180.1 for additions and §180.2 for alterations.

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

A. GENERAL INFORMATION

01	Project Location (city)					02	Climate Zone			
03	Occupancy Types Within Project (select all that apply):									
☐	Office	☐	High-Rise Residential Multifamily > 4 stories	☐	Relocatable	☐	School	☐	Restaurant/ Commercial Kitchen	☐ Religious Facility
☐	State Building	☐	Healthcare Facility	☐	Hotel/ Motel	☐	All Others	☐	Convention Center	☐ Medical Clinic
☐	Auditorium	☐	Parking Garage	☐	Warehouse	☐	Retail	☐	Sports Arena	☐ Gymnasium
☐	Classroom	☐	Library	☐	Theater	☐	Data Center	☐	Support Areas	☐ Financial Institution
☐	Commercial/ Industrial	☐	School	☐	Grocery Store					

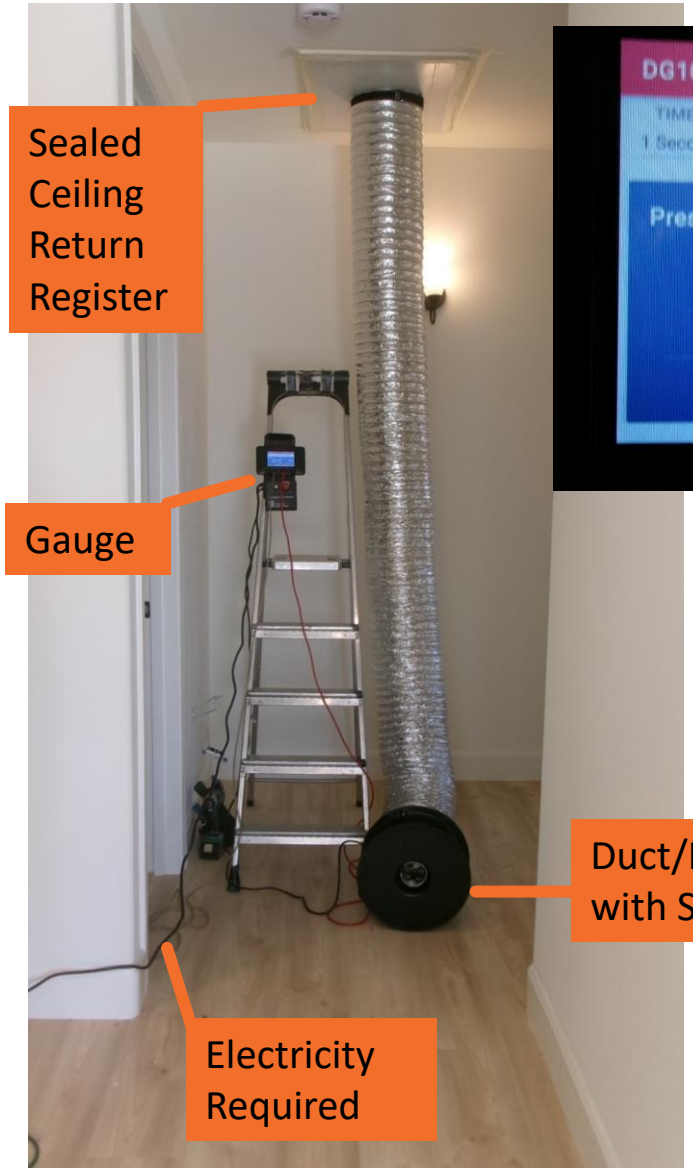
Registration Number: Registration Date/Time: Registration Provider:

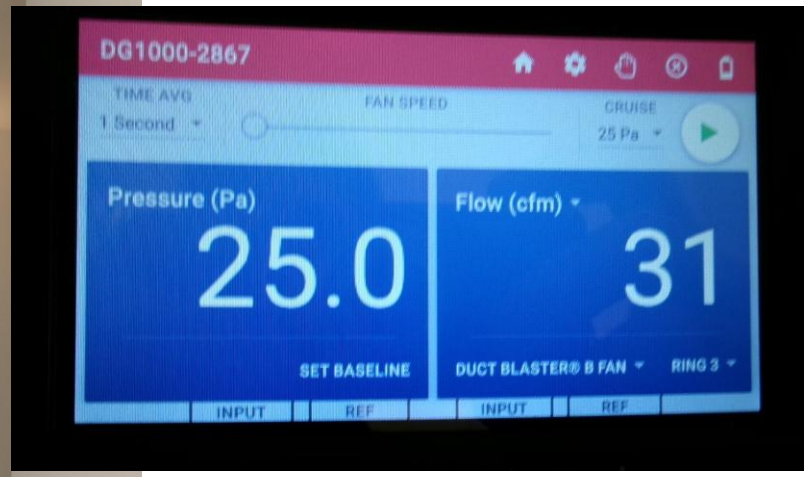
CA Building Energy Efficiency Standards - 2025 Low-Rise Multifamily Compliance January 1, 2026

HVAC –Duct Leakage Testing and other Credits

Duct Leakage Diagnostic Testing Equipment

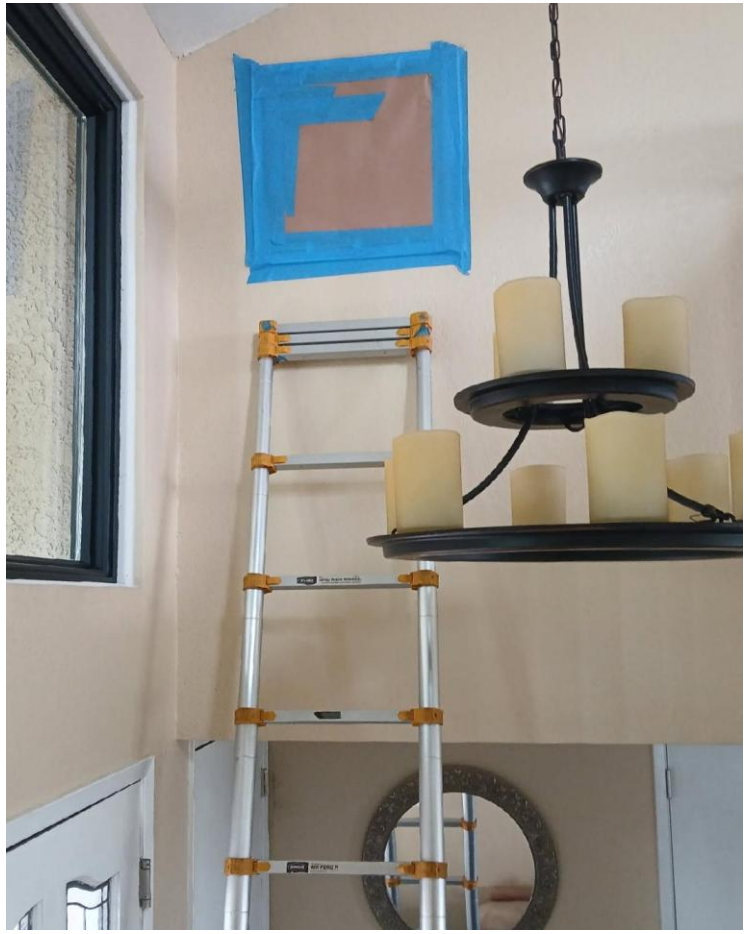
- Measure Pressure (Pa) and Airflow (cfm)
- Equipment:
  - Duct Blaster Fan Kit
  - DG1000 Gauge
  - Shows a “Return Duct Pressurization” Test
- Duct Leakage to/from:
  - Outdoors
  - Attic
  - Crawlspace





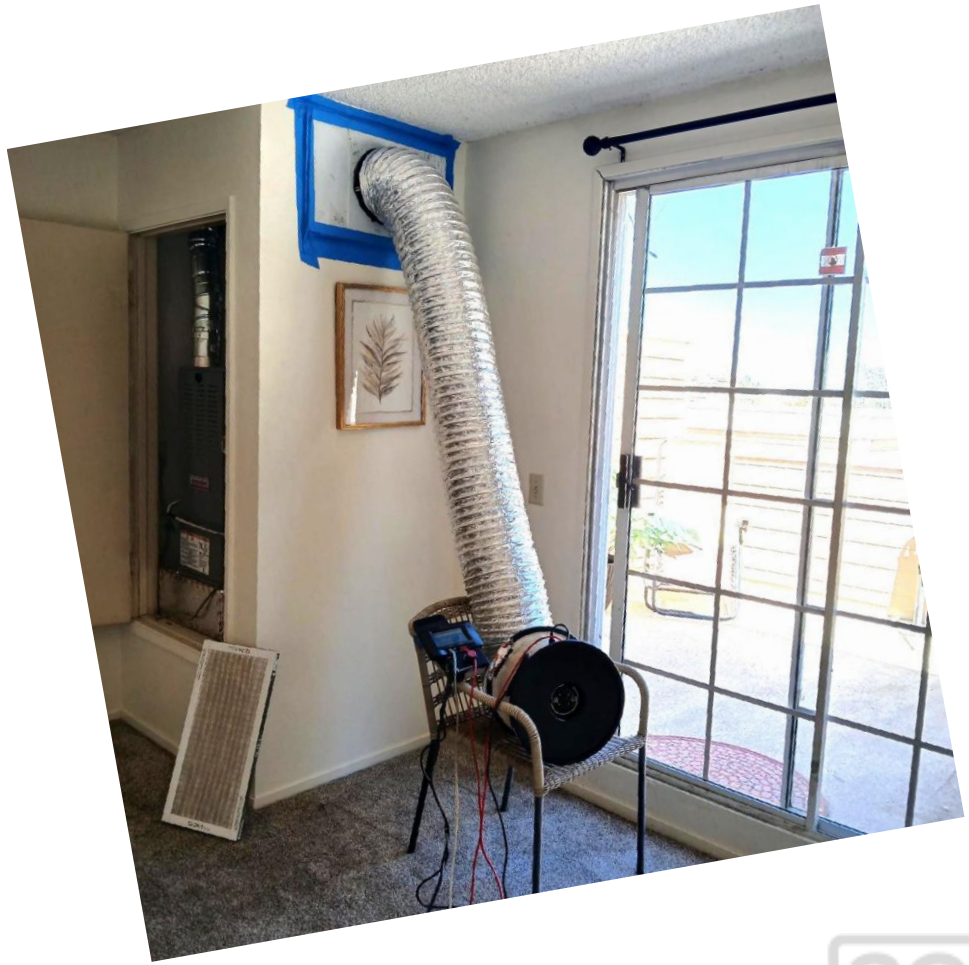
Pressure and Flow Gauge:
Test “CFM25” refers to the flow of air in cubic feet per minute at 25 Pascal air pressurization.

Duct Testing –A day in the Life of an ECC Rater…



Paul cautions, "Be prepared for anything…"

- *Climbing ladders…*
- *Taping-off duct registers…*
- *Using random furniture as props…*
- *Using specialized tools… and*
- *Recording measurements…*



Duct and HVAC Leakage Testing –MCH-20 Series

CF1R-PRF-01-E

ECC FEATURE SUMMARY

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

- Indoor air quality ventilation
- Kitchen range hood
- Minimum Airflow
- Verified EER/EER2
- Verified SEER/SEER2
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM
- Duct leakage testing
- Ducts located entirely in conditioned space confirmed by duct leakage testing

Note: These other ECC items are also triggered (MCH-01, MCH-22 and MCH-23)

Note: This also triggers (MCH-21 Duct Location)

HVAC - DISTRIBUTION SYSTEMS

01	02	03	04	05	06	07
Name	Type	Design Type	Duct Ins. R-value		Duct Location	
			Supply/Return		Supply	Return
Air Distribution System 1	Conditioned space-entirely	Non-Verified	R-8		Conditioned Zone	Conditioned Zone

ECC Work Flow:

- Triggered on CF1R
- "Kick-off" Job Site "Review" Meeting
- "Pre-Test(s)" can be performed after:
  - HVAC/Duct Sealing
- Final Duct Leakage Test

CF2R and CF3R Forms

- CF2R-MCH-20-H Duct Leakage Diagnostic Test
- CF2R-MCH-21-H Duct Location
- CF2R-MCH-22-H Space Conditioning System Fan Efficacy
- CF2R-MCH-23-H Space Conditioning System Airflow Rate
- CF3R-MCH-20-H Duct Leakage Diagnostic Test
- CF3R-MCH-21-H Duct Location
- CF3R-MCH-22-H Space Conditioning System Fan Efficacy
- CF3R-MCH-23-H Space Conditioning System Airflow Rate

Duct Leakage Diagnostic Testing
CF2R and CF3R-MCH-20-H

DUCT LEAKAGE DIAGNOSTIC TEST

CALIFORNIA ENERGY COMMISSION — CEC-CF2R-MCH-20-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by ECC Registry.

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

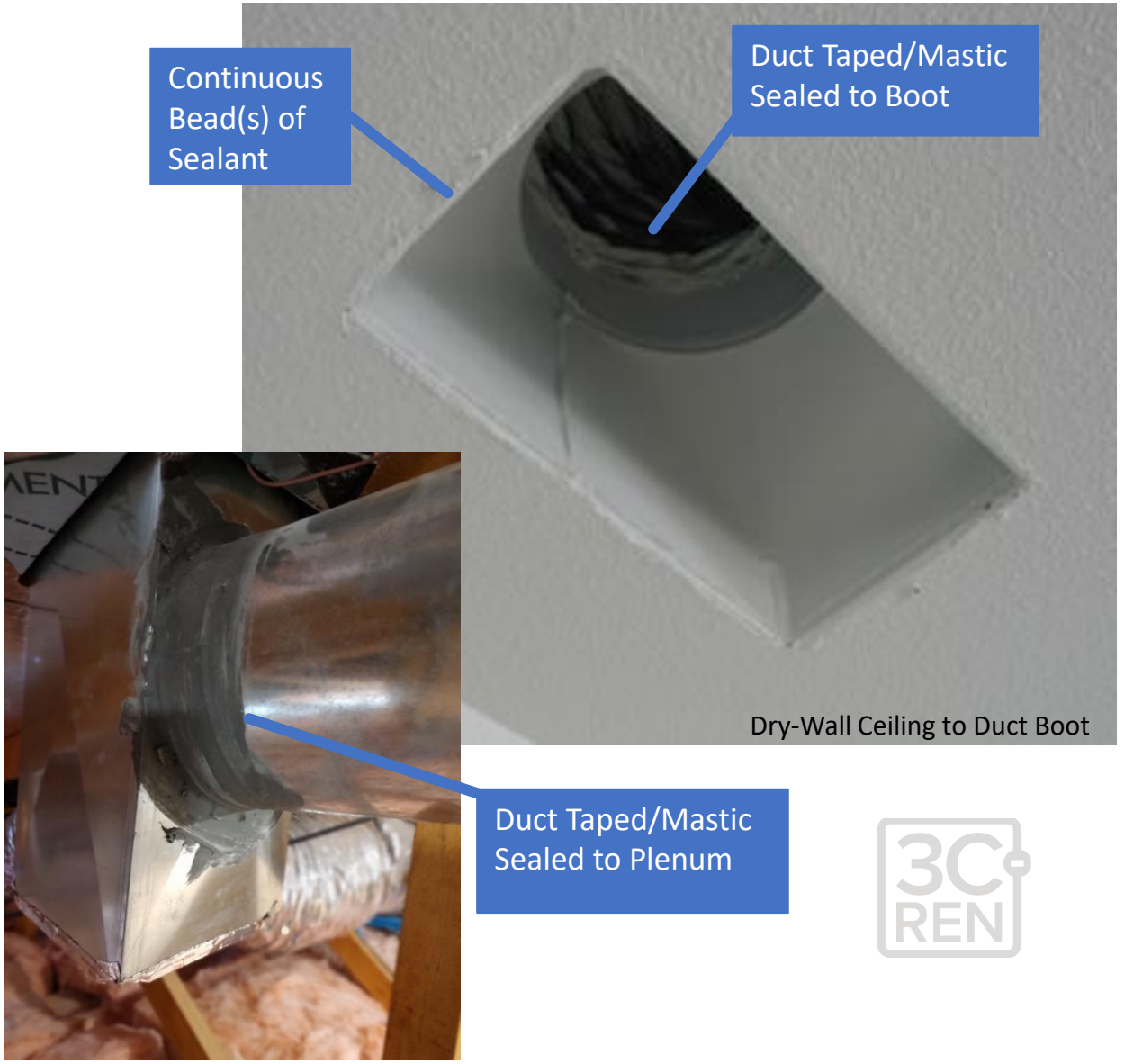
A. System Information

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Indoor Unit Name or Description of Area Served	
04	Building Type from CF1R	
05	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	
06	Verified Low Leakage Air-Handling Unit Credit from CF1R?	
07	Duct System Compliance Category	
08	Any portions of Duct Located in Garage?	
09	Is the system type Small Duct High Velocity (SDHV)?	

