

# We will be starting soon!

*Thanks for joining us*



# Energy Code Compliance: Using HERS Measures (Part 2)



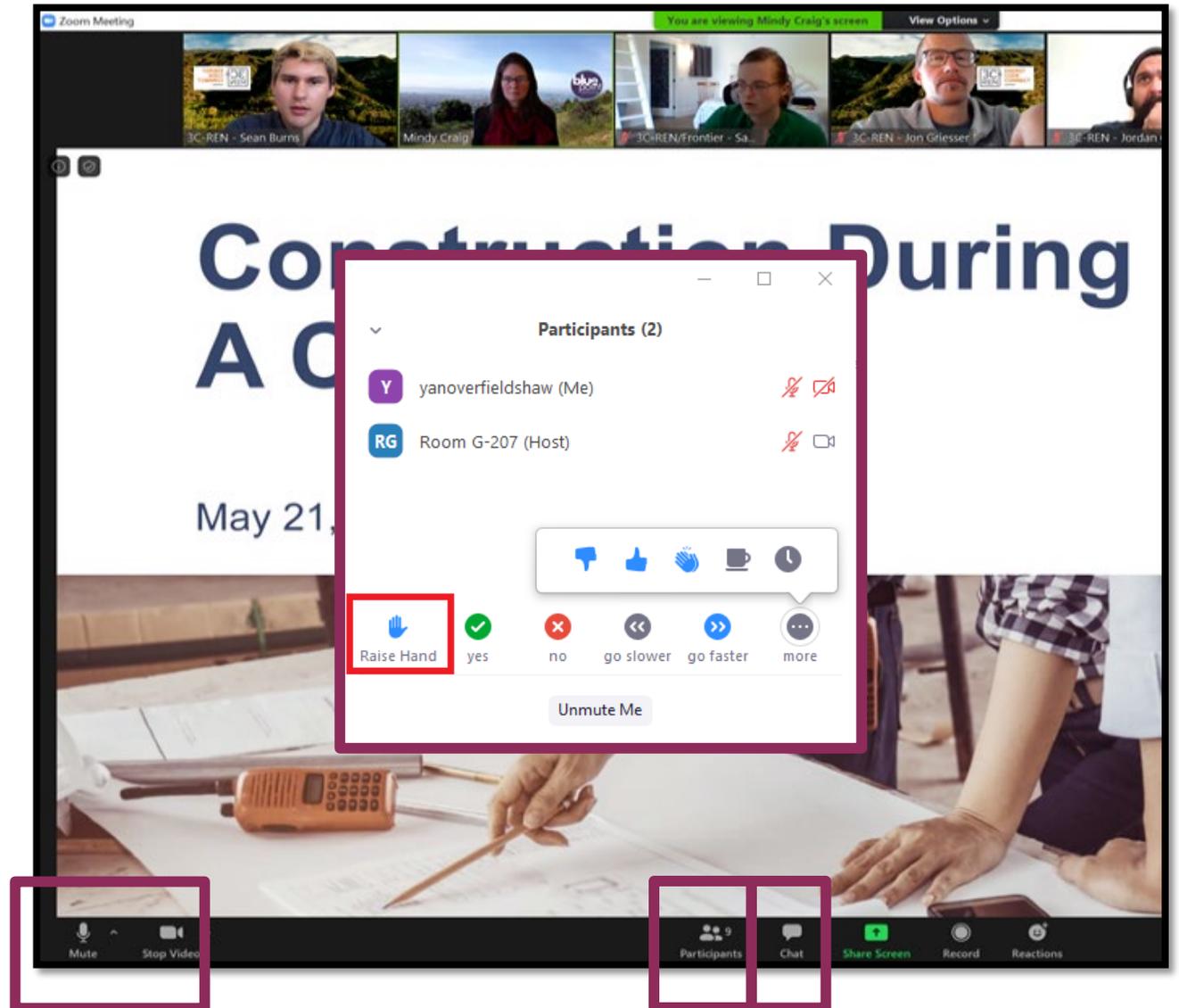
*Jennifer Rennick, AIA, CEA – In Balance Green Consulting*  
*Paul Dunn, HERS I & II – Central Coast Energy Compliance*

March 20, 2024



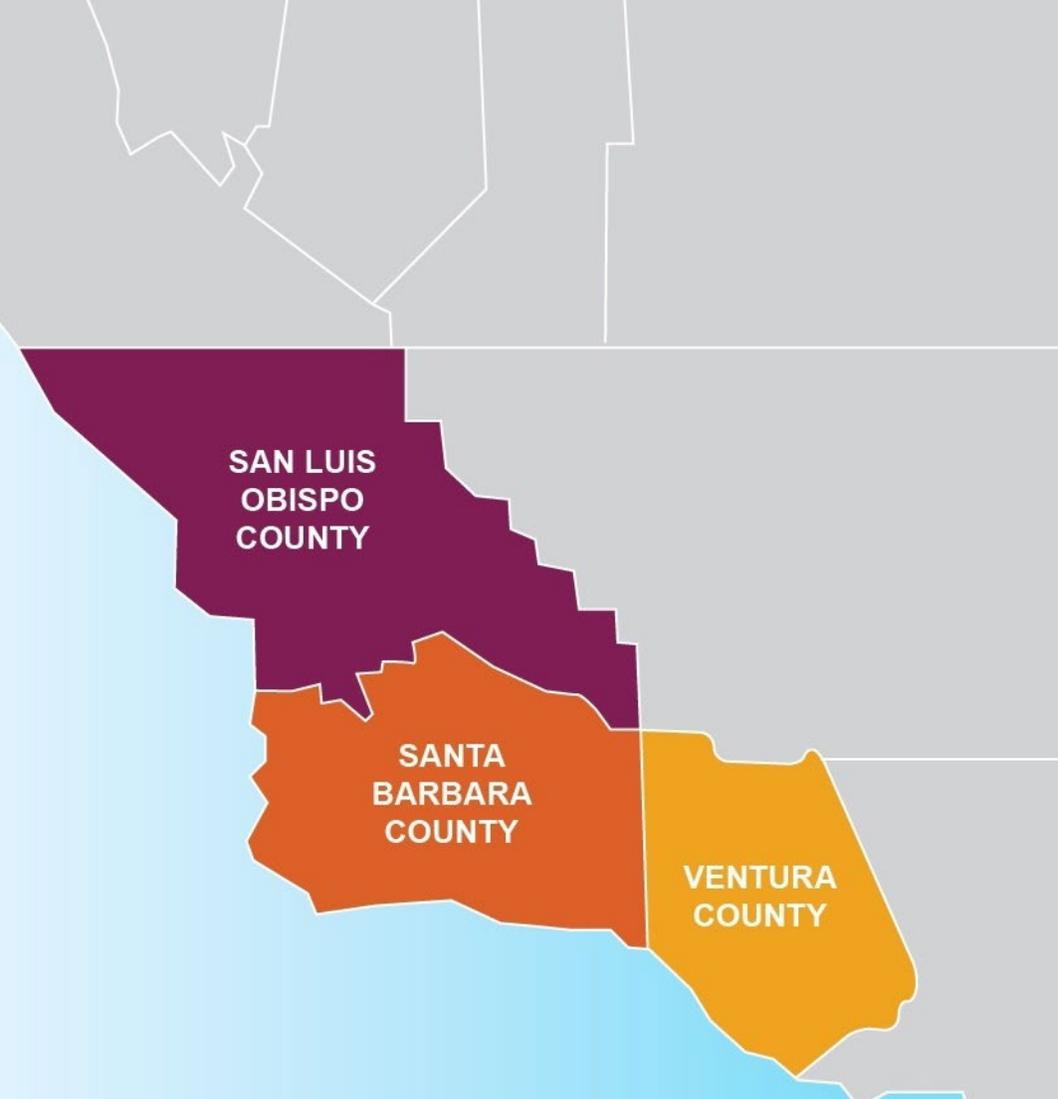
# Zoom Orientation

- Please be sure your full name is displayed
- Please **mute** upon joining
- Use "Chat" box to share questions or comments
- Under "Participant" select "Raise Hand" to share a question or comment verbally
- The session may be **recorded** and posted to 3C-REN's on-demand page. Feel free to ask questions via the chat and keep video off if you want to remain anonymous in the recording.



# 3C-REN: Tri-County Regional Energy Network

- Three counties working together to improve energy efficiency in the region
- Services for –
  - **Building Professionals:** industry events, training, and energy code compliance support
  - **Households:** free and discounted home upgrades
- Funded by ratepayer dollars that 3C-REN returns to the region





ENERGY  
CODE  
CONNECT

- Serves all building professionals
- Three services –
  - **Energy Code Coach**
  - **Training and Support**
  - **Regional Forums**
- Makes the Energy Code easy to follow

Energy Code Coach:  
[3c-ren.org/codes](http://3c-ren.org/codes)  
805.781.1201

Event Registration:  
[3c-ren.org/events](http://3c-ren.org/events)





## BUILDING PERFORMANCE TRAINING

- Serves current and prospective building professionals
- Expert instruction:
  - **Technical skills**
  - **Soft skills**
- Helps workers to thrive in an evolving industry

Event Registration:  
[3c-ren.org/events](https://3c-ren.org/events)





HOME  
ENERGY  
SAVINGS

### Multifamily (5+ units)

- No cost technical assistance
- Rebates up to \$750/apartment plus additional rebates for specialty measures like heat pumps

### Single Family (up to 4 units)

- Sign up to participate!
- Get paid for the metered energy savings of your customers

Enrollment:  
[3C-REN.org/contractor-participation](https://3C-REN.org/contractor-participation)



# Today's Learning Objectives

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

## Learning Units:

- 1.5 AIA HSW LU approved for this course
- 0.15 ICC CEU approved for this course





# Intro – Process Review

# 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

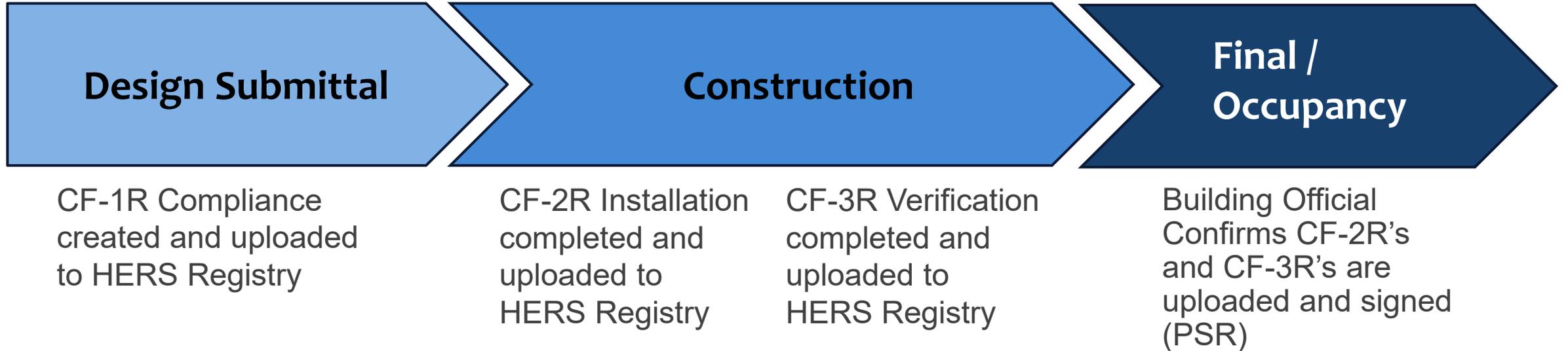
## New Under the 2022 Energy Code

## 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



# Process for Residential Permitting



## HERS – Home Energy Rating System

We have two HERS Providers, CalCERTS and CHEERS, in California. These organization are responsible for training and certifying HERS Raters, and supporting the California Energy Code HERS Registry.

**Note:** Low-Rise Multifamily 2022 Energy Code projects are *newly added to* HERS Registry.



# CEC – 2022 Supporting Documents - Forms



**CALIFORNIA ENERGY COMMISSION**

Enter keywords, e.g. Tracking Progress

HOME PROCEEDINGS RULES AND REGULATIONS PROGRAMS AND TOPICS FUNDING DATA AND REPORTS SHOWCASE

California Energy Commission > Programs and Topics > All Programs > Building Energy Efficiency Standards > 2022 Building Energy Efficiency Standards > 2022 Supporting Documents - Forms - Residential

Electric – Including Solar and Battery	+
Envelope	+
Existing Conditions	+
Lighting	+
Mechanical	+
Plumbing	+
Pool and Spa	+

- Most forms are for reference only
- NEW: HERS Registry for Performance Calculations are available for Multifamily Low-Rise projects.
- Single Family and Multifamily Low-Rise forms must be registered with a HERS provider.

California Energy Commission  
[www.energy.ca.gov](http://www.energy.ca.gov)



# 2022 Supporting Docs CF2R & CF3R

Note: Most forms are for reference only

Reminder:

E – Enforcement Agency

H – HERS

## Single Family

### Plumbing



#### CF1R

- CF1R-PLB-01-E Hydronic Heating System Worksheet

#### CF2R

- CF2R-PLB-02-E Non-HERS - Single Dwelling Unit Hot Water System Distribution
- CF2R-PLB-03-E Pool and Spa Heating Systems
- CF2R-PLB-22-H HERS Verified Single Dwelling Unit Hot Water System Distribution
- CF2R-STH-01-E Solar Water Heating Systems

#### CF3R

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

## Multifamily

### Plumbing



#### LMCC (Certificates of Compliance)

- LMCC-PLB-01-E Domestic Water Heating System That Do Not Require HERS Field Verification

#### LMCI (Certificates of Installation)

- LMCI-PLB-21-H HERS Verified Multifamily Central Hot Water System Distribution
- LMCI-PLB-22-H HERS Verified Multifamily Central Hot Water System Distribution – Individual Dwelling Unit

#### LMCI – Non-HERS (Certificates of Installation)

- LMCI-PLB-01-E Multifamily Central Hot Water System Distribution – Non-HERS
- LMCI-PLB-02-E Individual Dwelling Unit Hot Water System Distribution – Non-HERS
- LMCI-PLB-E Domestic Water Heating System
- LMCI-PLB-03-E Pool and Spa Heating Systems - Fillable PDF

#### LMCV (Certificates of Verification)

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

# 2022 Supporting Docs CF2R & CF3R

Note: Most forms are for reference only

## Reminder:

E – Enforcement Agency

H – HERS

### Mechanical



#### CF2R

- 01
  - CF2R-MCH-01a-E Space Conditioning Systems Ducts and Fans
  - 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 E+A+A
- 02
  - CF2R-MCH-02-E Whole House Fan
- 04
  - CF2R-MCH-04-E Evaporative Coolers
- 20
  - CF2R-MCH-20a-H Duct Leakage Diagnostic Test - New Construction
  - CF2R-MCH-20b-H Duct Leakage Diagnostic Test - LLDCS
  - CF2R-MCH-20c-H Duct Leakage Diagnostic Test - LLAHU
  - CF2R-MCH-20d-H Duct Leakage Diagnostic Test - Existing Construction
  - CF2R-MCH-20e-H Duct leakage Diagnostic Test - Sealing Accessible Leaks
- 21
  - CF2R-MCH-21-H QII - Air Infiltration Sealing - Framing Stage \*
- 22
  - CF2R-MCH-22a-H Space Conditioning System Fan Efficacy - All Zones Calling Only
  - CF2R-MCH-22b-H Space Conditioning System Fan Efficacy - Zonal Control Mode
  - CF2R-MCH-22c-H Space Conditioning System Fan Efficacy - All Zones Calling Only - With CFVCS
  - CF2R-MCH-22d-H Space Conditioning System Fan Efficacy - Every Zonal Control Mode - With CFVCS

- 23
  - CF2R-MCH-23a-H Space Conditioning System Airflow Rate - All Zones Calling Only
  - CF2R-MCH-23b-H Space Conditioning System Airflow Rate - Every Zonal Control Mode
  - CF2R-MCH-23c-H Space Conditioning System Airflow Rate - Best That I Can Do
  - CF2R-MCH-23d-H Space Conditioning System Airflow Rate - Measurement Only - All Zones Calling Only
  - CF2R-MCH-23e-H Space Conditioning System Airflow Rate - All Zones Calling Only - With CFVCS
  - CF2R-MCH-23f-H Space Conditioning System Airflow Rate - Every Zonal Control Mode - With CFVCS
- 24
  - CF2R-MCH-24a-H-Enclosure Air Leakage Worksheet-Single Point Test-Manual Meter
  - CF2R-MCH-24a-H-Enclosure Air Leakage Worksheet-Single Point Test-Automatic Meter
- 25
  - CF2R-MCH-25a-H Refrigerant Charge Verification - Superheat
  - CF2R-MCH-25b-H Refrigerant Charge Verification - Supercooling
  - CF2R-MCH-25c-H Refrigerant Charge Verification - Weigh-in Observation
  - CF2R-MCH-25f-H Refrigerant Charge Verification - Packaged System Manufacturer Cert
- 26
  - CF2R-MCH-26-H Rated Space Conditioning System Equipment Verification
- 27
  - CF2R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
  - CF2R-MCH-27d-H Indoor Air Quality and Mechanical Ventilation - Non-Dwelling Unit
- 28
  - CF2R-MCH-28-H Return Duct Design and Air Filter Device Sizing According to Tables 150.0-B or C
- 29
  - CF2R-MCH-29-H Duct Surface Area Reduction; R-Value; Buried Ducts Compliance Credit
- 30
  - CF2R-MCH-30-H Ventilation Cooling - Whole House Fan
- 31
  - CF2R-MCH-31a-H Whole House Fan HERS - Airflow and Watts per WHF
  - CF2R-MCH-31b-H Whole House Fan HERS - Airflow per WHF and Total Watts
- 32
  - CF2R-MCH-32-H Local Mechanical Exhaust
- 33
  - CF2R-MCH-33-H Variable Capacity Heat Pump Compliance Credit
- 34
  - CF2R-MCH-34-E Pre-Cooling