B1. Duct Leakage Diagnostic Test for Completely New Duct System

01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	
02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	
04	Heating Capacity (kBtu/h)	
05	Conditioned Floor Area Served by this HVAC System (ft^2)	
06	Measured AHU Airflow (cfm)	
07	Duct Leakage Test Conditions	
08	Duct Leakage Test Method	
09	Leakage Factor	
10	Calculated Target Allowable Duct Leakage Rate (cfm)	
11	Actual Duct Leakage Rate from Leakage Test Measurement	

INFORMATION AND DATA COLLECTION
ONLY. NOT VALID UNTIL REGISTERED
WITH AN ECC PROVIDER.

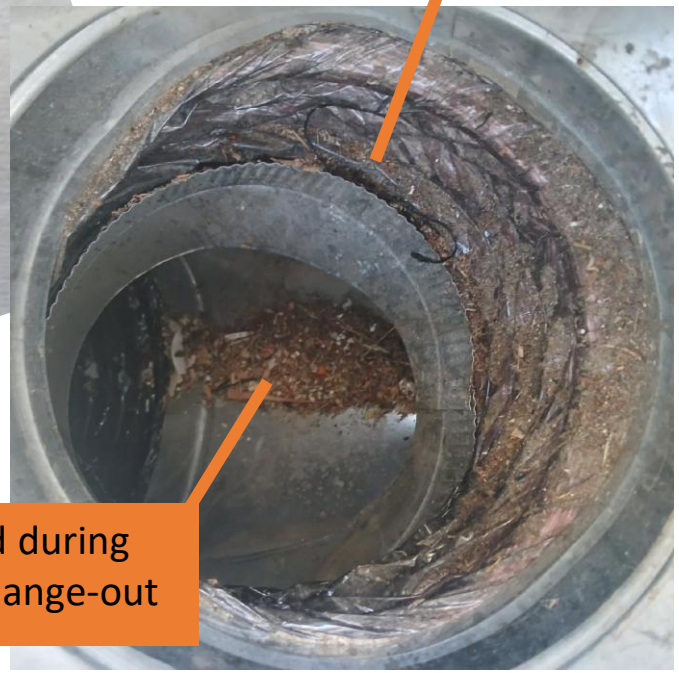


Pre-Testing Meetings –Important to Schedule

"…fear and loathing in an HVAC change-out…"

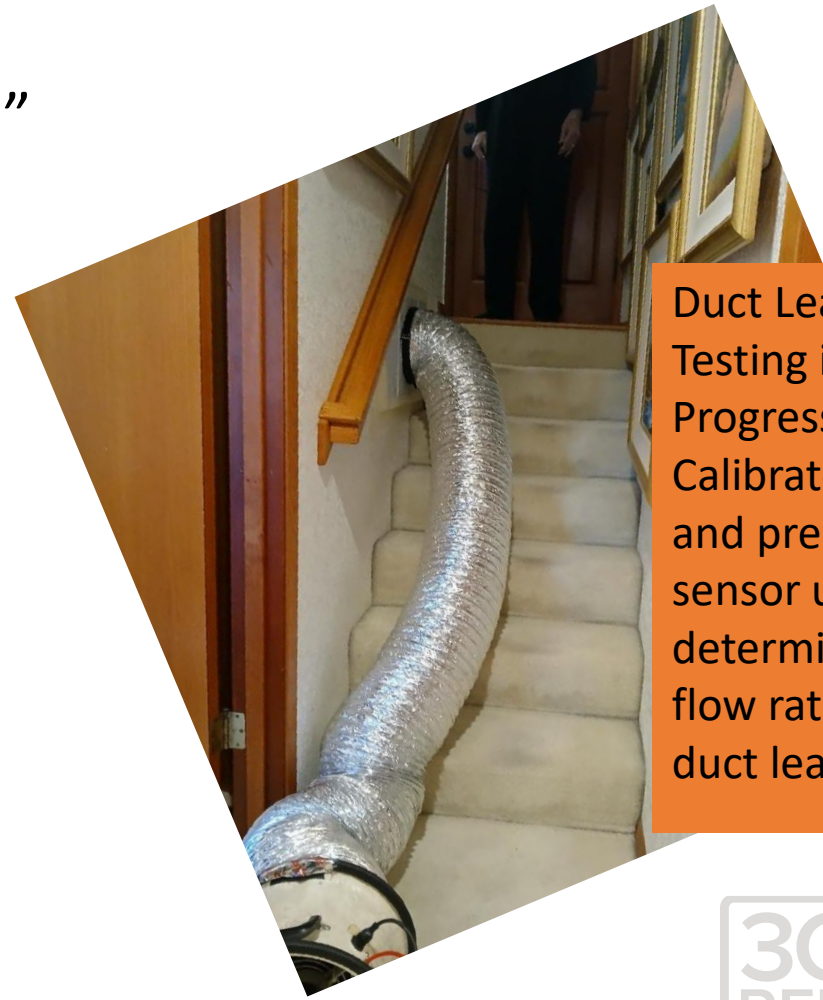


Existing duct boot is not sealed to floor



New duct was not sealed to existing boot

Register was not covered during construction remodel/change-out



Duct Leakage Testing in Progress -- Calibrated fan and pressure sensor used to determine air flow rate and duct leakage.

Gas Furnace Air-Handler and Air-Conditioning
Duct Leakage Diagnostic Test CF3R-MCH-20-H

DUCT LEAKAGE DIAGNOSTIC TEST

CALIFORNIA ENERGY COMMISSION CEC-CF3R-MCH-20-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF VERIFICATION

Note: This table completed by ECC Registry.

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

A. System Information

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Indoor Unit Name or Description of Area Served	
04	Building Type from CF1R	
05	Verified Low Leakage Ducts in Conditioned Space (VLLDCS) Credit from CF1R?	
06	Verified Low Leakage Air-Handling Unit Credit from CF1R?	
07	Duct System Compliance Category	
08	Any portions of Duct Located in Garage?	
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B1. Duct Leakage Diagnostic Test for Completely New Duct System

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02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	
04	Heating Capacity (kBtu/h)	
05	Conditioned Floor Area Served by this HVAC System (ft^2)	
06	Measured AHU Airflow (cfm)	
07	Duct Leakage Test Conditions	
08	Duct Leakage Test Method	
09	Leakage Factor	
10	Calculated Target Allowable Duct Leakage Rate (cfm)	
11	Actual Duct Leakage Rate from Leakage Test Measurement (cfm)	

INFORMATION AND DATA COLLECTION NOT VALID UNTIL REGISTERED WITH AN ECC PROVIDER.



Trane 2-Stage Gas Furnace S9X2 Series
Horizontal Attic Install with Trane "A" Coil

3C REN

Gas Furnace Air-Handler and Air-Conditioning
Duct Leakage Diagnostic Test CF3R-MCH-20-H



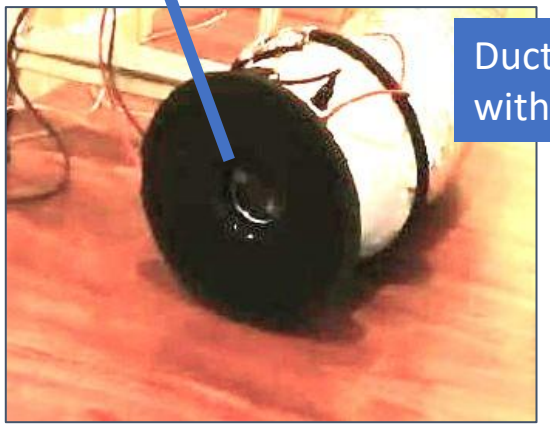
Flow and Pressure Results:
56 cubic feet per minute (cfm) at 25.0 Pascals (Pa)



Return Register/Duct – Sealed and Connected to Duct Blaster Kit

Job: HVAC change-out with ***all new duct work***. Code requires a tested 5% total air-handler and duct leakage rate.

'Ring 3' Flow Restrictor - Used for 'Tighter' Duct Systems



Duct Blaster Fan with Sensors

Gas Furnace Air-Handler with Two Returns

Space Conditioning System Fan Efficacy CF3R-MCH-22-H



Project had two returns; an additional 18” dia return duct was located near the M. Bedroom

Kill-A-Meter measures power and energy usage. Measured fan power of the HVAC air handler during test = 407 watts



Flow Hood Results Return #1



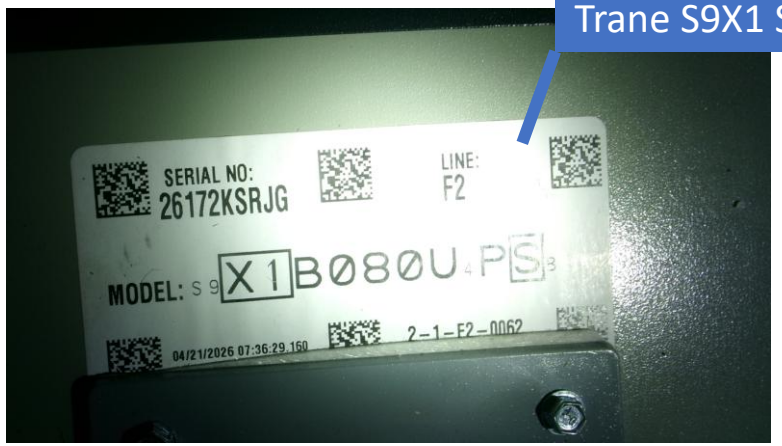
Return #2

Power and Flow Results:
407 w / 1574 cfm total = 0.26 w/cfm
Code requires a fan efficiency of 0.45 w/cfm for furnaces.
0.26 w/cfm < 0.45 w/cfm -- PASS



Flow hood measures air flow rate (cubic feet per minute) through the return register while HVAC air-handler is operating.

Gas Furnace Air-Handler and Air-Conditioning
Rated Equipment Performance Verification CF3R-MCH-26-H



Trane S9X1 Series Furnace Model No.

HERS Work Flow:
Identify and field verify that the specified (CF1R) equipment meets the type, efficiency, and air distribution parameters.



Efficiency: 96.0 % AFUE
Trane S9X1B0804PSB

AHRI CERTIFIED®
www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number : 203882599 Date : 10-13-2026 Model Status : Active

Brand Name : TRANE

Series Name : Trane S9X1

Model Number : S9X1B080U4PSB**

Rated as follows in accordance with the following test procedures and subject to verification of rating accuracy by AHRI-sponsored, independent, third party testing:

-10 CFR Part 430, Subpart B, Appendix AA-2016, Uniform Test Method for Measuring the Energy Consumption of Furnace Fans and CAN/CSA P.2-13, Test Method for Measuring the Annual Fuel Utilization Efficiency of Residential Gas Fired Furnaces and Boilers for AFUE and Output Heating Capacity

-10 CFR Part 430, Subpart B, Appendix N-2023, Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers for FER

AFUE, (%) : 96.0

Output Heating Capacity (MBTUH) : 77

Fan Energy Rating (FER) (W/1000 cfm) : 268

The following data is for reference only and is not certified by AHRI

Input Rating (MBTUH) : 80

Ef (MMBTU/yr) : 82.0

Eae including Eso(kWh/yr) : 494

PE (watts) : 57

Configuration : Horizontal, Upflow

Mobile Home? : No

Single Package Unit : No

Electronic Ignition : Yes

Electro-Mechanical Vent Damper(s) : No

Power Combustion or Power Vent : Yes

Condensing Type : Yes

†"Active" Model Status are those that an AHRI Certification Program Participant is currently producing AND selling or offering for sale; OR new models that are being marketed but are not yet being produced."Production Stopped" Model Status are those that an AHRI Certification Program Participant is no longer producing BUT is still selling or offering for sale.
Ratings that are accompanied by WAS indicate an involuntary re-rate. The new published rating is shown along with the previous (i.e. WAS) rating.

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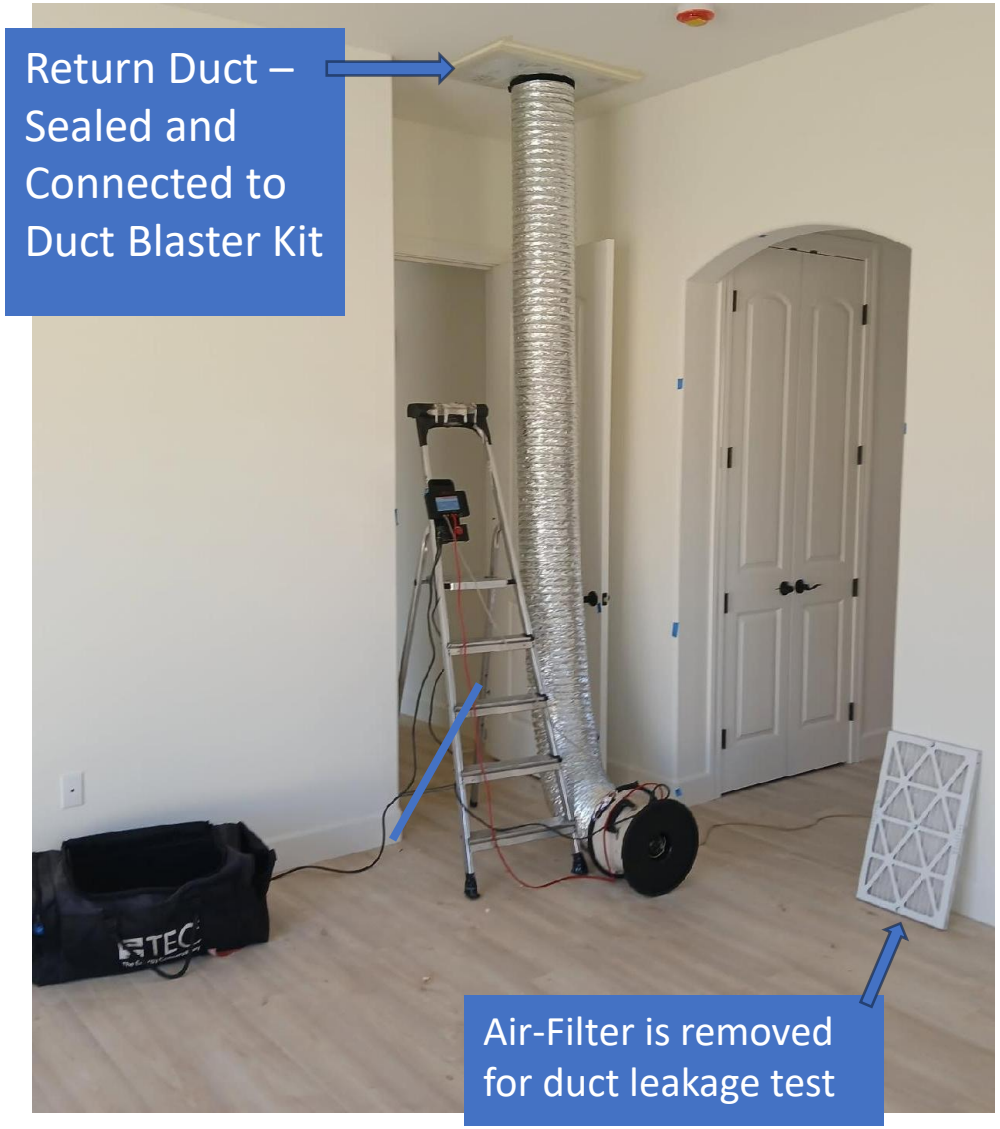
CERTIFICATE VERIFICATION
The information for the model cited on this certificate can be verified at www.ahridirectory.org, click on "Verify Certificate" link and enter the AHRI Certified Reference Number and the date on which the certificate was issued, which is listed above, and the Certificate No., which is listed at bottom right.