\* CF3R is for Duct Location

# 2022 Supporting Docs CF2R & CF3R

Note: Most forms are for reference only

## Reminder:

E – Enforcement Agency

H – HERS

## Mechanical

### CF3R

Note:  
MCH-01, MCH-02, and MCH-04 do not have a corresponding CF3R

- CF3R-MCH-20a Duct Leakage Diagnostic Test - New Construction
- CF3R-MCH-20b Duct Leakage Diagnostic Test - LLDCS
- CF3R-MCH-20c-H Duct Leakage Diagnostic Test - LLAHU
- CF3R-MCH-20d-H Duct Leakage Diagnostic Test - Existing Construction
- CF3R-MCH-20e-H Duct leakage Diagnostic Test - Sealing Accessible Leaks

- CF3R-MCH-21 Duct Location

- CF2R-MCH-22a-H Space Conditioning System Fan Efficacy - All Zones Calling Only
- CF3R-MCH-22b-H Space Conditioning System Fan Efficacy - Zonal Control Mode
- CF3R-MCH-22c-H Space Conditioning System Fan Efficacy - All Zones Calling Only - With CFVCS
- CF3R-MCH-22d-H Space Conditioning System Fan Efficacy - Every Zonal Control Mode - With CFVCS

\* CF2R is for Air Sealing and QII

- CF3R-MCH-23a-H Space Conditioning System Airflow Rate - All Zones Calling Only
- CF3R-MCH-23b-H Space Conditioning System Airflow Rate - Every Zonal Control Mode
- CF3R-MCH-23c-H Space Conditioning System Airflow Rate - Best That I Can Do
- CF3R-MCH-23d-H Space Conditioning System Airflow Rate - Measurement Only - All Zones Calling Only
- CF3R-MCH-23e-H Space Conditioning System Airflow Rate - All Zones Calling Only - With CFVCS
- CF3R-MCH-23f-H Space Conditioning System Airflow Rate - Every Zonal Control Mode - With CFVCS
- CF3R-MCH-24a Building Air Leakage Diagnostic Test Worksheet - Building Enclosures and Dwelling Unit Enclosures - Single Point Test - Manual Meter
- CF3R-MCH-24b Building Air Leakage Diagnostic Test Worksheet - Building Enclosures and Dwelling Unit Enclosures - Single Point Test - Automatic Meter
- CF3R-MCH-25a-H Refrigerant Charge Verification - Superheat
- CF3R-MCH-25b-H Refrigerant Charge Verification - Supercooling
- CF3R-MCH-25c-H Refrigerant Charge Verification - Weigh-in Observation
- CF3R-MCH-25d Refrigerant Charge Verification - FID
- CF3R-MCH-26-H Rated Space Conditioning System Equipment Verification
- CF3R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
- 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 Ventilation Cooling - Whole House Fan
- CF3R-MCH-31a-H Whole House Fan HERS - Airflow and Watts per WHF
- CF3R-MCH-31b-H Whole House Fan HERS - Airflow per WHF and Total Watts
- CF3R-MCH-32-H Local Mechanical Exhaust
- CF3R-MCH-33-H Variable Capacity Heat Pump Compliance Credit

# List of CF2R and CF3R Forms

## –Example Project on CalCERTS

<b>Installation and Verification Certificates that MAY be Required from the CF1R</b>		<b>Installation Certificate (CF2R)</b>	<b>Certificate of Verification (CF3R)</b>
<b>You may add tested measures if the Yes/No option is available.</b>			
CF2R-ELC-01	Electric Ready Requirements:	YES	N/A
CF2R-ENV-01	Fenestration Installation:	YES	N/A
CF2R-ENV-03	Insulation Installation:	YES	N/A
CF2R-ENV-04	Roofing-Radiant Barrier:	No	N/A
CF2R-ENV-20	Building Leakage Diagnostic Test:	No	No
CF2R-ENV-21	QII-Framing Stage:	No	No
CF2R-ENV-22	QII-Insulation Installation:	No	No
CF2R-LTG-01	Lighting:	YES	N/A
CF2R-MCH-01	Space Conditioning Systems, Ducts and Fans:	YES	N/A
CF2R-MCH-02	Whole House Fan:	No	N/A
CF2R-MCH-25	Refrigerant Charge:	YES	YES
CF2R-MCH-27	IAQ and MV:	YES	YES
CF2R-MCH-31	HERS Whole House Fan:	No	No
CF2R-MCH-32	Local Mechanical Exhaust:	YES	YES
CF2R-PLB-02	SD HWS Distribution:	No	N/A
CF2R-PLB-03	Pool and Spa:	<input type="button" value="No"/>	N/A
CF2R-PLB-22	HERS SD HWS Distribution:	YES	YES
CF2R-PVB-01	Photovoltaic Systems:	YES	N/A
CF2R-PVB-02	Battery Storage Systems:	No	N/A
CF2R-SRA-02	Minimum Solar Zone Area Worksheet:	No	N/A

\* Fan Efficacy Airflow is required and can be satisfied by EITHER the MCH-23 and MCH-22 OR the MCH-28. The exact measure is determined by the CF2R-MCH-01.

\*\* The MCH-26 is determined on the CF2R-MCH-01.



# After CF2R/CF3R's are complete, the project can obtain final Occupancy approval.

<b>CERTIFICATE OF VERIFICATION</b>		<b>CF3R-ENV-21-H</b>
<b>QII - Air Infiltration Sealing - Framing Stage</b>		<b>(Page 1 of 6)</b>
<b>Project Name:</b> <input type="text"/>	<b>Enforcement Agency:</b> <input type="text"/>	<b>Permit Number:</b> <input type="text"/>
<b>Dwelling Address:</b> <input type="text"/>	<b>City:</b> <input type="text"/>	<b>Zip Code:</b> <input type="text"/>

<b>A. Air Barrier Materials</b>			
01	<p>A continuous sealed exterior air barrier is required in all thermal envelope assemblies to limit air movement between unconditioned/ outside spaces and conditioned/ inside spaces, and must comply using one of the following methods:</p> <ol style="list-style-type: none"> <li>Using individual materials that have an air permeance not exceeding 0.004 cfm/ft<sup>2</sup> under a pressure differential of 0.3 in. w.g. (1.57 pcf) (0.02 L/s.m<sup>2</sup> at 75 pa) when tested in accordance with ASTM E2178; or</li> <li>Using assemblies of materials and components that have an average air leakage not to exceed 0.04 cfm/ft<sup>2</sup> under a pressure differential of 0.3 in. w.g. (1.57 pcf) (0.2 L/s.m<sup>2</sup> at 75 pa) when tested in accordance with ASTM E2357, ASTM E1677, ASTM E1680, or ASTM E283; or</li> <li>Testing the complete building and demonstrating that the air leakage rate of the building envelope does not exceed 0.40 cfm/ft<sup>2</sup> under a pressure differential of 0.3 in. w.g. (1.57 pcf) (2.0 L/s.m<sup>2</sup> at 75 pa) when tested in accordance with ASTM E779 or an equivalent approved method.</li> </ol>		
02	<table border="1"> <tr> <td>Method of Compliance</td> <td>Method 2 (Assemblies of Materials)</td> </tr> </table>	Method of Compliance	Method 2 (Assemblies of Materials)
Method of Compliance	Method 2 (Assemblies of Materials)		
03	<table border="1"> <tr> <td>Verification Status</td> <td>Pass - all applicable requirements are met.</td> </tr> </table>	Verification Status	Pass - all applicable requirements are met.
Verification Status	Pass - all applicable requirements are met.		
04	<table border="1"> <tr> <td>Correction Notes</td> <td></td> </tr> </table>	Correction Notes	
Correction Notes			
<p>Note: SPF insulation is an acceptable air barrier and sealant when installed to a minimum thickness of 2 inches for closed cell and 5.5 inches for open cell, except where not allowed by manufacturer (e.g. flues, vents, can lights, etc).</p>			
<p>The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.</p>			

## Approval Process

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

# PSR – Project Status Report - Compliance

## CF2R's

System	Form	Registered Date	Registration Number	
CF2R-ENV-01-E	Fenestration Installation	2023-11-24 08:38:03	222-P010006992B-000-001-ED1001A-0000	✓

## CF3R's

System	Form	Registered Date	Registration Number	
System 1	CF3R-MCH-25-H (Refrigerant Charge)	2023-11-22 17:59:48	222-P010006992B-000-001-M25001A-M25A Paul Dunn (CC2005798) (Central Coast Energy Compliance)	✓
System 1	CF3R-MCH-26-H (Rated Equipment)	2023-11-22 17:59:48	222-P010006992B-000-001-M26001A-M26A Paul Dunn (CC2005798) (Central Coast Energy Compliance)	✓
	CF3R-MCH-27-H (IAQ and MV)	2023-11-22 17:59:48	222-P010006992B-000-001-M27001A-M27A Paul Dunn (CC2005798) (Central Coast Energy Compliance)	✓
Exhaust Fan 1	CF3R-MCH-32-H (Local Mechanical Exhaust)	2023-11-22 17:59:48	222-P010006992B-000-001-M32001A-M32A Paul Dunn (CC2005798) (Central Coast Energy Compliance)	✓
System 1	CF3R-MCH-33-H (VCHP Credit)	2023-11-22 17:59:48	222-P010006992B-000-001-M33001A-M33A Paul Dunn (CC2005798) (Central Coast Energy Compliance)	✓





# Hot Water Distribution

## Pipe Insulation

## Compact Plumbing

# Domestic Hot Water Distribution—Mandatory, Credit or Penalty?

## Excerpt from the ACM:

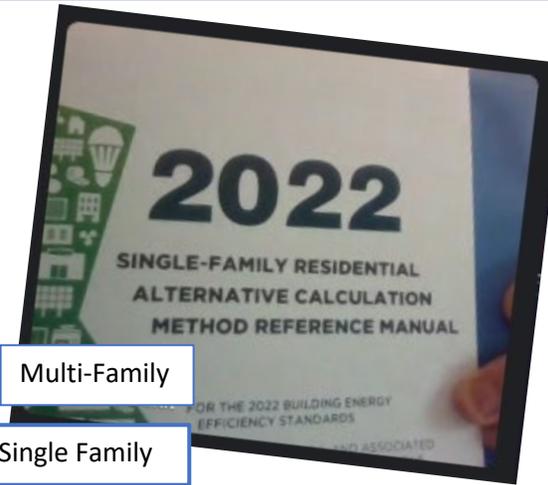
APPENDIX B — Water Heating Calculation Method

**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
<b>No HERS Inspection Required</b>			
Trunk and Branch -Standard (STD)	1.0	Yes	Yes
Central Parallel Piping (PP)	1.10	Yes	
Point of Use (POU)	0.30	Yes	
X Recirculation: Nondemand Control Options (R-ND)	9.80*	Yes	
X Recirculation with Manual Demand Control (R-DRmc)	1.75*	Yes	
X Recirculation with Motion Sensor Demand Control (R-DRsc)	2.60*	Yes	
<b>Optional Cases: HERS Inspection Required</b>			
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	
X Recirculation with Manual Demand Control (R-DRmc-H)	1.60*	Yes	
X 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.

Source: California Energy Commission



Multi-Family

Single Family

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

## Screen-Shots of EnergyPro Inputs:

Residential

Distribution:

Compact Distribution:

Compact DHW Distribution

Distance to Kitchen:  feet

Distance to M Bath:  feet

Distance to Other:  feet

Enable Compact at the DHW Tab. Enter plan view straight line distance measured from the DHW heater to the furthest use plumbing fixtures in the

This information will populate to the CF2R and CF3R

**Reminder:**  
An Assigned Distribution System Multiplier (ADSM)

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



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

**HERS 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 (R-DRmc) (RA4.4.9)/Sensor Control (RDRsc) (RA4.4.10) Requirements**

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.

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 active by wired or wireless mechanisms.
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: 1. 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 2. 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 3. 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: 1. Not more than 10°F (5.6°C) above the initial temperature of the water in the pipe 2. Not more than 102°F (38.9°C).
07	Controls shall limit operation to no more than 5 minutes following activation.

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

Manual Shut Off and Check Valve

Manual Control and Mandatory Requirements

Demand Controlled Recirculation Pump



**Q. HERS-Verified Demand Recirculation (RA3.6.7) Requirements**

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.

**N. Mandatory Requirements for all Recirculation Systems (RA4.4.7)**  
 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

01	A check valve located between the recirculation pump and the water heater to prevent unintentional recirculation.
02	Piping must take most direct path between water heater and fixtures.
03	Insulation is not required on the cold water line when it is used as the return.
04	If more than one loop installed each loop shall have its own pump and controls.

1. Pass - all applicable requirements are met; or  
 2. Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or  
 3. All N/A - This entire table is not applicable

01	HERS rater shall perform a visual inspection and operating properly consistent with the requirements.
02	Verification Status:
03	Correction Notes:

# Pipe Insulation –Mandatory Measure or HERS Credit Option

## CF3R-PLB-22-H



CALIFORNIA ENERGY COMMISSION

### HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CEC-CF3R-PLB-22-H

**SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS**

CERTIFICATE OF VERIFICATION

#### F. Mandatory Measures for all Domestic Hot Water Distribution Systems

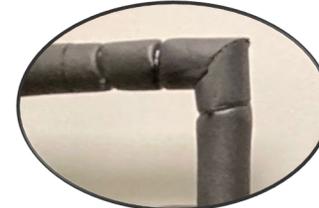
01	Equipment shall meet the applicable requirements of the Appliance Efficiency Regulations (Section 110.3(b)1).
02	Unfired Storage Tanks are insulated with an external R-3.5 or combination of R-16 internal and external Insulation. (Section 110.3(c)4).
03	<p>The following pipes are insulated, to the thicknesses required by Table 120.3A, except for those sections of pipe that are subject to one of the exceptions below: All domestic hot water piping shall be insulated as specified in Section 609.11 of the California Plumbing Code. Insulation buried below grade must be installed in a waterproof and non-crushable casing or sleeve.</p> <p><b>1.1</b> 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.</p> <p><b>1.2</b> Piping installed in interior or exterior walls that is surrounded on all sides by at least 1 inch (2.5 cm) of insulation.</p> <p><b>1.3</b> Piping installed in crawlspace with a minimum of 1 inch (2.5 cm) of crawlspace insulation above and below.</p> <p><b>1.4</b> Piping installed in attics with a minimum of 4 inches (10 cm) of attic insulation on top</p> <p><b>1.5</b> Pipe insulation shall fit tightly, and all elbows and tees shall be fully insulated.</p>

#### J. HERS-Verified Pipe Insulation Credit Requirements (PIC-H) (RA3.6.3)

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	HERS rater shall perform a visual inspection that all hot water piping comply with the insulation requirements in 150.0(j).
02	<p>Verification Status:</p> <ol style="list-style-type: none"> <li>1. <b>Pass</b> - all applicable requirements are met; or</li> <li>2. <b>Fail</b> - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or</li> <li>3. <b>All N/A</b> - This entire table is not applicable</li> </ol>
03	Correction Notes:

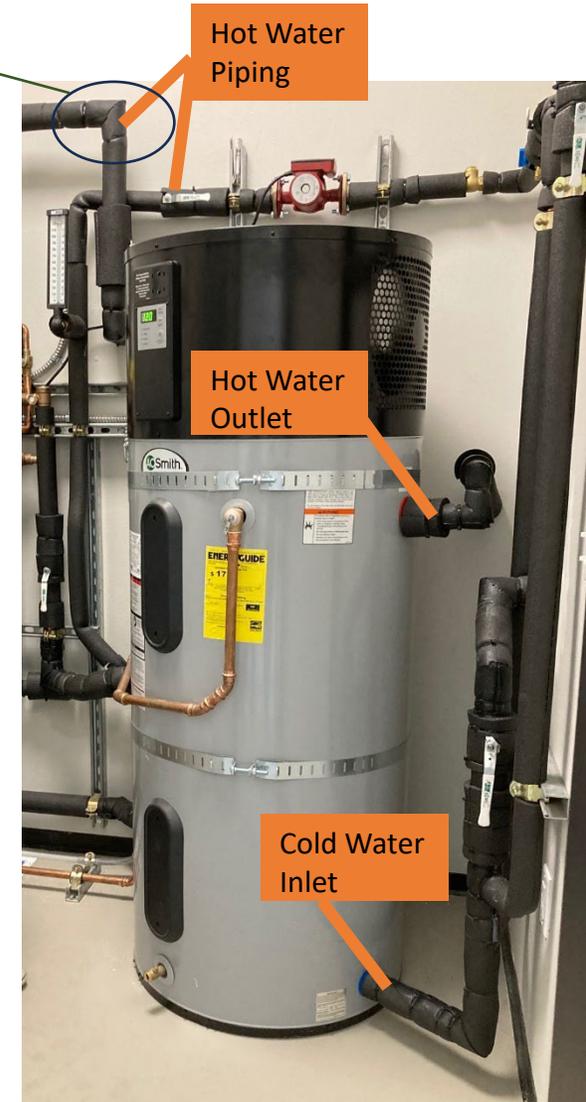


...all elbows and tees shall be fully insulated

Table J HERS-Verified directs to the Energy Code Mandatory Measures 150.0(j)

Excerpt from 150.0(j):

- (a) The first five feet of cold water piping from storage gas water heaters.
- (b) All hot water piping with a nominal diameter between 3/4 inch (19 millimeter) and 1 inch.
- (c) All hot water piping less than 3/4 inch in diameter that is associated with a domestic hot water recirculation system or leading to the kitchen fixtures.