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we make life better™

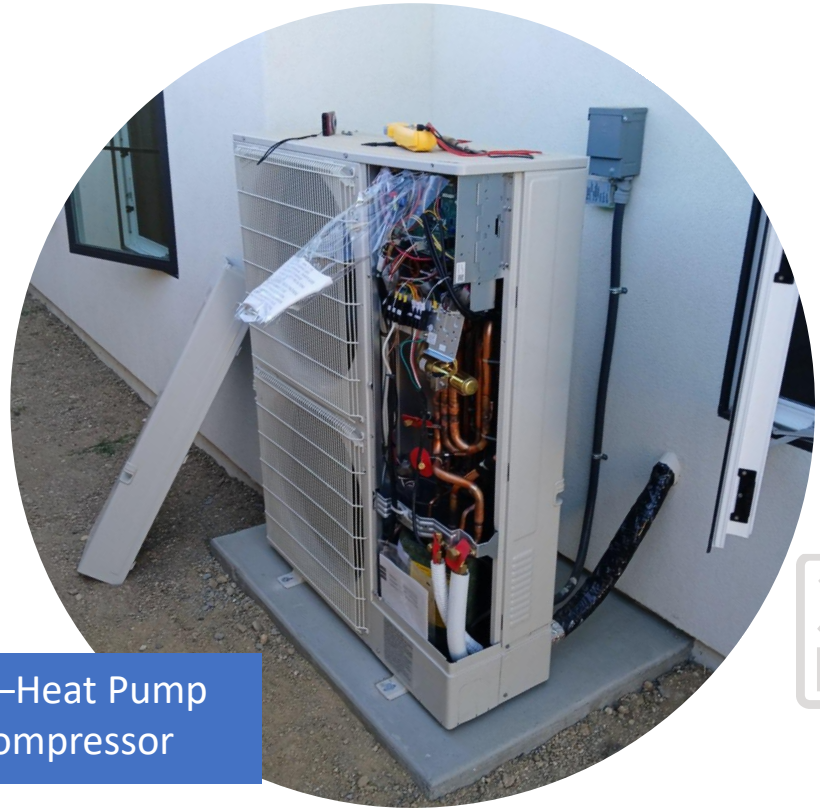
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Split System Heat Pump with Indoor Air-Handler
Duct Leakage Diagnostic Test CF3R-MCH-20-H



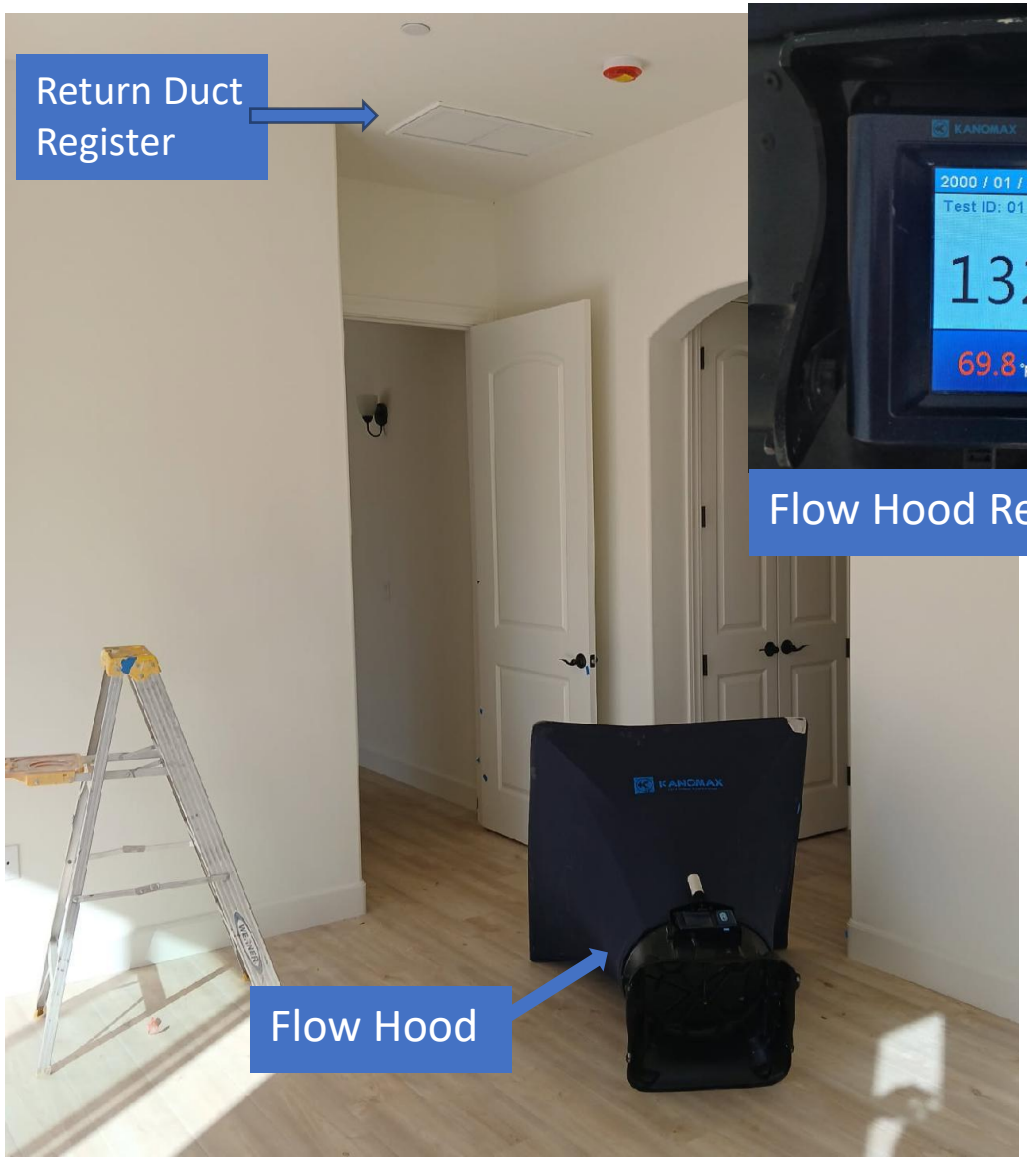


Indoor Air-Handler -Attic



Outdoor Unit –Heat Pump Condenser /Compressor

Split System Heat Pump with Indoor Air-Handler
Duct Leakage Diagnostic Test CF3R-MCH-20-H

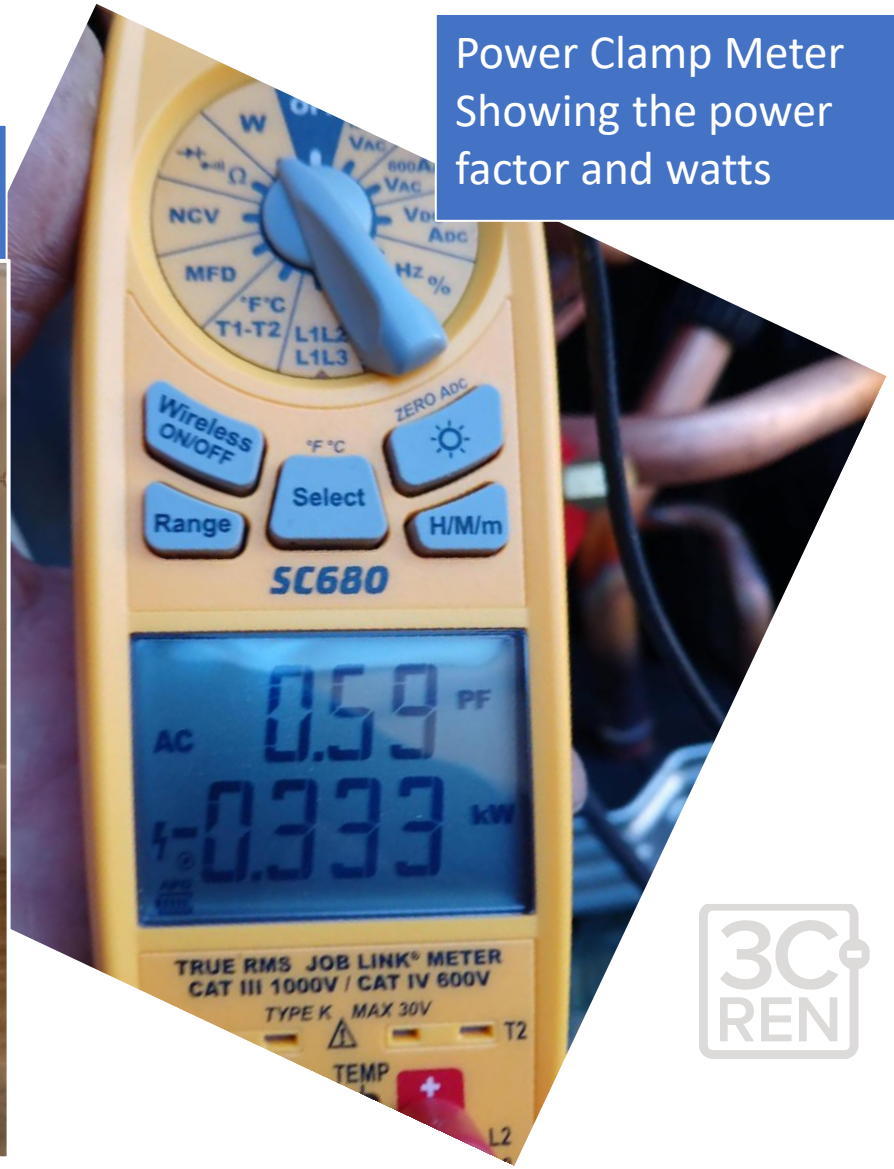


Flow Hood Results

Flow Hood in Action!



Power Clamp Meter Showing the power factor and watts



Split System Heat Pump with Indoor Air-Handler
Rated Equipment Performance Verification CF3R-MCH-26-H

Potential Eligibility for IRA Tax Credit*

AHRI CERTIFIED® www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number : 213362186 Date : 10-28-2025 Model Status : Production Stopped

AHRI Type : HRCU-A-CB (Mini-Split System: Heat Pump with Outdoor Unit-Air-Source, Ducted)

Series Name : P-Series

Outdoor Unit Brand Name : Mitsubishi Electric

Outdoor Unit Model Number : PUZ-HA36NKA*

Indoor Type : Mini-Splits (Ducted)

Indoor Model Number(s) : PEAD-A36AA9

Rated as follows in accordance with the latest edition of AHRI 210/240 – 2024, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment and subject to rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (A Full) – Single or High Stage (95F), btuh : 36000

SEER2 : 17.60

EER2 (A Full) – Single or High Stage (95F) : 12.70

Heating Capacity (H1Nom) - Multi/Variable Stage (47F) : 40000

HSPF2 (Region IV) : 9.30

Sold in? : USA, Canada

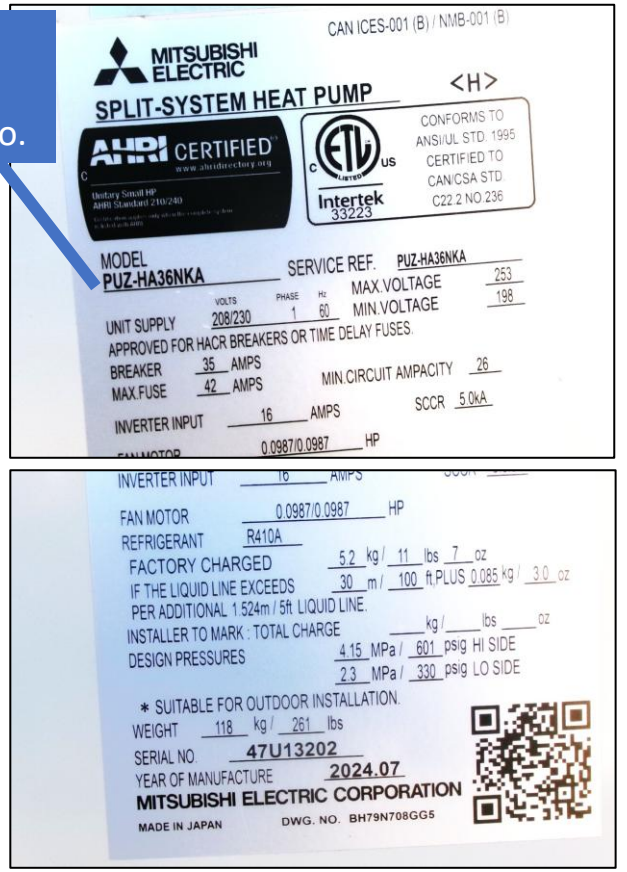
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†"Active" Model Status are those that an AHRI Certification Program Participant is currently producing AND selling or offering for sale; OR new models that are being marketed but are not yet being produced."Production Stopped" Model Status are those that an AHRI Certification Program Participant is no longer producing BUT is still selling or offering for sale.
Ratings that are accompanied by WAS indicate an involuntary re-rate. The new published rating is shown along with the previous (i.e. WAS) rating.
The Department of Energy has published updated energy efficiency metrics for central air conditioners and heat pumps. This publication reflects both the 1987 metric (SEER) and the 2023 metric (SEER2). Efficiency requirements are published at 10 C.F.R. 430.32(c). Please refer to www.AHRInet.org for more information about updated energy efficiency metrics.
*As of the date, this AHRI Certificate of Product Performance is printed, the product may be eligible for the U.S. federal tax credit based on the displayed AHRI Certified ratings meeting the Consortium for Energy Efficiency (CEE) highest efficiency tier, not including any advanced tier, of the CEE Residential Heating and Cooling Systems Initiative - Electric Equipment Specification with effective date January 1, 2025.
Disclaimer: The identification of "Potential Eligibility for IRA Tax Credit" is not intended to constitute tax or legal advice. It is for general informational purposes only. Individuals considering eligibility for the tax credit are advised to confirm eligibility with their equipment installers, tax attorneys, or preparers.
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CERTIFICATE NO.: 13406147293776181 8



Mitsubishi Electric PUZ Series Model No.



ECC Work Flow:

- **Triggered on CF1R**
- **Identify Equipment and Specifications**
- **Visual Inspection** – Verify specified equipment meets the type, efficiency, and air distribution parameters.

Refrigerant Charge – MCH-25-H Series

Paul says, "Best time to verify refrigerant charge is while looking over the shoulder of the Installing Contractor."

REFRIGERANT CHARGE VERIFICATION

CALIFORNIA ENERGY COMMISSION

CEC-CF2R-MCH-25-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF INSTALLATION

Note: This table completed by HERS Registry.

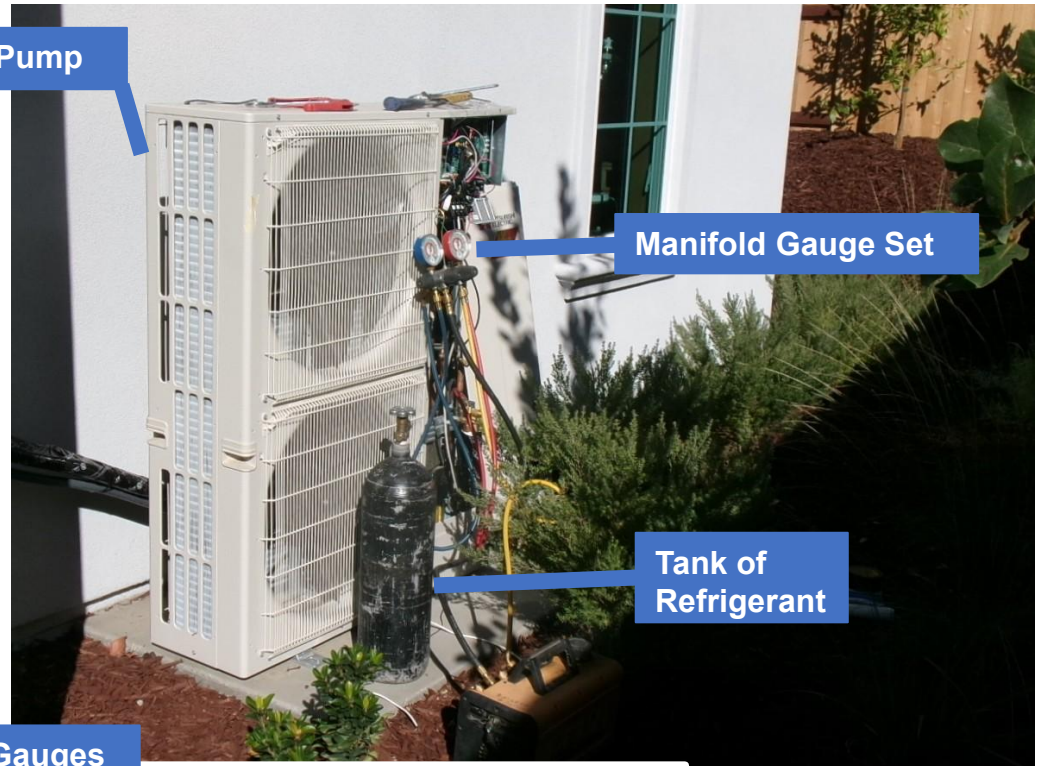
Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:

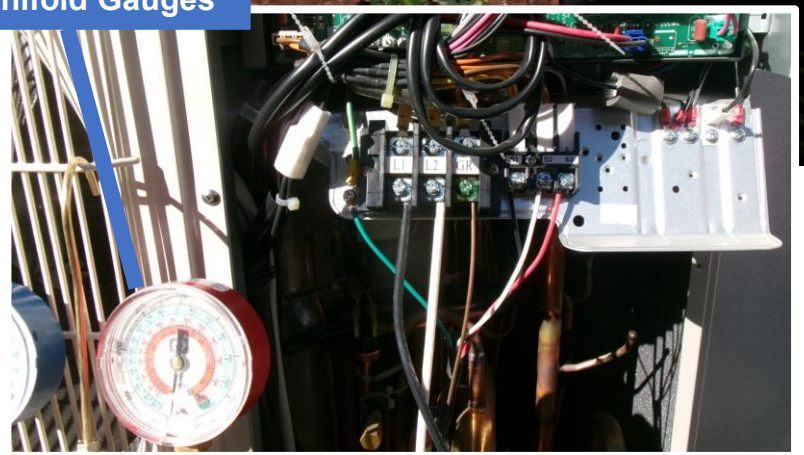
A. System Information

Each system requiring refrigerant charge verification will be documented on a separate certificate.

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Location or Area Served	
03	Condenser (or package unit) Make or Brand	
04	Condenser (or package unit) Model Number	
05	Nominal Cooling Capacity (tons) of Condenser	
06	Condenser (or package unit) Serial Number	
07	Refrigerant Type	
08	Other Refrigerant Type (if applicable)	
09	Liquid Line Filter Drier Installed According to Manufacturer's Specifications (if applicable)	
10	System Installation Type	
11	Fault Indicator Display (FID) Status (Note: Even systems with a FID must have refrigerant charge verified by installer)	
12	Is the system of a type that the minimum airflow can be verified for all indoor units using an approved measurement procedure (RA3.3 or RA3.3.3)?	

...and data collection ...until registered with a ...rovider





Compressor is energized and ready to go!

Low Leakage Ducts in Conditioned Space
CF3R-MCH-21-H (Single Fam) and LMCV-MCH-21-H (Multi-Fam)

DUCT LOCATION

CALIFORNIA ENERGY COMMISSION — CEC-CF3R-MCH-21-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

CERTIFICATE OF VERIFICATION

Note: This table completed by HERS Registry.

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

A. General Information

Note: Submit one Installation Certificate for each duct system that is taking credit for duct location.

01	SC System Identification or Name	
02	SC System Location or Area Served	
03	Indoor Unit Name or Description of Area Served	
04	Status – Less than 12 ft Ducts in Conditioned Space Performance Credit	
05	Status – Ducts Located In Conditioned Space Performance Credit	
06	Status – Duct System Located Entirely in Directly Conditioned Space, No Insulation Requirement	
07	Status – Portions of Ducts Located in Conditioned Space, R-6 Exception	

B. 12 Linear Feet or Less of Duct Located Outside of Conditioned Space - RA3.1.4.1.2

01	A visual inspection shall confirm space conditioning systems with air handlers located outside the conditioned space have 12 linear feet or less of duct located outside the conditioned space including air handler and plenum.	
02	Verification Status:	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or ☐ All N/A - This entire table is not applicable
03	Correction Notes:	

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

C. Ducts Located In Conditioned Space - RA3.1.4.1.3

01	A visual inspection shall confirm the space conditioning system is located entirely in conditioned space.	
02	Verification Status:	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or ☐ All N/A - This entire table is not applicable
03	Correction Notes:	

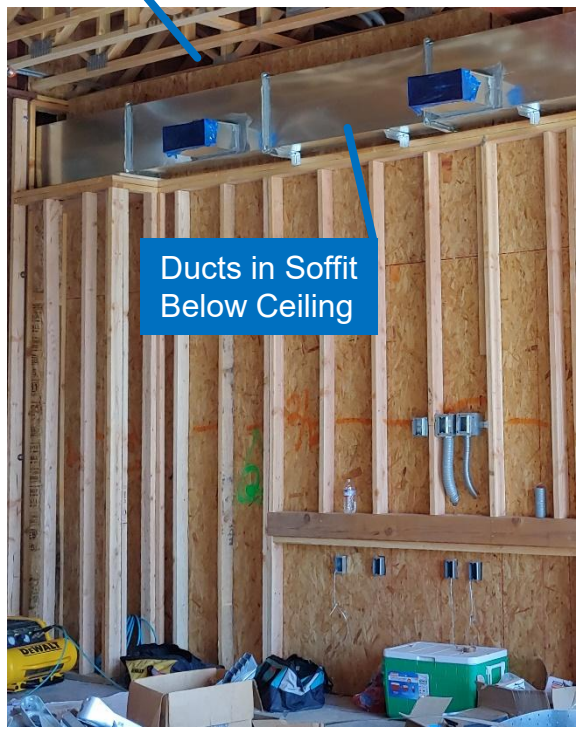
For information and data collection. Not valid until registered with a HERS provider

Benefits:

- Performance Method 'Credit' for improved energy efficiency
- Trade-Off 'Credit' can be used to off-set other energy losing features
- Ducts entirely in conditioned space - insulation not required

ECC Scope:

- Visual Inspection of Duct Location
- Testing: Duct Leakage to Outside from Fan Pressurization of Ducts



Mechanical Measures – IAQ and Exhaust Fans

Indoor Air Quality Ventilation (IAQ) and Local Exhaust– MCH-27-H and MCH 32-H

CF1R-PRF-01-E

ECC FEATURE SUMMARY
The following is a summary of the features that must be field-verified by a certified ECC Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the ECC Registry
Indoor air quality ventilation Kitchen range hood

ECC IAQ Work Flow:

- Triggered on CF1R
- Job Site Meeting “Review Requirements”
- ECC Field Verification:
  - Measure the air flow of fans

CF2R and CF3R Forms

- CF2R-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- CF3R-MCH-27-H Indoor Air Quality and Mechanical Ventilation
- CF2R-MCH-32-H Local Mechanical Exhaust
- CF3R-MCH-32-H Local Mechanical Exhaust

IAQ – Indoor Air Quality Ventilation CF2R-MCH-32-H and LMCI-MCH-32-H

LOCAL MECHANICAL EXHAUST

CALIFORNIA ENERGY COMMISSION CEC-LMCI-MCH-32-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

Table 150.0-E
Demand-Controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency

Application	Airflow
Enclosed Kitchen or Nonenclosed Kitchen	Vented range hood, including appliance-range hood combinations shall meet either the capture efficiency (CE) or the airflow rate specified in Table 150.0-G as applicable.
Enclosed Kitchen or Nonenclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm (150 L/s)
Bathroom	50 cfm (25 L/s)

Table 150.0-F
Continuous Local Ventilation Exhaust Airflow Rates

Application	Airflow
Enclosed kitchen	5 ach, based on kitchen volume
Bathroom	20 cfm (10 L/s)

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

Dwelling Unit Floor Area (ft^2)	Hood Over Electric Range	Hood Over Natural Gas Range
>1500	50% CE or 110 cfm	70% CE or 180 cfm
>1000 - 1500	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

Table 150.0-H
Prescriptive Ventilation System Duct Sizing

Fan Airflow Rating, CFM at minimum static pressure of 0.25 in. water	≤50 (25)	≤80 (40)	≤100 (50)	≤125 (60)	≤150 (70)	≤175 (85)	≤200 (95)	≤250 (120)	≤350 (165)	≤400 (190)	≤450 (210)	≤700 (330)	≤800 (380)
Duct Type	**Minimum Duct Diameter, in. (mm) [a,b]**												
Rigid duct	4[e] (100)	5 (125)	5 (125)	6 (150)	6 (150)	7 (180)	7 (180)	8 (205)	9 (230)	10 (255)	10 (255)	12 (305)	12 [d] (305)
Flex duct [c]	4 (100)	5 (125)	6 (150)	6 (150)	7 (150)	7 (180)	8 (205)	8 (205)	9 (230)	10 (255)	NP	NP	NP

a. For noncircular ducts, calculate the diameter as four times the cross-sectional area divided by the perimeter.
b. NP = application of the prescriptive table is not permitted for this scenario.

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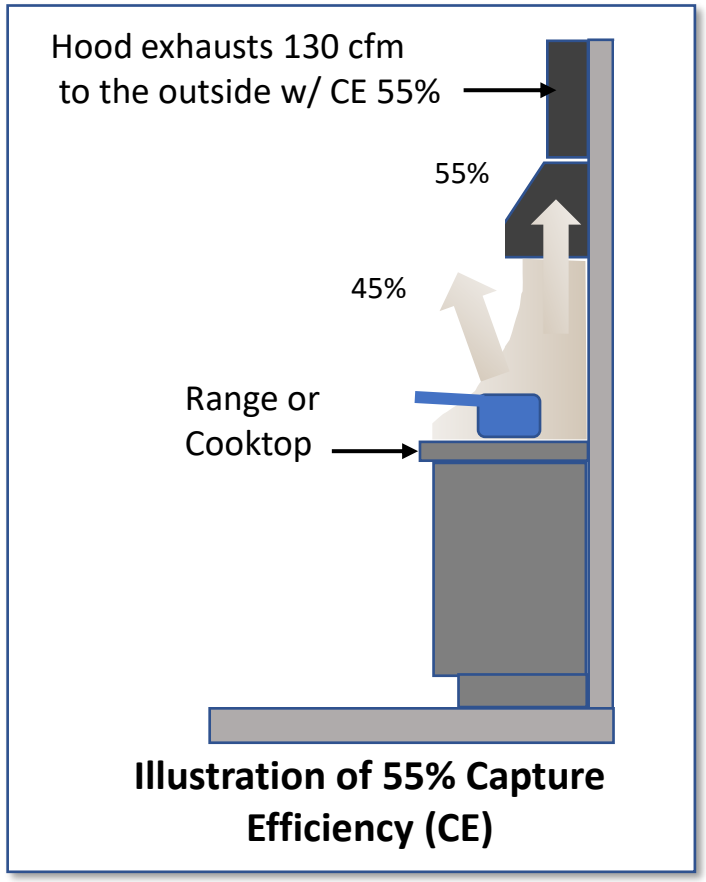


Illustration of 55% Capture Efficiency (CE)

Kitchen Exhaust System CF3R-MCH32-H

CALIFORNIA ENERGY COMMISSION

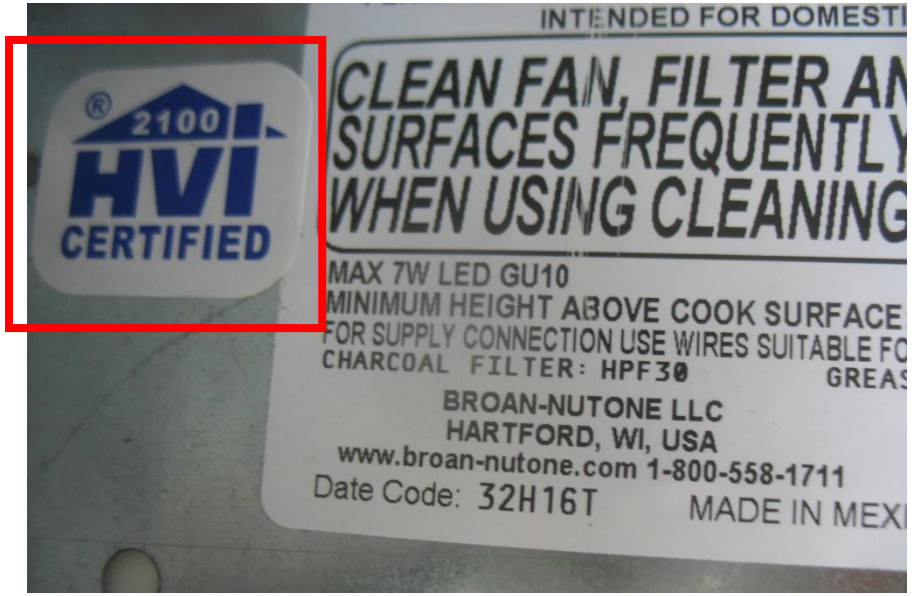
LOCAL MECHANICAL EXHAUST

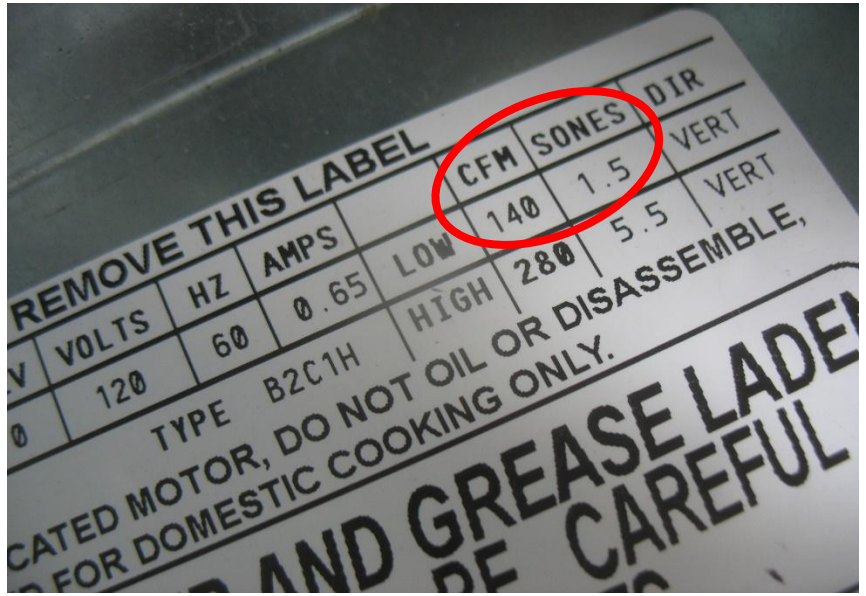
CF3R-MCH-32-H

(Page 2 of 3)

B. Kitchen Exhaust System

01	02	03	04	05	06	07	08	09	10	11	12	13
System Name	Manufacturer Name	System Type	HVI or AHAM Directory Listed Model Number	HVI or AHAM Directory Listed Rated Airflow	HVI or AHAM Directory Listed Sound Rating	Minimum Airflow (defaults to rated airflow)	Operation Schedule	Method of Compliance	Required Minimum Ventilation Rate (if demand controlled)	Exception to Maximum Sound Rating	Compliance Statement for Airflow	Compliance Statement for Sound
Kitchen Hood	Broan-Nutone	Vented Range Hood	DNR	140	1.5	140	Demand Control	Airflow	110	3 sone	Complies	Complies





Note:
CFM – Airflow
SONES – Sound Rating

3C REN

IAQ – Indoor Air Quality Ventilation CF2R-MCH-32-H and LMCI-MCH-32-H

LOCAL MECHANICAL EXHAUST

CALIFORNIA ENERGY COMMISSION

CEC-LMCI-MCH-32-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

Table 150.0-E
Demand-Controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency

Application	Airflow
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Enclosed Kitchen or Nonenclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm (150 L/s)
Bathroom	50 cfm (25 L/s)

Table 150.0-F
Continuous Local Ventilation Exhaust Airflow Rates

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Kitchen Range Hood Airflow Rates (cfm) and ASTM E3087 Capture Efficiency (CE) Ratings According to Dwelling Unit Floor Area and Kitchen Range Fuel Type

Dwelling Unit Floor Area (ft^2)	Hood Over Electric Range	Hood Over Natural Gas Range
>1500	50% CE or 110 cfm	70% CE or 180 cfm
>1000 - 1500	50% CE or 110 cfm	80% CE or 250 cfm





Bathroom Exhaust
Flow Hood and Guage

IAQ – Indoor Air Quality Ventilation CF3R-MCH-27-H

Indoor Air Quality and Mechanical Ventilation

CALIFORNIA ENERGY COMMISSION CEC-CF3R-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

C. Ventilation - Total Ventilation Rate

A mechanical supply system, exhaust system, or combination thereof shall provide whole-dwelling ventilation with outdoor air each hour at no less than the rate in 150.0(o)1Ci

01	Total Required Ventilation rate, (Q_{tot})	
02	Enclosure Leakage Rate (Q_{sc})	
03	Effective Annual Average Infiltration Rate (Q_{inf})	
04	Total Exterior Envelope Surface Area	
05	Unshared Exterior Envelope Surface Area (exclude surface areas attached to garages or other dwelling units)	
06	Required Mechanical Ventilation Rate (Q_{fan})	

D. Installed Ventilation - Total Ventilation Rate

A mechanical supply system, exhaust system, or combination thereof shall provide whole-dwelling ventilation with outdoor air each hour at no less than the rate in 150.0(o)1Ci

01	02	03	04	05
Fan Name	Fan Location	Runtime (Min/Hr)	Installed Mechanical Ventilation Rate (CFM)	Equivalent Continuous Ventilation (CFM)
06	Total Installed Equivalent Continuous Ventilation (CFM)			

E. HRV or ERV Serving Individual Dwelling Unit Information

Balanced ventilation systems shall comply with appropriate requirements in 150.0(o)2C.