# 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)
- Variable capacity heat pump compliance option (verification details from VCHP Staff report, Appendix B, and RA3)
- 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 - 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	HERS Verification
Dwelling	DHW Sys 1	n/a	n/a	n/a	0.7	n/a

### WATER HEATING - HERS VERIFICATION

01	02	03	04	05	06	07
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Shower Drain Water Heat Recovery
DHW Sys 1 - 1/1	Not Required	Not Required	Not Required	Basic	Not Required	Not Required

### Note:

Under the Performance Method, the compliance software calculates the 'Compactness Factor' and the supporting information is auto-filled on the CF2R Form.

### HERS Work Flow:

- Triggered on CF1R
- Calculations and Dimensions should be shown on plans
- HERS 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 –HERS Feature

## CF1R-PRF-01-E

### HERS FEATURE SUMMARY

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

- Quality insulation installation (QII)
- Building air leakage/reduced infiltration
- Kitchen range hood
- 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	HERS Verification
Dwelling	DHW Sys 1	n/a	n/a	n/a	0.6	Expanded Credit

### WATER HEATING - HERS VERIFICATION

01	02	03	04	05	06	07
Name	Pipe Insulation	Parallel Piping	Compact Distribution	Compact Distribution Type	Recirculation Control	Shower Drain Water Heat Recovery
DHW Sys 1 - 1/1	Not Required	Not Required	Required	Expanded	Not Required	Not Required

**Note:**  
Under the Performance Method, the compliance software calculates the 'Compactness Factor' and the supporting information is auto-filled on the CF2R and CF3R Form

### HERS Work Flow:

- Triggered on CF1R
- Calculations and Dimensions should be shown on plans
- HERS 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 –HERS Verified CF3R-PLB-22-H

**HERS 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**

**CERTIFICATE OF VERIFICATION**

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

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			

08	No hot water piping >1 inch diameter is allowed.							
09	Length of 1 inch diameter piping is limited to 8 feet or less.							
10	Two and three story buildings cannot have hot water distribution piping in the attic, unless the water heater is also located in the attic.							
11	Eligible recirculating systems must be HERS-Verified Demand Recirculation: Manual Control conforming to RA4.4.17.							
12	Verification Status:	1. <u>Pass</u> - all applicable requirements are met; or 2. <u>Fail</u> - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or 3. <u>All N/A</u> - This entire table is not applicable						
13	Correction Notes:							

Compact Plumbing Example without a recirculation pump from the Calif Energy Commission Residential 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

 **HERS 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**

**HERS 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)**  
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.**

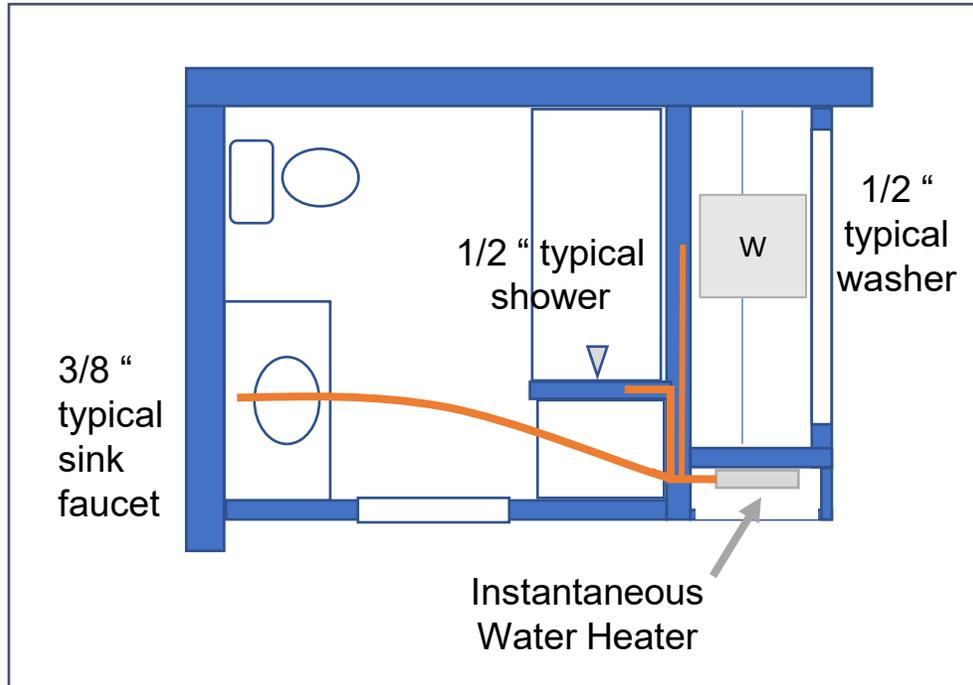
01	All hot water supply pipe run lengths are equal to or less than the maximum values shown below, based on the pipe diameter. If a combination of piping is used in a single run, then one half the allowed length of each size is the maximum installed length. The maximum allowed length of piping for the longest run terminating in:
01	<b>3/8 inch</b> - 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 1/2 inch piping is 5 feet, and 3/4 inch piping is 2.5 feet.
	<b>1/2 inch</b> - For only one pipe size – max length allowed is 10 feet  For combination pipe sizes the allowed length of 1/2-inch piping is 5 feet, and 3/4 inch piping is 2.5 feet.
	<b>3/4 inch</b> - 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 instantaneous water heater*



# Point of Use (POU)



**POU - Point of Use Distribution**

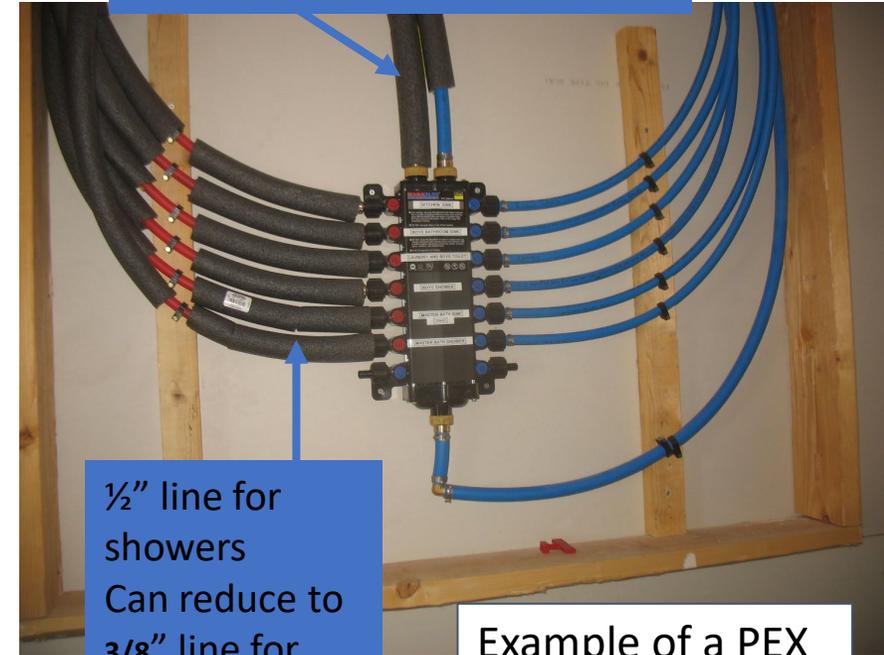
*Table 4.4.5*

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.