01	02	03
Manufacturer Make	Manufacturer Model Number	Fan Efficacy Performance Rating (W/CFM)

F. Fault Indicator Display Installation Verification

Qualification Requirements for Ventilation System Fault Indicator Displays are detailed in in Appendix JA17.

01	FID Manufacturer Name/Make	
03	The display module is mounted adjacent to the system thermostat.	
04	The manufacturer has certified to the Energy Commission that the FID model meets the requirements of Reference Joint Appendix JA17 (make and model found on CEC list of approved FID devices).	
05	The system has operated for at least 15 minutes and the FID reports that the system is operating within acceptable parameters.	

INFORMATION AND DATA COLLECTION
DO NOT VALIDATED UNTIL REGISTERED
WITH AN ECC PROVIDER.

Duct System 'Home Runs' to the Heat Exchanger and Fan Unit





Heat Exchanger and Fan Unit



ERV / HRV Balanced Ventilation Example
ERV = Energy Recovery Ventilation
HRV = Heat Recovery Ventilation

Indoor Air Quality and Mechanical Ventilation for Low-rise Multifamily LMCI-MCH-27-H

INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CALIFORNIA ENERGY COMMISSION CEC-LMCI-MCH-27-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

E. Additional Envelope Requirements

01	Envelope Leakage	

F. Additional Central Ventilation System Balancing Requirements

01	Maximum Ventilation Flow (CFM)	

G. Requirements for balanced and supply only ventilation systems (160.0(b)2Axi)

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

Balanced and supply ventilation component accessibility. Balanced and supply ventilation systems shall meet the following requirements for accessibility:

01	IAQ filter and HRV/ERV accessibility. System air filters and HRV/ERV heat/energy recovery cores shall be located such that they are accessible for service from within occupiable spaces, basements, garages, balconies, mechanical closets or accessible rooftops. Filters and heat/energy recovery cores behind access panels, access doors, or grilles located no more than 10 feet above a walking surface inside a space specified above comply with this requirement. **Exception to Section 160.2(b)2Axia:** Systems that require servicing from inside the attic shall have the following: 1. A Fault Indicator Display (FID) meeting the requirements of Reference Appendix JA17; and 2. An attic access door located in a wall or, where at integrated ladder; and 3. A walkway from the attic access door to the HRV/
02	IAQ system component accessibility. Fans, motors, heat exchang California Mechanical Code 304.0 accessibility of service.

H. Fault Indicator Display

Qualification Requirements for Ventilation System Fa

01	FID Manufacturer Name/Make
02	FID Model Number

04	**7.4 Exhaust Ducts.** 7.4.1 **Multiple Exhaust Fans Using One Duct.** Exhaust fans in separate dwelling units shall not share a common exhaust duct. If more than one of the exhaust fans in a single dwelling unit shares a common exhaust duct, each fan shall be equipped with a backdraft damper to prevent the recirculation of exhaust air from one room to another through the exhaust ducting system. 7.4.2 **Single Exhaust Fan Ducted to Multiple Exhaust Inlets.** Where exhaust inlets are commonly ducted across multiple dwelling units, one or more exhaust fans located downstream of the exhaust inlets shall be designed and intended to run continuously, or a system of one or more backdraft dampers shall be installed to isolate each dwelling unit from the common duct when the fan is not running.
05	**7.5 Supply Ducts.** Where supply outlets are commonly ducted across multiple dwelling units, one or more supply fans located upstream of all the supply outlets shall be designed and intended to run continuously, or a system of one or more backdraft dampers shall be installed to isolate each dwelling unit from the common duct when the fan is not running.

Note:
Differences for exhaust ducts include backdraft dampers and air sealing to stop air movement between dwellings.



2025 Update: Mechanical IAQ Ventilation

Outside air (OA) ventilation and testing:

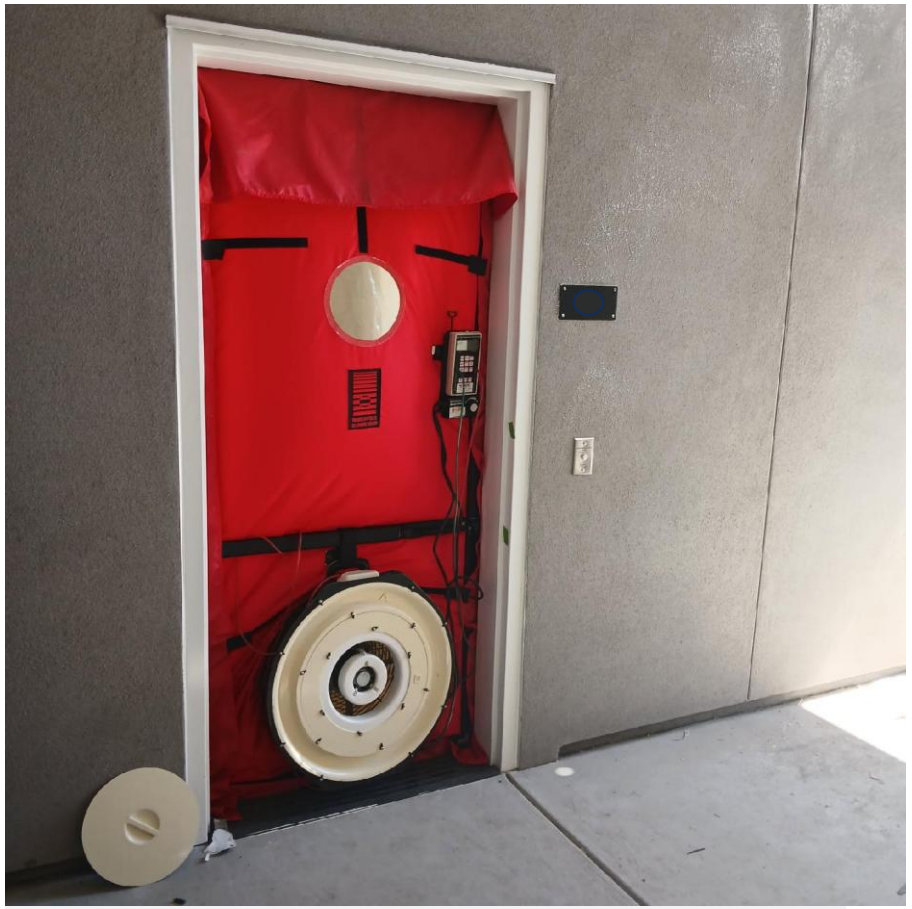
- Balanced Ventilation, or
- Supply Only Ventilation,

and

- Compartmentalization Testing – ECC-Rater

Note:
For ***new construction,*** exhaust only IAQ ventilation is **no longer an option**.

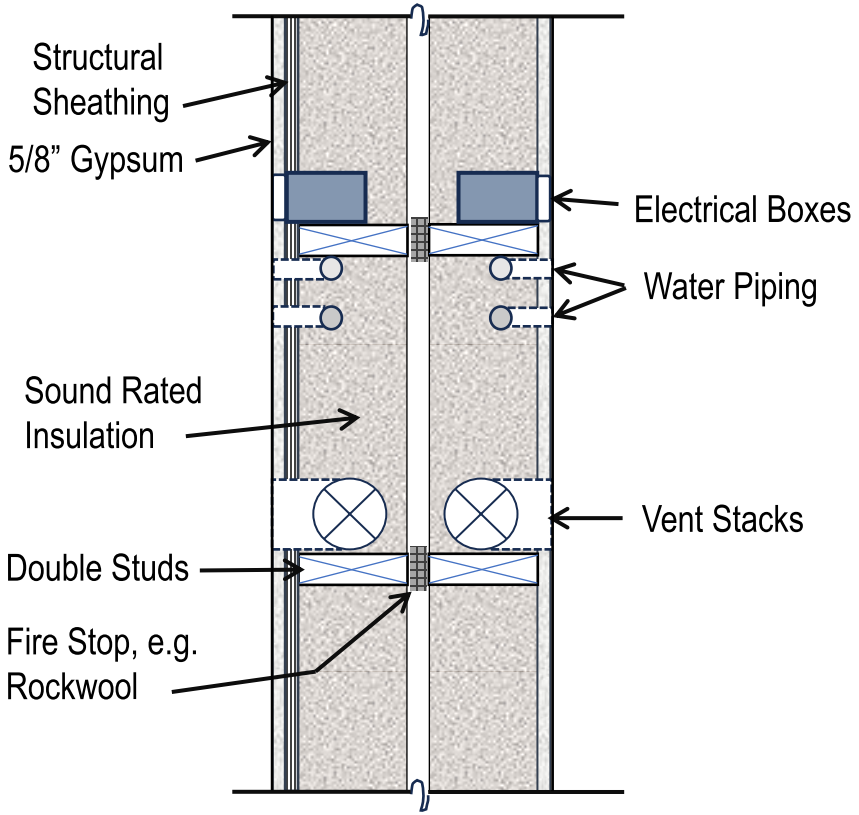
For **additions**, balanced, supply or **exhaust only** IAQ ventilation remains **allowable**.



Compartmentalization Testing,
i.e. Blower Door Testing

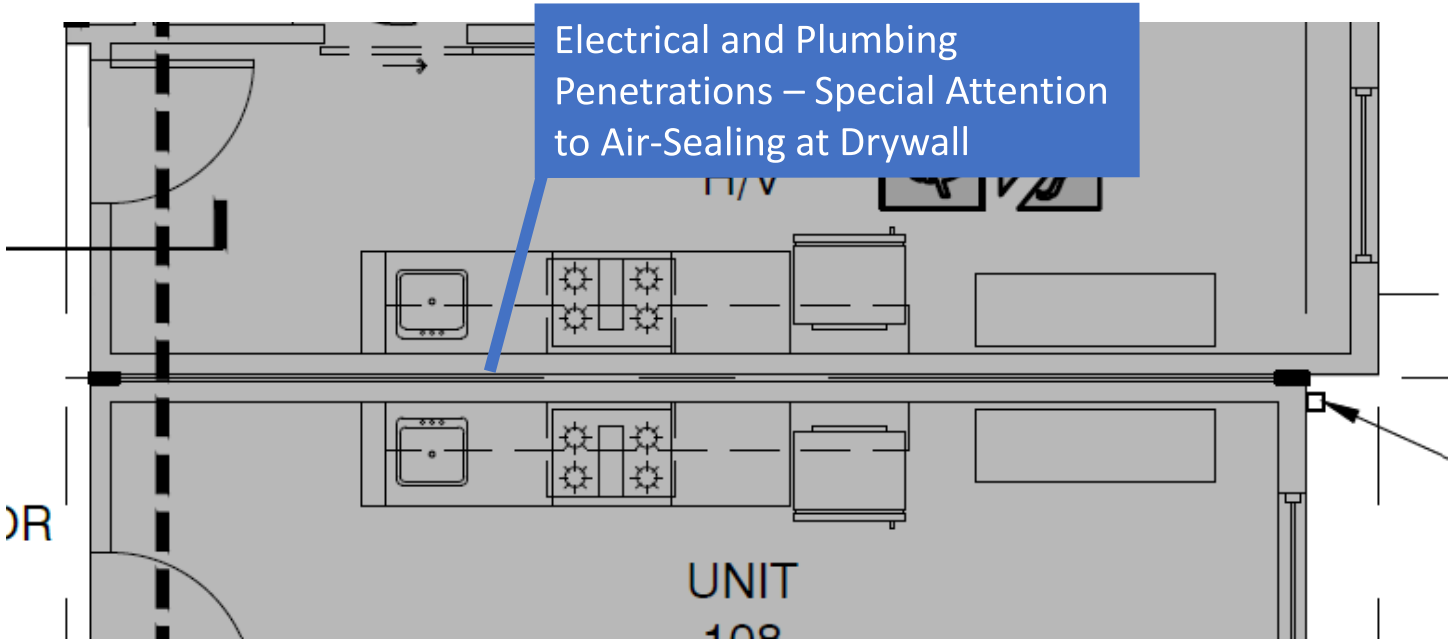
Air-Sealing Party-Walls and Shared Floor/Ceilings

Multifamily Party Wall –Looking Down



Most details are focused on sound classification ratings and "fire stopping" material between the studs, rather than air-sealing.

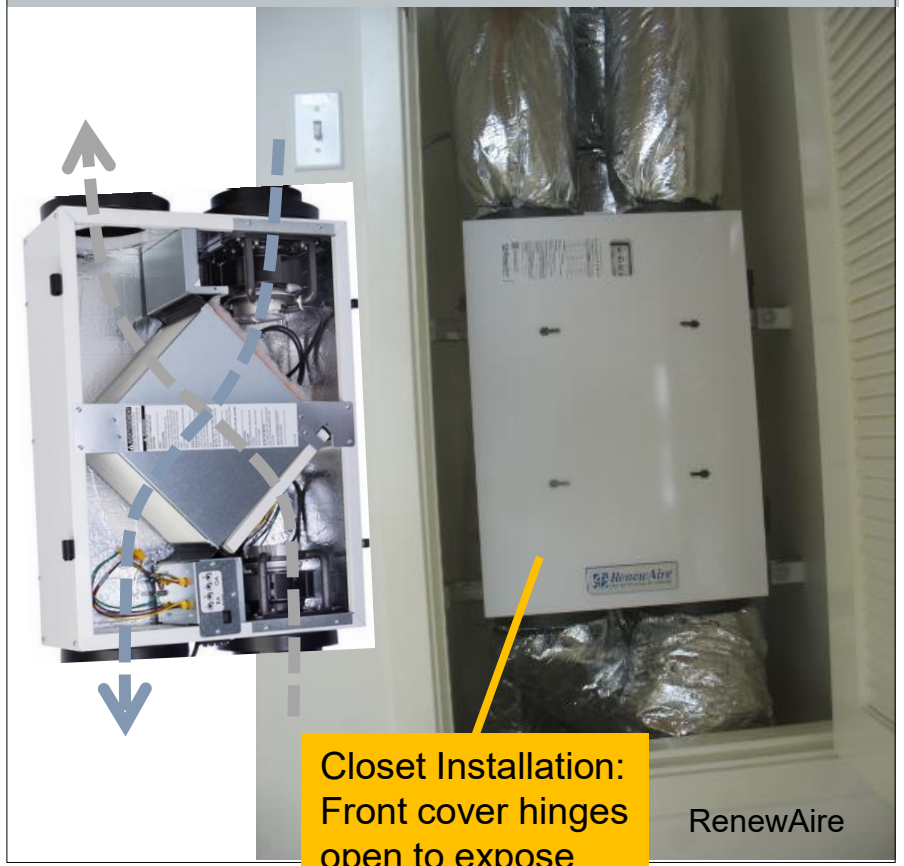
Multifamily Party Walls



"…don't forget to air-seal at the bottom plate and the top plates too!" --P.D., ECC Rater

Balanced Ventilation –Component Access

Accessible for Maintenance



Closet Installation: Front cover hinges open to expose Air Filters and Core ERV/HRV Filter

RenewAire

Fault Diagnostics

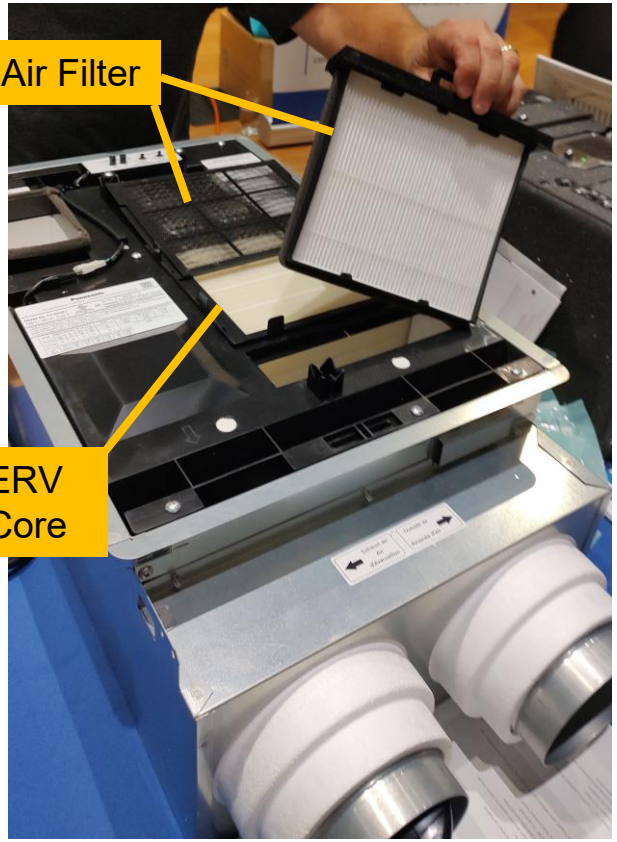


Fault Diagnostics

Fault Indicator Display (FID)



Broan AI Series



Panasonic ERV

2025 Update: Balance Ventilation

xi. **Balanced and supply ventilation component accessibility**. Balanced and supply ventilation systems shall meet the following requirements for accessibility:

a. **IAQ filter and HRV/ERV accessibility**. System air filters and HRV/ERV heat/energy recovery cores shall be located such that they are accessible for service from within occupiable spaces, basements, garages, balconies, mechanical closets or accessible rooftops. Filters and heat/energy recovery cores behind access panels, access doors, or grilles located no more than 10 feet above a walking surface inside a space specified above comply with this requirement.

Exception to Section 160.2(b)2Axia: Systems that require servicing from inside the attic shall have the following:

1. **Fault Indicator Display** (FID) meeting the requirements of Reference Appendix JA 17; and
2. **An attic access door** located in a wall or, where attic access is provided through a ceiling, an attic access hatch that includes an integrated ladder; and
3. **A walkway** from the attic access door to the HRV/ERV.

b. **IAQ system component accessibility**. Fans, motors, heat exchangers, filters and recovery cores shall meet all applicable requirements of California Mechanical Code 304.0 accessibility of service.

Plumbing –Hot Water Distribution

Domestic Hot Water Distribution–Mandatory, Credit or Penalty?

Excerpt from the ACM:

www.energy.ca.gov/publications/2026/2025-alternative-calculation-method-reference-manual

APPENDIX B — Water Heating Calculation Method

Table B-2: Distribution System Multipliers Within a Dwelling Unit With One or More Water Heaters

Distribution System Types	Assigned Distribution System Multiplier (ADSM)	System Types 1 and 2	System Type 3 and 4
No HERS Inspection Required			
Trunk and Branch -Standard (STD)	1.0	Yes	Yes
Central Parallel Piping (PP)	1.10	Yes	
Point of Use (POU)	0.30	Yes	
Recirculation: Nondemand Control Options (R-ND)	9.80*	Yes	
Recirculation with Manual Demand Control (R-DRmc)	1.75*	Yes	
Recirculation with Motion Sensor Demand Control (R-DRsc)	2.60*	Yes	
Optional Cases: HERS Inspection Required			
Pipe Insulation (PIC-H)	0.85	Yes	Yes
Central Parallel Piping with 5' maximum length (PP-H)	1.00	Yes	
Compact Design (CHWDS-H)	0.70	Yes	
Recirculation with Manual Demand Control (R-DRmc-H)	1.60*	Yes	
Recirculation with Motion Sensor Demand Control (RDRsc-H)	2.40*	Yes	

***Recirculation ADSMs reflect the effect of reduced hot water consumption associated with recirculation systems.**

Multi-Family

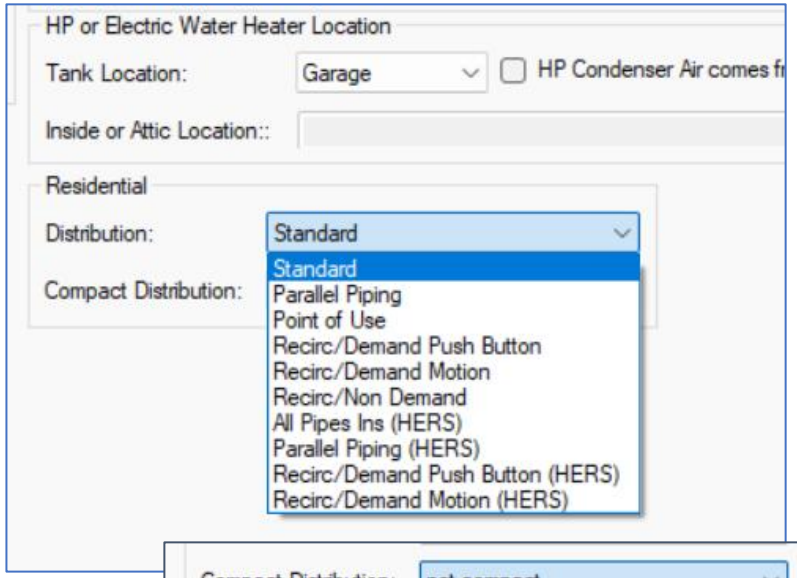
Single Family

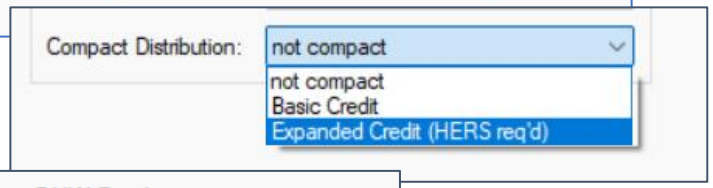
Compact *Expanded* HERS Credit (CHWDS-H-EX) ADSM is 0.60 +/-.

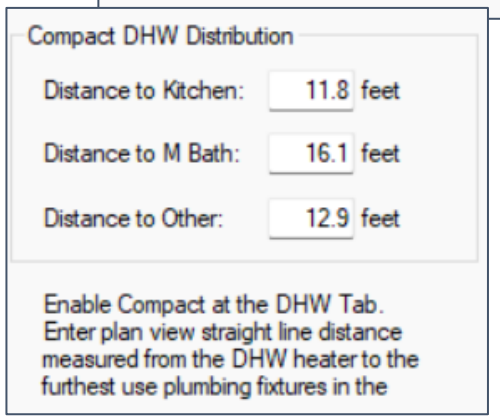
Reminder:
An Assigned Distribution System Multiplier (ADSM)

- Equal to 1 is neutral.
- Less than 1 is a credit.
- More than 1 is a penalty.

Screen-Shots of EnergyPro Inputs:







JA13 Compliant Water Heater Credit

Excerpt from the ACM:

Table 26: JA13 HPWH Basic Control Credit

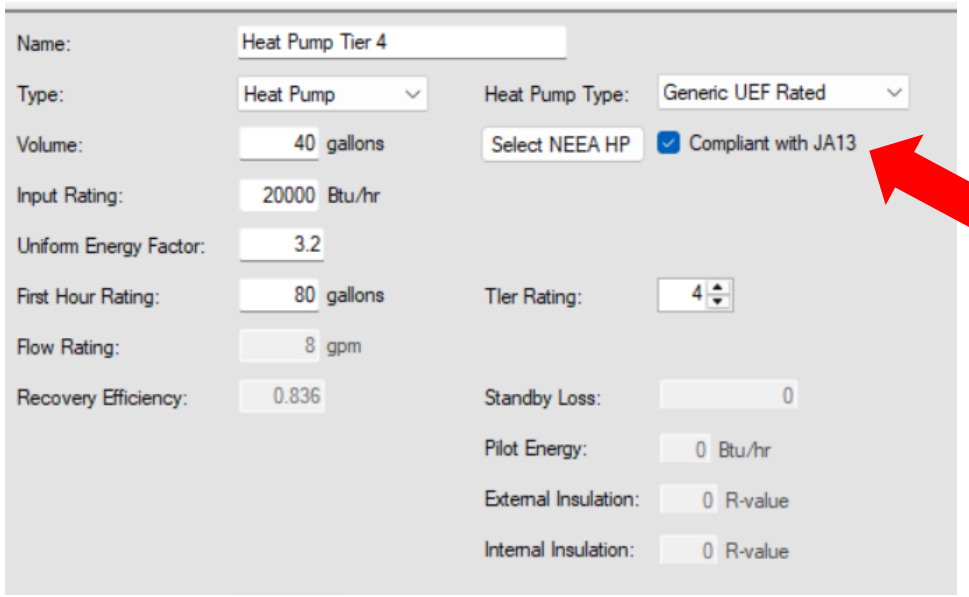
Climate Zone	JA13 Credit
1	6.7%
2	3.7%
3	7.6%
4	4.0%
5	8.5%
6	6.8%
7	8.8%
8	4.4%
9	4.4%
10	4.4%
11	4.2%
12	4.7%
13	8.0%
14	3.1%
15	8.2%
16	22.7%

Excerpt from JA13.2.1:

Heat Pump Water Heater Demand Management System
The primary function of the System is to interface with the HPWH to serve the users' domestic hot water needs and provide daily load shifting, as applicable, for the purpose of user bill reductions, maximized solar self-utilization, and grid harmonization.

Note:
A list of JA13 Certified HPWH can be found on the CEC website at www.energy.ca.gov/media/4490

Screen-Shot of EnergyPro DHW Input:



CF1R-PRF – HPWH Outdoor Location

REQUIRED SPECIAL FEATURES
The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.
• Solar Electric Generation Systems / Solar PV System requirements for newly constructed residential buildings are suspended per Executive Order N-29-25 • Indoor air quality, balanced fan • IAQ Ventilation System: as low as 0.14 W/CFM • IAQ Ventilation System Heat Recovery: minimum 60 SRE and 60 ASRE • IAQ Ventilation System: supply outside air inlet, filter, and H/ERV cores accessible per RACM Reference Manual • Floor has high level of insulation Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed One or more heat pump water heaters have been modeled as demand response compatible



WATER HEATERS - HEAT PUMP									
01	02	03	04	05	06	07	08	09	10
Name	# of Units	Tank Vol. (gal)	NEEA Heat Pump Brand	NEEA Heat Pump Model	Tank Location	Duct Inlet Air Source	Duct Outlet Air Source	UEF	JA13 Compliant
HPWH	1	80	Rheem	RheemPROPH80 T2RH40015	Outside	Outside	Outside	n/a	☒



Who Confirms NEEA Model, HPWH Location, and JA13 Compliant?

CF2R-PLB-02 – HPWH Mandatory Measures

SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION

CEC-CF2R-PLB-02-E

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

F. Mandatory Measures for Single Dwelling Systems

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

01	Equipment shall meet the applicable requirements of the Appliance Efficiency Regulations (Section 110.3(b)1).
02	Unfired storage tanks are insulated with an external R-3.5 or combination of R-16 internal and external Insulation. (Section 110.3(c)3).
	Domestic hot water piping insulation requirements (Section 150(J)):
	• All domestic hot water piping shall be insulated as specified in Section 609.12 of the California Plumbing Code. Insulation buried
05	For Air-Source Heat Pump Water Heaters (HPWH), the following shall be met (Section 110.3(c)7) A. Backup heat is required when inlet air is unconditioned, unless the compressor cutout cut-off temperature is below the Heating Winter Median of Extreme. Backup heat may be internal or external to the HPWH B. Meet one of the ventilation requirements below. Minimum volume and opening size requirements shall be the sum of all HPWHs installed within the same space. Compressor capacity shall be determined using AHRI 540 Table 4 reference conditions for refrigeration with the "High" rating test point: a. Installed using a method provided by the manufacturer to meet or exceed the level of performance provided by the ventilation requirements of Section 110.3(c)7B2 through Section 110.3(c)B4. b. For HPWH installation without ducts, the installation space shall have a volume not less than the greater of 100 cubic feet per kBtu per hour of compressor capacity, or the minimum volume provided by the manufacturer for this method; or c. For HPWH installation without ducts, the installation space shall be vented to a communicating space via permanent openings, according to the following requirements: i. Communicating space shall meet the minimum volume of Section 110.3(c)7B12 above, minus the volume of the HPWH installation space; and ii. Permanent openings shall consist of a single layer of fixed flat slat louvers or grilles, with a total minimum Net Free Area (NFA) the larger of 125 square inches plus 25 square inches per kBtu per hour of compressor capacity, or the minimum provided by the manufacturer for this method. The permanent openings shall be fully louvered doors or two openings of equal area, one in the upper half of the enclosure and one in the bottom half of the enclosure. The top of the upper opening must be 12 inches or less from the enclosure top and the bottom of the lower vent must be 12 inches or less from the enclosure bottom; or

FOR FUTURE USE ONLY - NOT FOR SUBMISSION

Could be useful …

Table F explicitly references the Mandatory Measures concerning ventilation requirements for integrated HPWH

Hot Water Recirculation – Large Penalty, but less so with Verified Demand Recirculation

VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION CEC-CF3R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

P. Demand Recirculation Manual; Control (RA4.4.9)/Sensor Control (RA4.4.10) Requirements

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

Systems that utilize this distribution type shall comply with these requirements.

01	The system operates "on-demand", meaning that the pump begins to operate shortly before or immediately after hot water draw begins, and stops when the return water temperature reaches a certain threshold value. For Demand Recirculation Manual Control, the pump shall be turned on using a manual switch system. For Demand Recirculation Sensor Control, the pump shall be turned on using a sensor system.
02	The controls shall be located in the kitchen, bathroom, and any hot water fixture location that is at least 20 feet from the water heater.
03	Manual controls may be activated by wired or wireless mechanisms. Each control shall have standby power of 1 Watt or less.
04	Sensor Controls may be activated by wired or wireless mechanisms, including buttons, motion sensors, door switches and flow switches. Each control shall have standby power of 1 Watt or less.
05	Pump and control placement shall meet one of the following criteria: • When a dedicated return line has been installed the pump, controls and thermo-sensor are installed at the end of the supply portion of the recirculation loop; or • The pump and controls are installed on the dedicated return line near the water heater and the thermo-sensor is installed in an accessible location as close to the end of the supply portion of the recirculation loop as possible; or • When the cold water line is used as the return, the pump, demand controls and thermo-sensor shall be installed in an accessible location at the end of supply portion of the hot water distribution line (typically under a sink).
06	After the pump has been activated, the controls shall allow the pump to operate until the water temperature at the thermo-sensor rises to one of the following values: • Not more than 10°F (5.6°C) above the initial temperature of the water in the pipe • Not more than 102°F (38.9°C).
07	Controls shall limit operation to no more than 5 minutes following activation.

Q. Verified Demand Recirculation Manual Control (RDRmc-H) (RA3.6.6)/Sensor Control (RDRsc-H) (RA3.6.7) Requirements

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

Systems that utilize this distribution type shall comply with these requirements

01	ECC rater shall perform a visual inspection to verify that the demand pump, manual/sensor controls and thermo-sensor are present and operating properly consistent with the applicable requirements of RA4.4.9 and RA4.4.10	
02	Verification Status:	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or ☐ All N/A - This entire table is not applicable
03	Correction Notes:	

Manual Control and Mandatory Requirements

Potentially saves water, but uses more energy than a non-recirc system.



Pipe Insulation –Mandatory Measure or HERS Credit Option
CF3R-PLB-22-H

VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION

CEC-CF3R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

F. Mandatory Measures for Single Dwelling Systems

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

01	Equipment shall meet the applicable requirements of the Appliance Efficiency Regulations (Section 110.3(b)1).
02	Unfired storage tanks are insulated with an external R-3.5 or combination of R-16 internal and external Insulation. (Section 110.3(c)3).
03	Domestic hot water piping insulation requirements (Section 150(J)): • All domestic hot water piping shall be insulated as specified in Section 609.12 of the California Plumbing Code. Insulation buried below grade must be installed in a waterproof and non-crushable casing or sleeve. • Pipe insulation shall fit tightly and all elbows and tees shall be fully insulated. • Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. • Piping that penetrates metal framing shall use grommets, plugs, wrapping or other insulating material to assure that no contact is made with the metal framing. Insulation shall butt securely against all framing members. • Piping surrounded with a minimum of 1 inch of wall insulation, 2 inches of crawlspace insulation, or 4 inches of attic insulation shall not be required to have pipe insulation.

J. Verified Pipe Insulation for Single Dwelling Systems Requirements (RA3.6.2)

Systems that utilize this distribution type shall comply with these requirements.