3/4" Hot Water Line Directly from Water Heater



1/2" line for showers  
Can reduce to 3/8" line for sinks

Example of a PEX Manifold System





# **Mechanical HERS Measures Mandatory –IAQ, Exhaust Fans**

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

CF1R-PRF-01-E

Calculation Description: Title 24 Analysis

Input File Name: Sample Res Project.ribd22

## HERS FEATURE SUMMARY

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

- Quality insulation installation (QII)
- Indoor air quality ventilation
- Kitchen range hood

## HERS IAQ Work Flow:

- Triggered on CF1R
- Job Site Meeting “Review Requirements”
- HERS Inspection:
  - Measure the air flow of fans

## CF2R and CF3R Forms

- CF2R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
- CF2R-MCH-27d-H Indoor Air Quality and Mechanical Ventilation - Non-Dwelling Unit
- CF2R-MCH-32-H Local Mechanical Exhaust
  
- CF3R-MCH-27a-H Indoor Air Quality and Mechanical Ventilation - Single Family Attached
- CF3R-MCH-32-H Local Mechanical Exhaust



# IAQ – Indoor Air Quality Ventilation CF3R-MCH-32-H



CALIFORNIA ENERGY COMMISSION

CEC-LMCI-MCH-32-H

## SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS

### LOCAL MECHANICAL EXHAUST

**Table 160.2-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 160.2-G as applicable.
Enclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm or a capacity of 5 ACH
Nonenclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm
Bathroom	50 cfm

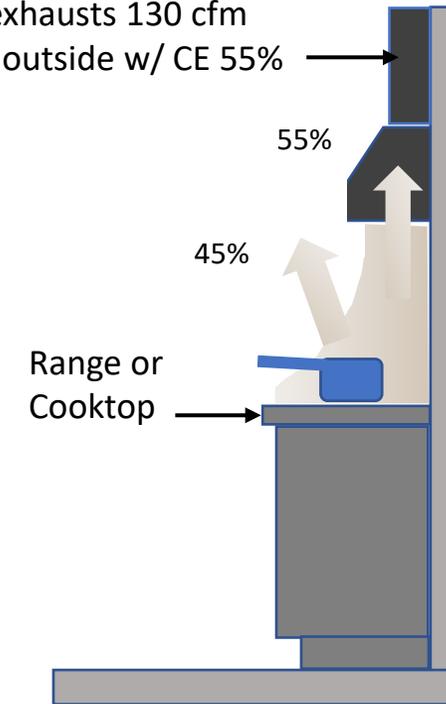
**Table 160.2-F**  
Continuous Local Ventilation Exhaust Airflow Rates

Application	Airflow
Enclosed kitchen	5 ach, based on kitchen volume
Bathroom	20 cfm

**Table 160.2-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 <sup>2</sup> )	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

Hood exhausts 130 cfm to the outside w/ CE 55%



**Illustration of 55% Capture Efficiency (CE)**

# Kitchen Exhaust System CF3R-MCH32-H



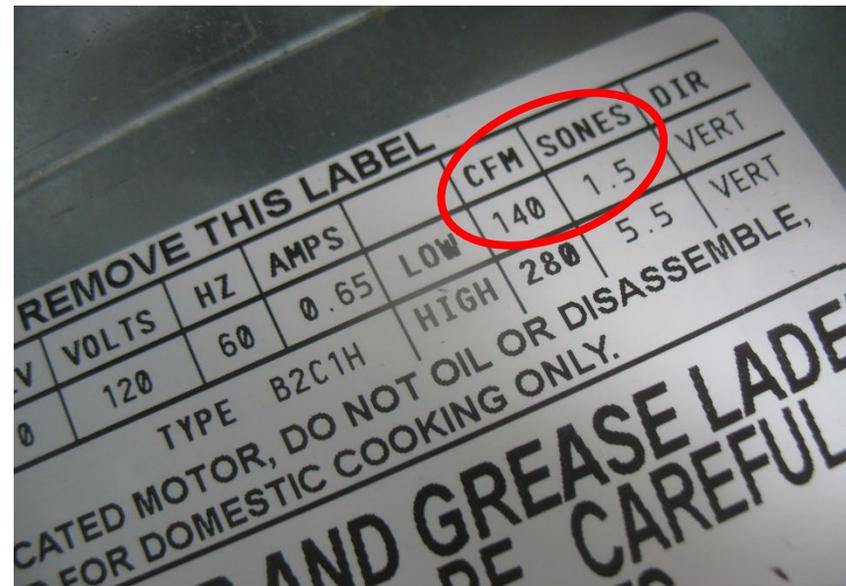
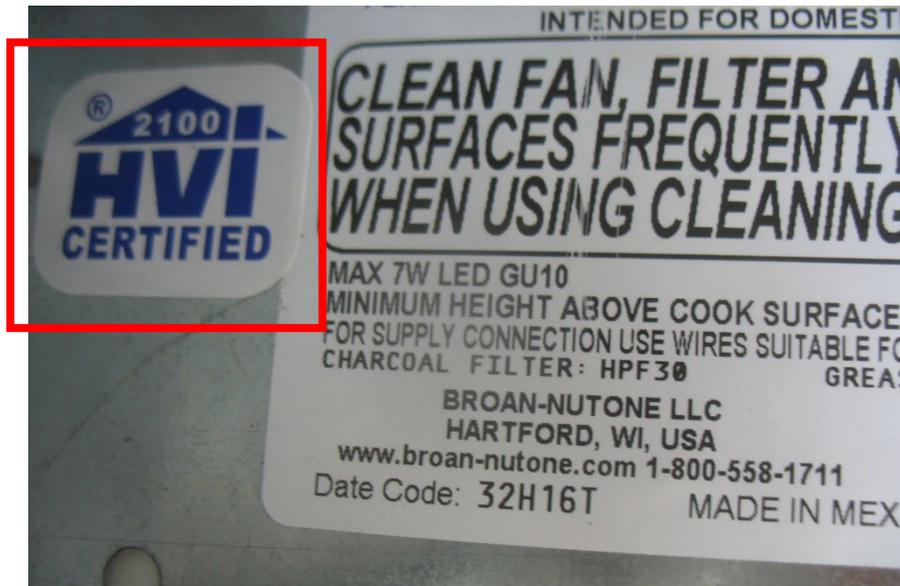
## LOCAL MECHANICAL EXHAUST

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



# IAQ – Indoor Air Quality Ventilation CF3R-MCH-32-H



CALIFORNIA ENERGY COMMISSION

## LOCAL MECHANICAL EXHAUST

CEC-LMCI-MCH-32-H

**SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS**

**Table 160.2-E**  
Demand-Controlled Local Ventilation Exhaust Airflow Rates and Capture Efficiency

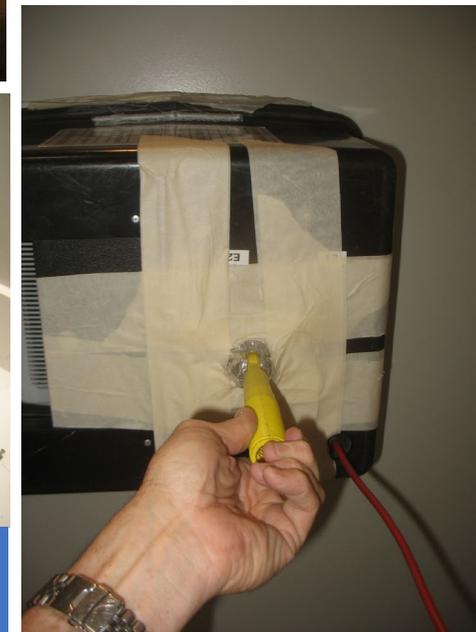
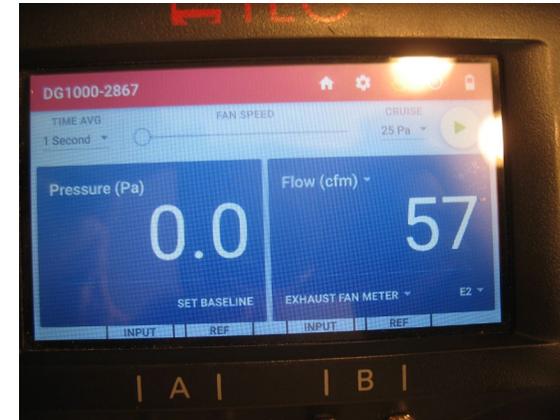
Application	Airflow
Enclosed Kitchen or Nonenclosed Kitchen	Vented range hood, including appliance-range hood combinations shall meet either the capture efficiency (CE) or the airflow rate specified in Table 160.2-G as applicable.
Enclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm or a capacity of 5 ACH
Nonenclosed Kitchen	Other kitchen exhaust fans, including downdraft: 300 cfm
Bathroom	50 cfm

**Table 160.2-F**  
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Application	Airflow
Enclosed kitchen	5 ach, based on kitchen volume
Bathroom	20 cfm

**Table 160.2-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 <sup>2</sup> )	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



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



CALIFORNIA ENERGY COMMISSION

CEC-CF3R-MCH-27-H

**SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS**

### Indoor Air Quality and Mechanical Ventilation

CERTIFICATE

Note: This form is a sample form and is not valid for submission to building departments.

Project

Dwelling

City and County

Title 24, Part 01, Chapter 14, Section 010301

requirements

Residential

A. Whole-Dwelling

Note: This section applies to non-dwelling units and living spaces.