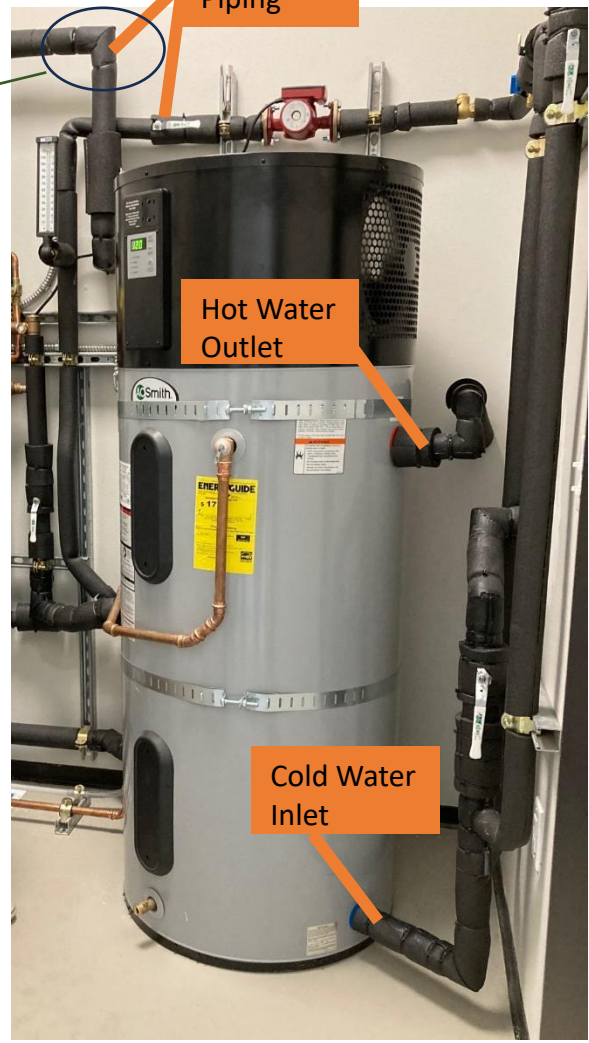
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met unless otherwise noted in the Verification Status and the Corrections Notes in this table.

01	ECC rater shall perform a visual inspection that all hot water piping comply with the insulation requirements in 150.0(j).	
02	Verification Status:	☐ Pass - all applicable requirements are met; or ☐ Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or ☐ All N/A - This entire table is not applicable
03	Correction Notes:	



…all elbows and tees shall be fully insulated

Note: Tables F and J Directs to the Energy Code Mandatory Measures 150.0(j) which in turn references Plumbing Code Section 609.12



Reference: Section 609.12 (previously 609.11) of the CA Plumbing Code

609.12 Pipe Insulation. Insulation of domestic hot water piping shall be in accordance with Section 609.12.1 and Section 609.12.2.

609.12.1 Insulation Requirements. Domestic hot water piping shall be insulated.

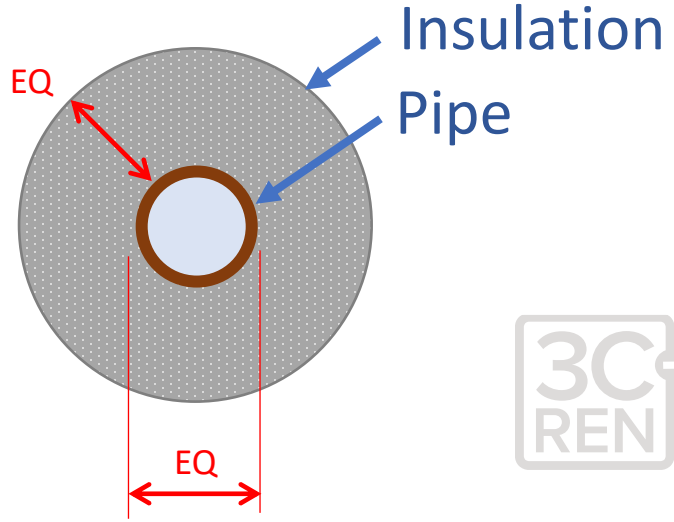
609.12.2 Pipe Insulation Wall Thickness. Hot water pipe insulation shall have a minimum wall thickness of not less than the diameter of the pipe for a pipe up to 2 inches (50 mm) in diameter. Insulation wall thickness shall be not less than 2 inches (51 mm) for a pipe of 2 inches (50 mm) or more in diameter.

Exceptions:

(1) Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration.

(2) Hot water piping between the fixture control valve or supply stop and the fixture or appliance shall not be required to be insulated.

Pipe insulation thickness shall be at least as thick as the pipe diameter.



Compact Plumbing 'Basic' Credit –Special Features

CF1R-PRF-01-E

REQUIRED SPECIAL FEATURES
The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.
• PV exception 2: No PV required when minimum PV size (Section 150.1(c)14) < 1.8 kWdc (0 kW) • Compact distribution system basic credit • Northwest Energy Efficiency Alliance (NEEA) rated heat pump water heater; specific brand/model, or equivalent, must be installed

WATER HEATING SYSTEMS

01	02	03	04	05	06	07	08	09
Name	System Type	Distribution Type	Water Heater Name	Number of Units	Solar Heating System	Compact Distribution	ECC Verification	Water Heater Name (#)
DHW Sys 1	Domestic Hot Water (DHW)	Standard	DHW Heater 1	1	n/a	Basic	n/a	DHW Heater 1 (1)

WATER HEATING - COMPACT DISTRIBUTION

01	02	03	04	05	06	07
Dwelling Unit type	Water Heating System Name	Master Bath distance of furthest fixture to Water Heater (ft)	Kitchen distance of furthest fixture to Water Heater (ft)	Furthest Third furthest fixture to Water Heater (ft)	Compactness Factor	ECC Verification
Dwelling	DHW Sys 1	20	20	20	0.7	n/a

ECC Work Flow:

- Triggered on CF1R
- Calculations and Dimensions should be shown on plans
- ECC Visual Inspection –Includes pipe insulation

CF2R and CF3R Forms

- CF2R-PLB-22-H HERS Verified Single Dwelling Unit Hot Water System Distribution
- CF3R-PLB-22-H HERS Verified Single Dwelling Unit Hot Water System Distribution

Compact Plumbing ‘Expanded’ Credit –ECC Feature

CF1R-PRF-01-E

ECC FEATURE SUMMARY
The following is a summary of the features that must be field-verified by a certified ECC Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the building tables below. Registered CF2Rs and CF3Rs are required to be completed in the ECC Registry
• Quality insulation installation (QII) • Building air leakage/reduced infiltration • Compact distribution system expanded credit

WATER HEATING - COMPACT DISTRIBUTION						
01	02	03	04	05	06	07
Dwelling Unit type	Water Heating System Name	Master Bath distance of furthest fixture to Water Heater (ft)	Kitchen distance of furthest fixture to Water Heater (ft)	Furthest Third furthest fixture to Water Heater (ft)	Compactness Factor	ECC Verification
Dwelling	DHW Sys 1	20	20	20	0.63	Expanded Credit

WATER HEATING - COMPACT DISTRIBUTION						
01	02	03	04	05	06	07
Dwelling Unit type	Water Heating System Name	Master Bath distance of furthest fixture to Water Heater (ft)	Kitchen distance of furthest fixture to Water Heater (ft)	Furthest Third furthest fixture to Water Heater (ft)	Compactness Factor	ECC Verification
Dwelling	DHW Sys 1	16.1	11.8	12.9	0.53	Expanded Credit

ECC Work Flow:

- Triggered on CF1R
- Calculations and Dimensions should be shown on plans
- ECC Visual Inspection –Includes pipe insulation

CF2R and CF3R Forms

- CF2R-PLB-22-H HERS Verified Single Dwelling Unit Hot Water System Distribution
- CF3R-PLB-22-H HERS Verified Single Dwelling Unit Hot Water System Distribution

Compact Plumbing Expanded Credit –ECC/HERS Verified
CF2R and CF3R-PLB-22-H

VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION CEC-CF2R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

G. Verified Compact Hot Water Distribution Expanded Credit (CHWDS-H-EX) (RA3.6.5)

For dwelling units with multiple systems, enter the master bath distance and kitchen distance to the closest water heater, and enter the average of the furthest fixture to each water heater.

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

01	02	03	04	05	06	07	08	09
Dwelling Name	Number of Stories	Master Bath distance of furthest fixture to Water Heater in feet	Kitchen distance from furthest fixture to Water Heater in feet	Furthest Third furthest fixture to Water Heater in feet (Avg for multiple water heaters)	Weighted Distance	Qualification Distance	Design Compactness Factor	Calculated Compactness Factor
	2	16.1	11.8	12.9	13.1		0.6	0.53

10	No hot water piping >1 inch diameter is allowed.
11	Length of 1 inch diameter piping is limited to 8 feet or less.
12	Two and three story buildings cannot have hot water distribution piping in the attic, unless the water heater is also located in the attic.
13	Eligible recirculating systems must be Verified Demand Recirculation: Manual Control conforming to RA4.4.17.

INFORMATION AND DATA ON THIS FORM IS NOT VALID UNTIL REGISTERED WITH AN ECC PROVIDER.

Compact Plumbing Example without a recirculation pump from the Calif Energy Commission Residencial Compliance Manual

Figure 5-14: Weighted Distance Calculation for the 1,814 Plan with a Centrally Located Water Heater

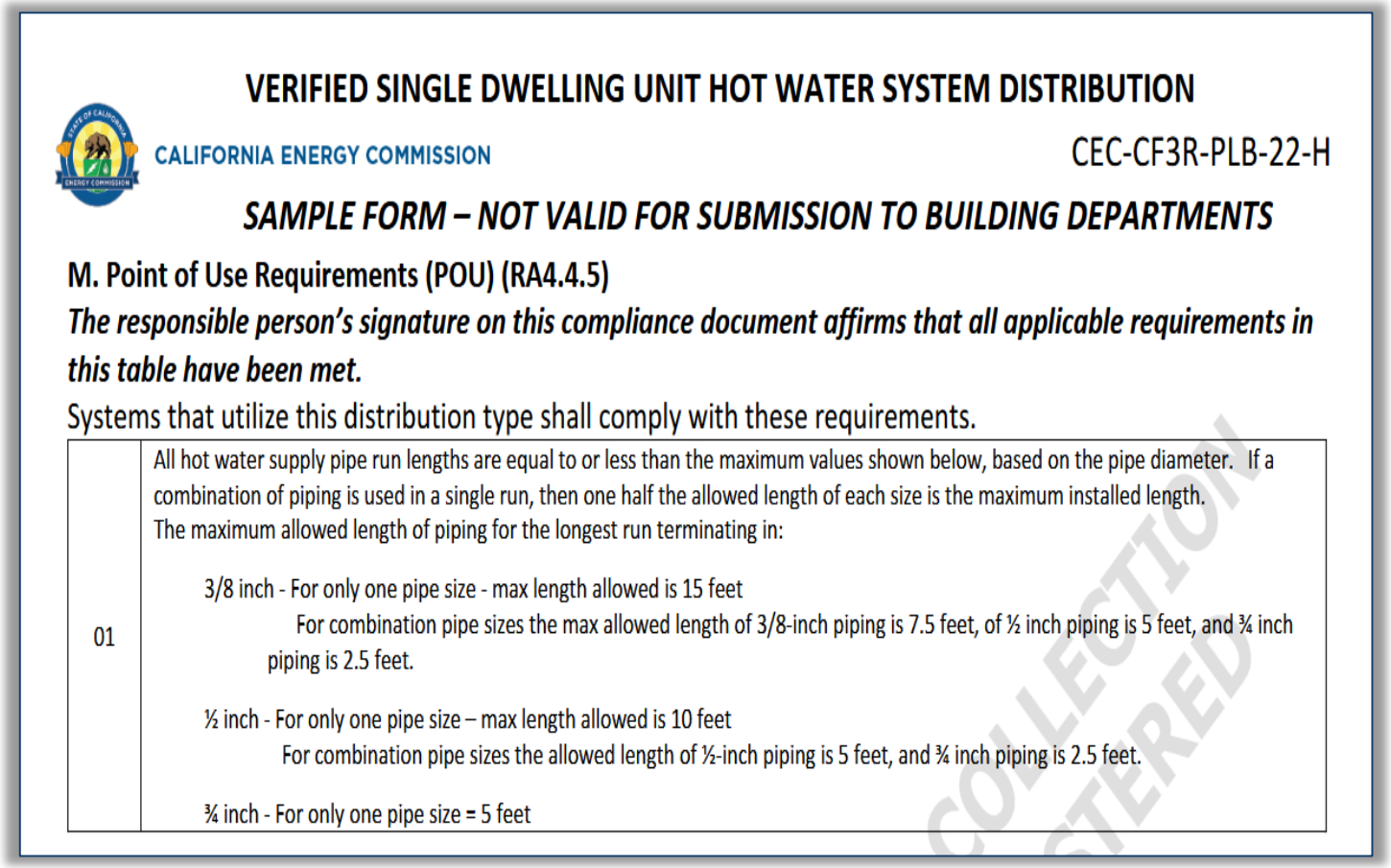


Weighted Distance = 0.4 * 12.9 ft + 0.4 * 11.8 ft + 0.2 * 16.1 ft = 13.1 ft

- Distances from water heater to fixture are 'Plan View' measurements.

- Additional piping distribution requirements must be met under the 'Expanded' credit.

POU –Point of Use Credit
CF3R-PLB-22-H



VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CALIFORNIA ENERGY COMMISSION CEC-CF3R-PLB-22-H

SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

M. Point of Use Requirements (POU) (RA4.4.5)

The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

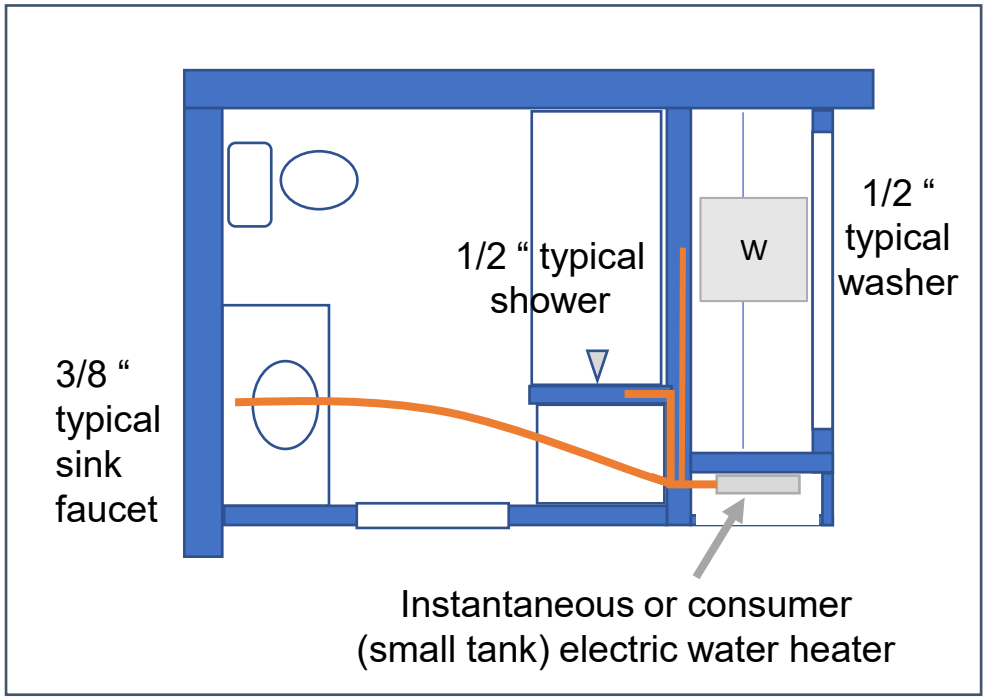
Systems that utilize this distribution type shall comply with these requirements.

01	All hot water supply pipe run lengths are equal to or less than the maximum values shown below, based on the pipe diameter. If a combination of piping is used in a single run, then one half the allowed length of each size is the maximum installed length. The maximum allowed length of piping for the longest run terminating in: 3/8 inch - For only one pipe size - max length allowed is 15 feet For combination pipe sizes the max allowed length of 3/8-inch piping is 7.5 feet, of ½ inch piping is 5 feet, and ¾ inch piping is 2.5 feet. ½ inch - For only one pipe size – max length allowed is 10 feet For combination pipe sizes the allowed length of ½-inch piping is 5 feet, and ¾ inch piping is 2.5 feet. ¾ inch - For only one pipe size = 5 feet

Point of Use (POU) Plumbing Distribution:

- **Credit** under the **Performance** pathway (ADSM is 0.30)
- Shown on the plan set
- Called out on the CF1R
- Documented on the CF2R and CF3R PLB-22-H forms
- **Requirement** for New Construction or Additions that are 500 sq ft or less that install an *electric water heater*

Point of Use (POU)



POU - Point of Use Distribution

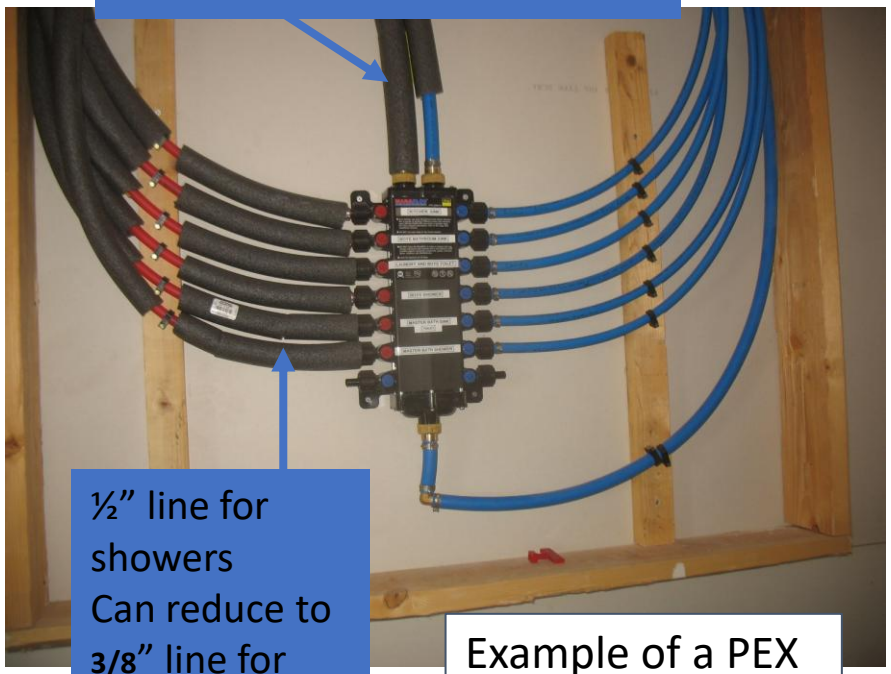
Table 4.4.5

Size Nominal (Inch)	Length of Pipe (feet)
3/8"	15
1/2"	10
3/4"	5

Line size vs Length for each run

Take most direct path with truck-branch line. If two pipe sizes are used in a single run, half the length of pipe shall be considered for each pipe size.

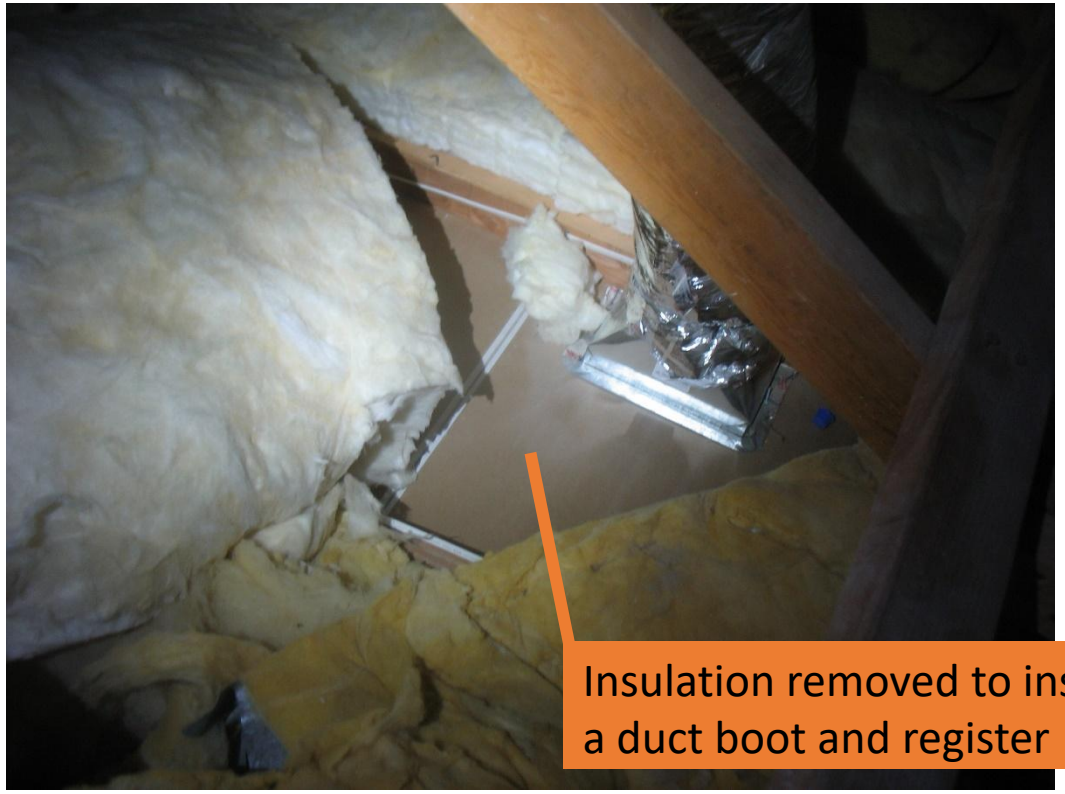
¾" Hot Water Line Directly from Water Heater



½" line for showers
Can reduce to 3/8" line for sinks

Example of a PEX Manifold System

‘Design – Construction – Verification’ is a Team Sport



Insulation removed to install a duct to a duct boot and register

- Well executed job site work flow makes ECC/HERS Duct Leakage Testing, QII, and Envelope Air Leakage Sealing go smoothly and easily.
- Follow up with each trade to ensure one trades person is not undermining the other trades person’s work.



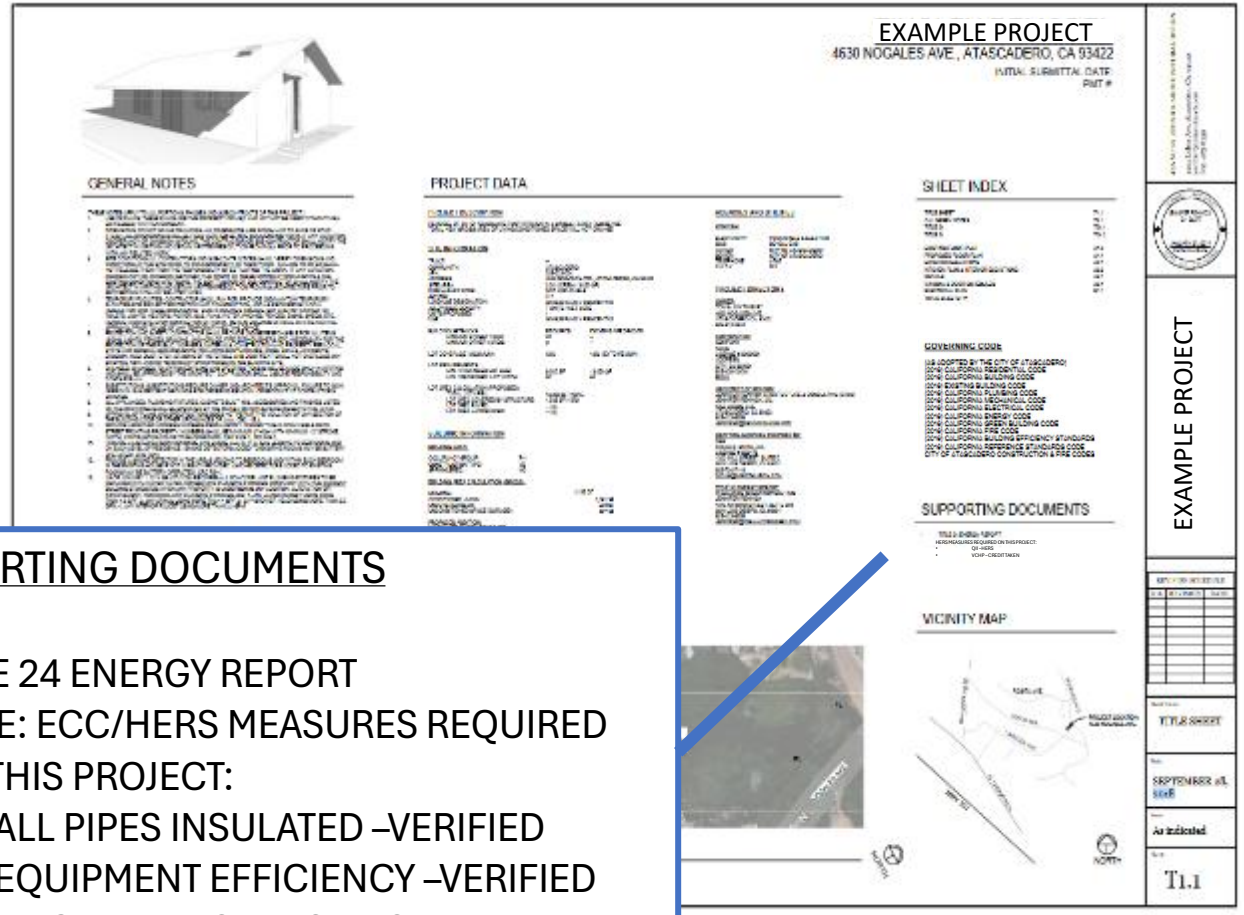
Happy HERS Rater

“I've found that certain trades can affect thermal performance... In a bad way....!” --P.D., HERS Rater

Consider Including Key ECC Features on the Cover Sheet

If a project design includes ECC measures (See CF1R or LMCC) consider calling that out on the Cover Sheet, suggested locations:

- ‘Code Summary’
- ‘Code Analysis’
- ‘Supporting Documents’
- ‘ECC/HERS Summary’

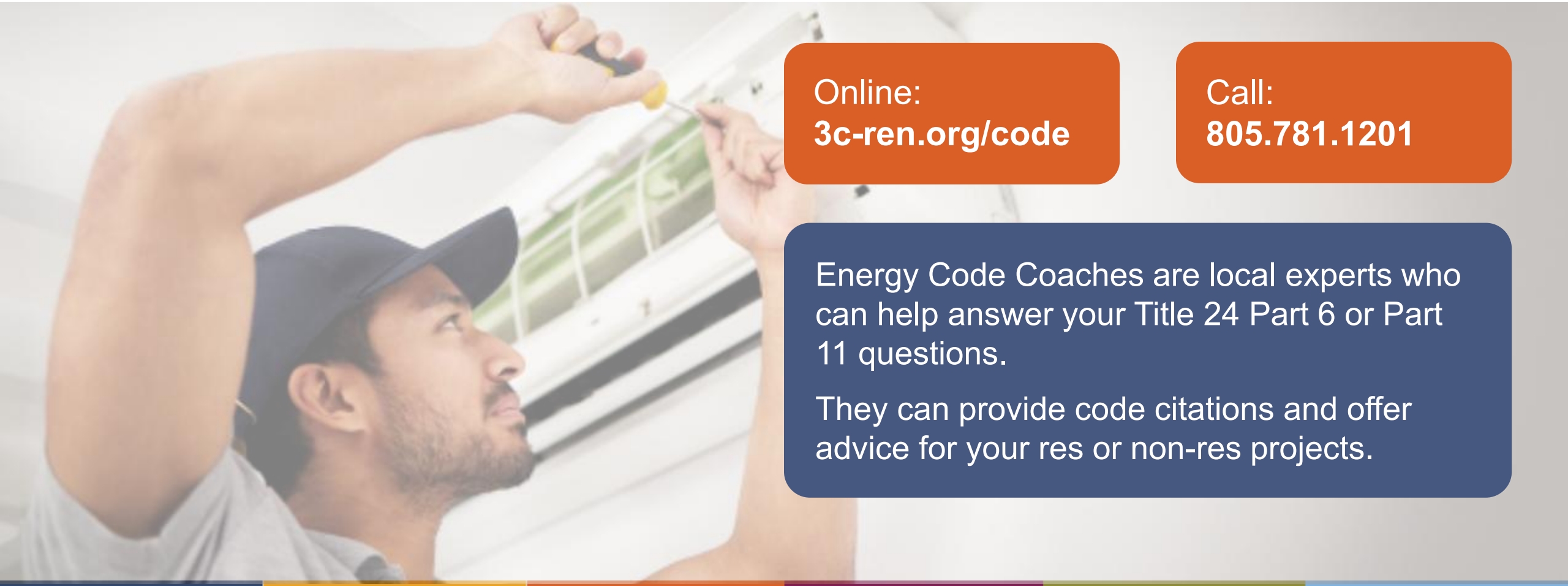


SUPPORTING DOCUMENTS

- TITLE 24 ENERGY REPORT
- NOTE: ECC/HERS MEASURES REQUIRED ON THIS PROJECT:
  - ALL PIPES INSULATED –VERIFIED
  - EQUIPMENT EFFICIENCY –VERIFIED
  - DUCT LEAKAGE TESTING

Questions about Title 24?

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



Online:
3c-ren.org/code

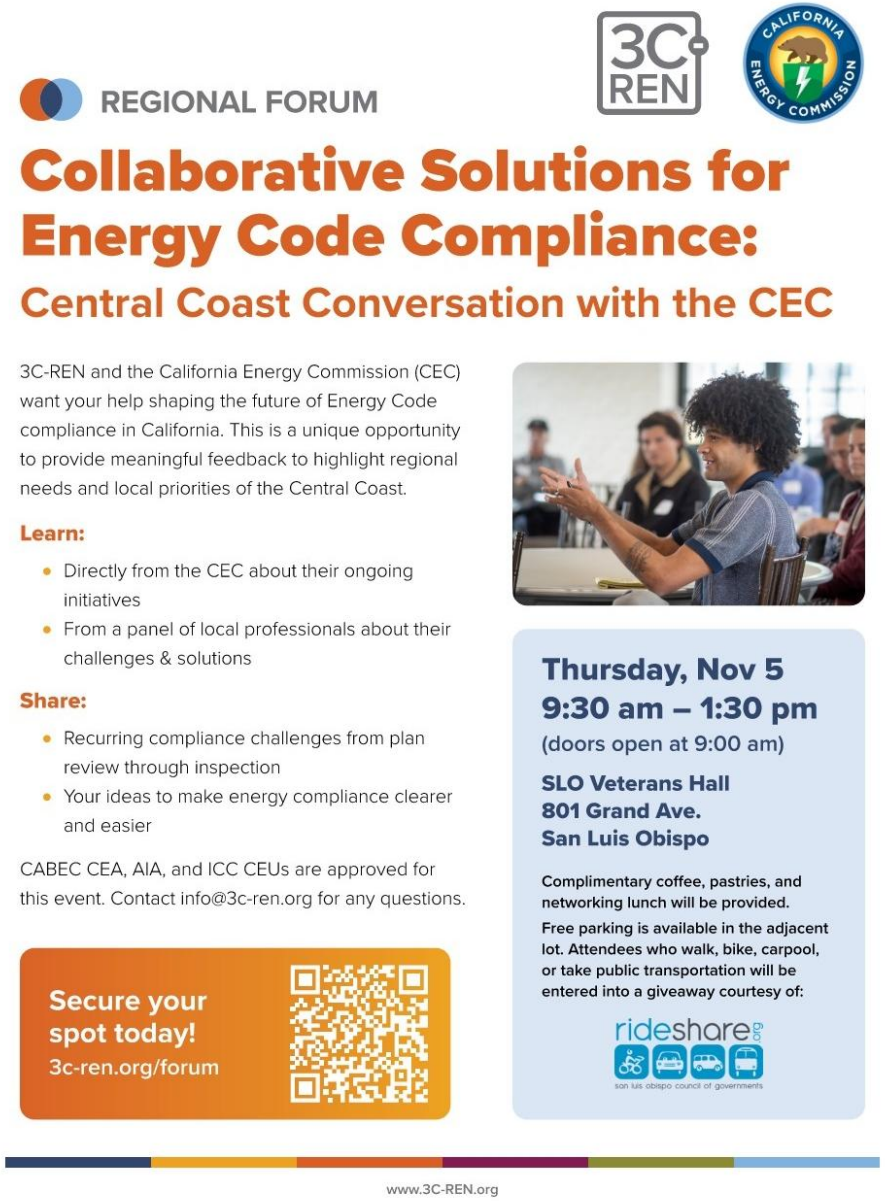
Call:
805.781.1201

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.

Upcoming In-person Events





Closing

Continuing Education Units Available

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

Coming to Your Inbox Soon!

- Slides & Recording

Upcoming Events:

- 11/10 Resiliency with Grid-tied Solar & Battery
- 11/12 Ask the Experts: HVAC Design
- 11/13 Ventilation 101
- 12/3 Checking Residential Load Calculations and Duct Design
- 12/10 Ask the Expert: Ventilation & Airtightness

Any phone numbers who joined?
Please share your name!