Non-dwelling units and living spaces

#### 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 <sub>tot</sub> )	
02	Enclosure Leakage Rate (Q <sub>50</sub> )	
03	Effective Annual Average Infiltration Rate (Q <sub>inf</sub> )	
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 <sub>fan</sub> )	

#### 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)			

#### D2. HRV or ERV 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)

#### B. Single Family Attached/Detached General Information

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



Manifold



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



CALIFORNIA ENERGY COMMISSION

## INDOOR AIR QUALITY AND MECHANICAL VENTILATION

CEC-LMCI-MCH-27-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:

Title 24, Part 6, Section 160.2(b)2 **Ventilation and Indoor Air Quality for Attached Dwelling Units.** All dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2019 Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to the amendments specified by Title 24, Part 6, Section 160.2(b)2A

#### A. Whole-Dwelling Mechanical Ventilation - General Information

**Note:**  
Non-dwelling units do not meet the definition for a dwelling unit as defined in Section 100.1(b). Non-dwelling units are not designed to provide independent living facilities and do not provide permanent provisions for

living		
01		
02		
03	03	<p><b>7.3 Exhaust Ducts.</b></p> <p><b>7.3.1 Multiple Exhaust Fans Using One Duct.</b> 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.</p> <p><b>7.3.2 Single Exhaust Fan Ducted to Multiple Inlets.</b> 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.</p>
04	04	<p><b>7.4 Supply Ducts.</b> 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.</p>
05		
06		
07		

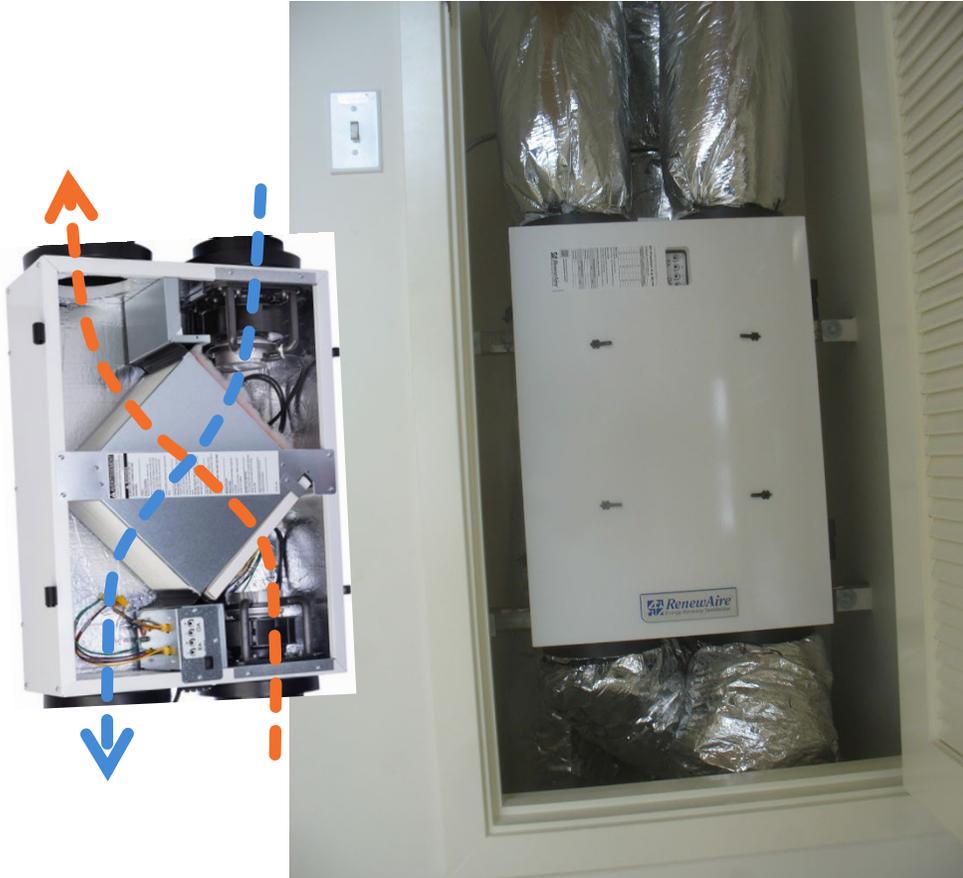
Multifamily Project



Hardworking HERS Rater

Forms are similar to Single Family. Some big differences include backdraft dampers and air sealing to stop air movement between dwellings.

# Multifamily IAQ: Balance Ventilation per Each Dwelling Unit vs Dwelling Unit Compartmentalization



Balanced Ventilation  
HRV Provides Outside Air (OA)

VS



Blower Door  
Compartmentalization  
Testing

**Exhaust Only  
Fan System:**  
Depends on leaky  
outside walls for  
OA and sealed  
interior shared  
walls to eliminate  
transferred air  
between dwelling  
units.

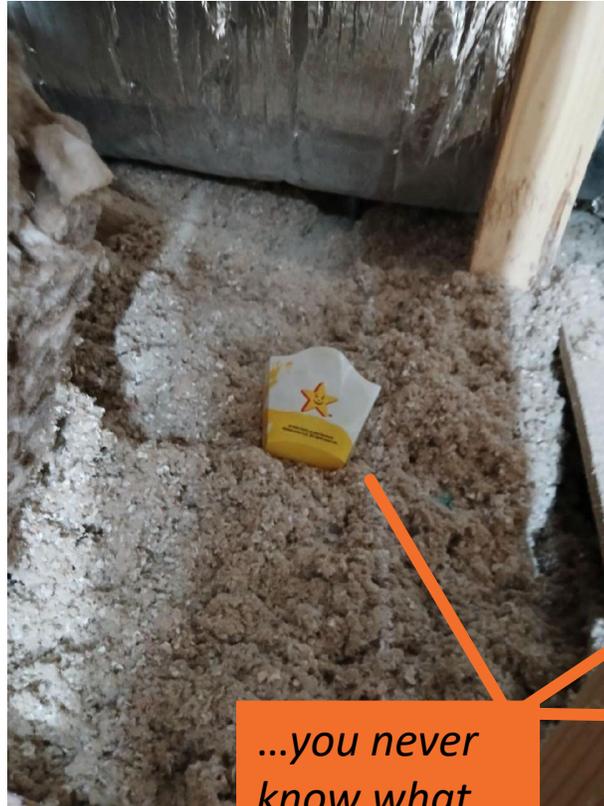


# HVAC –Duct Leakage Testing and other HERS Credits

# HVAC Attic Access and the Typical Residential Attic



*...not a staged 'poser' shot!*



*...you never know what you'll find...*

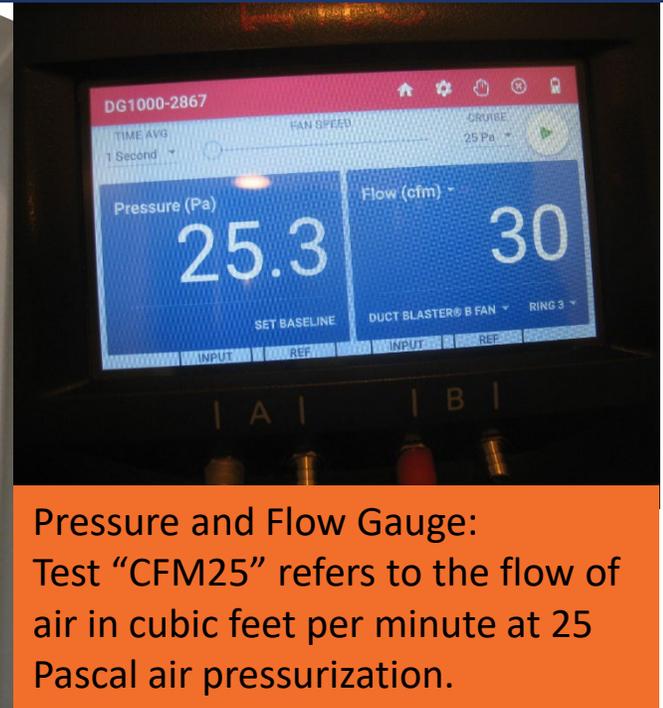
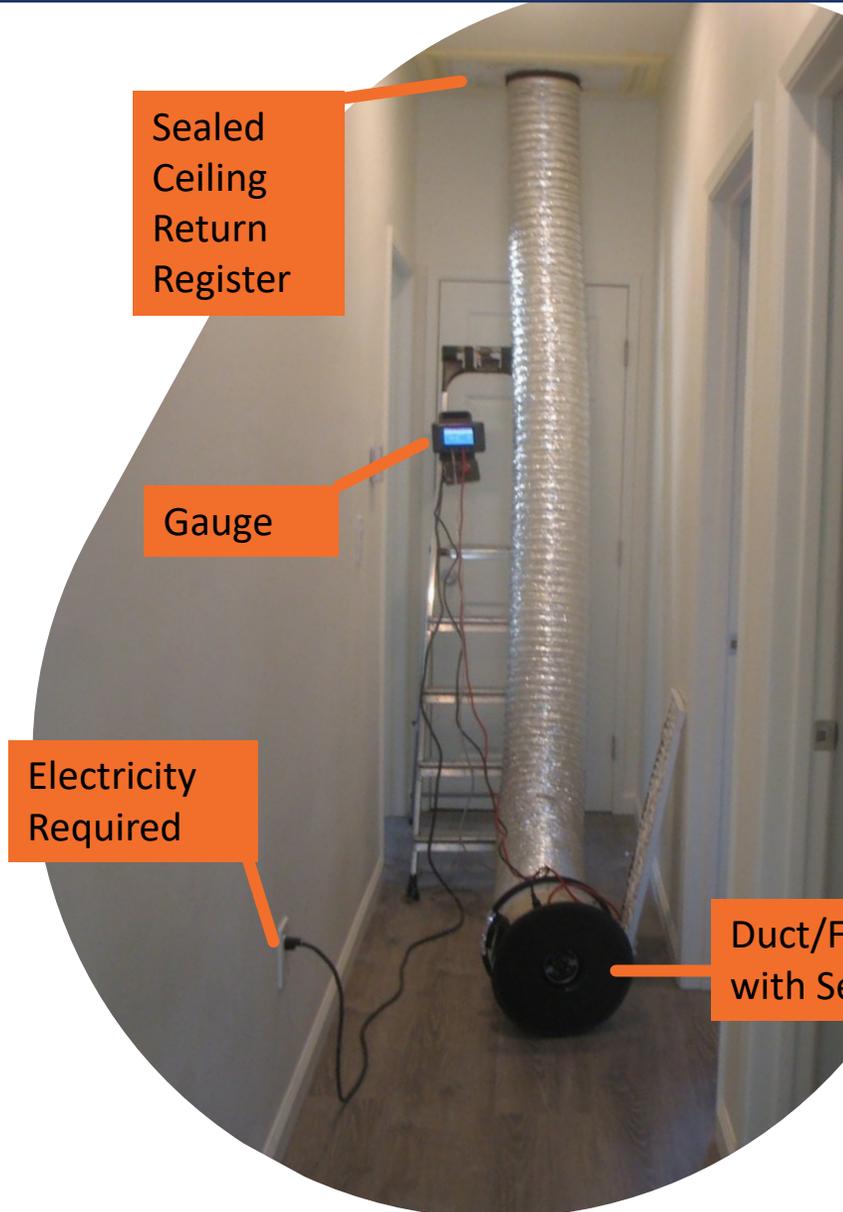


“...just another day in attic life.” --P.D., HERS Rater



# 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



# Duct and Air-Handler Leakage

## Assumed Four Cases on a CF1R

Case	Duct Leakage	Air Handler Leakage	Total Duct/Air Handler Leakage
Duct systems in existing single-family houses	10%	Included in duct leakage	10%
Sealed and tested new or altered duct systems in unconditioned or conditioned space in a townhome or single-family home	5%	2%	7%
Verified low-leakage ducts in conditioned space	0%	0%	0%
Low leakage air handlers in combination with sealed and tested new duct systems	5% or as measured	0%	5% or as measured

These values are what a duct and/or low-leakage air-handler system(s) are compared to for Performance compliance credit.

**Note:**  
Low Leakage Air Handlers (LLAH) often 1.4% or less, must be on CEC list of approved air handlers.



Table 21: Duct/Air Handler Leakage  
Source: [California Energy Commission](#)

# Duct and HVAC Leakage Testing –MCH-20 Series

## CF1R-PRF-01-E

### HERS FEATURE SUMMARY

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

- Quality insulation installation (QII)
- Indoor air quality ventilation
- Kitchen range hood
- Minimum Airflow
- Verified EER/EER2
- Verified SEER/SEER2
- Fan Efficacy Watts/CFM
- Duct leakage testing
- Low-leakage Air Handling Unit

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

### HVAC DISTRIBUTION - HERS VERIFICATION

	01	02	03	04	05	06	07	08	09
Name		Duct Leakage Verification	Duct Leakage Target (%)	Verified Duct Location	Verified Duct Design	Buried Ducts	Deeply Buried Ducts	Low-leakage Air Handler	Low Leakage Ducts Entirely in Conditioned Space
Air Distribution System 1-hers-dist		Yes	5.0	Not Required	Not Required	Not Required	Credit not taken	Required	No

### HERS 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-20a-H Duct Leakage Diagnostic Test - New Construction
- CF2R-MCH-20b-H Duct Leakage Diagnostic Test - LLDCS (Low Leakage Ducts in Conditioned Space)
- CF2R-MCH-20c-H Duct Leakage Diagnostic Test - LLAHU (Low Leakage Air Handler Unit)
- CF3R-MCH-20a Duct Leakage Diagnostic Test - New Construction
- CF3R-MCH-20b Duct Leakage Diagnostic Test - LLDCS (Low Leakage Ducts in Conditioned Space)
- CF3R-MCH-20c-H Duct Leakage Diagnostic Test - LLAHU (Low Leakage Air Handler Unit)



# Duct Leakage Diagnostic Testing

## CF2R and CF3R-MCH-20-H



CALIFORNIA ENERGY COMMISSION

### DUCT LEAKAGE DIAGNOSTIC TEST

CEC-CF2R-MCH-20-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

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)?	

#### MCH-20a - Completely New Duct System

#### B. Duct Leakage Diagnostic Test

01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	
02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	



# 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 HERS Registry.

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

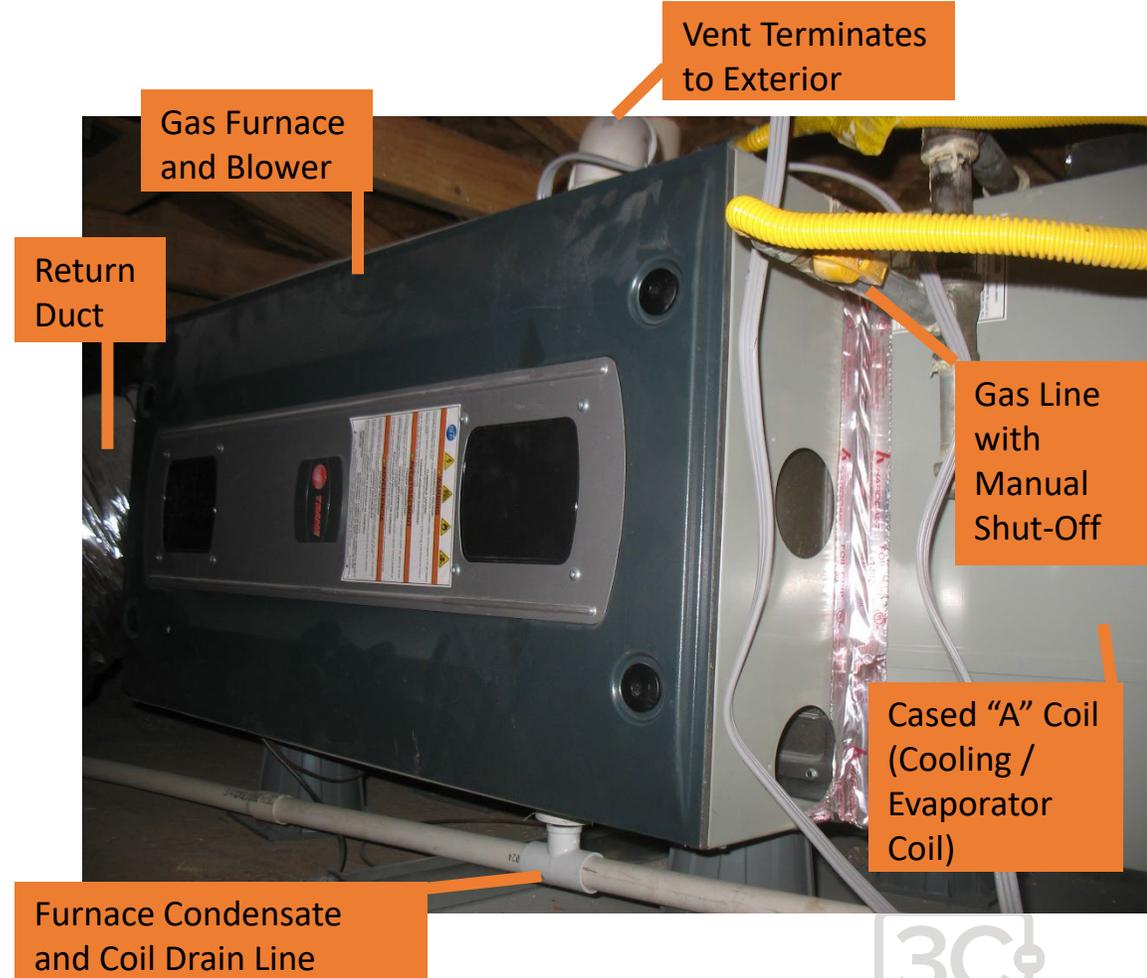
**A. System Information**

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)?	

**MCH-20a - Completely New Duct System**

**B. Duct Leakage Diagnostic Test**

01	Air-Handling Unit Airflow (AHU Airflow) Determination Method	
02	Condenser Nominal Cooling Capacity (ton)	
03	Indoor Unit Nominal Cooling Capacity	
04	Heating Capacity (kBtu/h)	
05	Conditioned Floor Area Served by this HVAC System (ft <sup>2</sup> )	
06	Measured AHU Airflow (cfm)	
07	Duct Leakage Test Conditions	



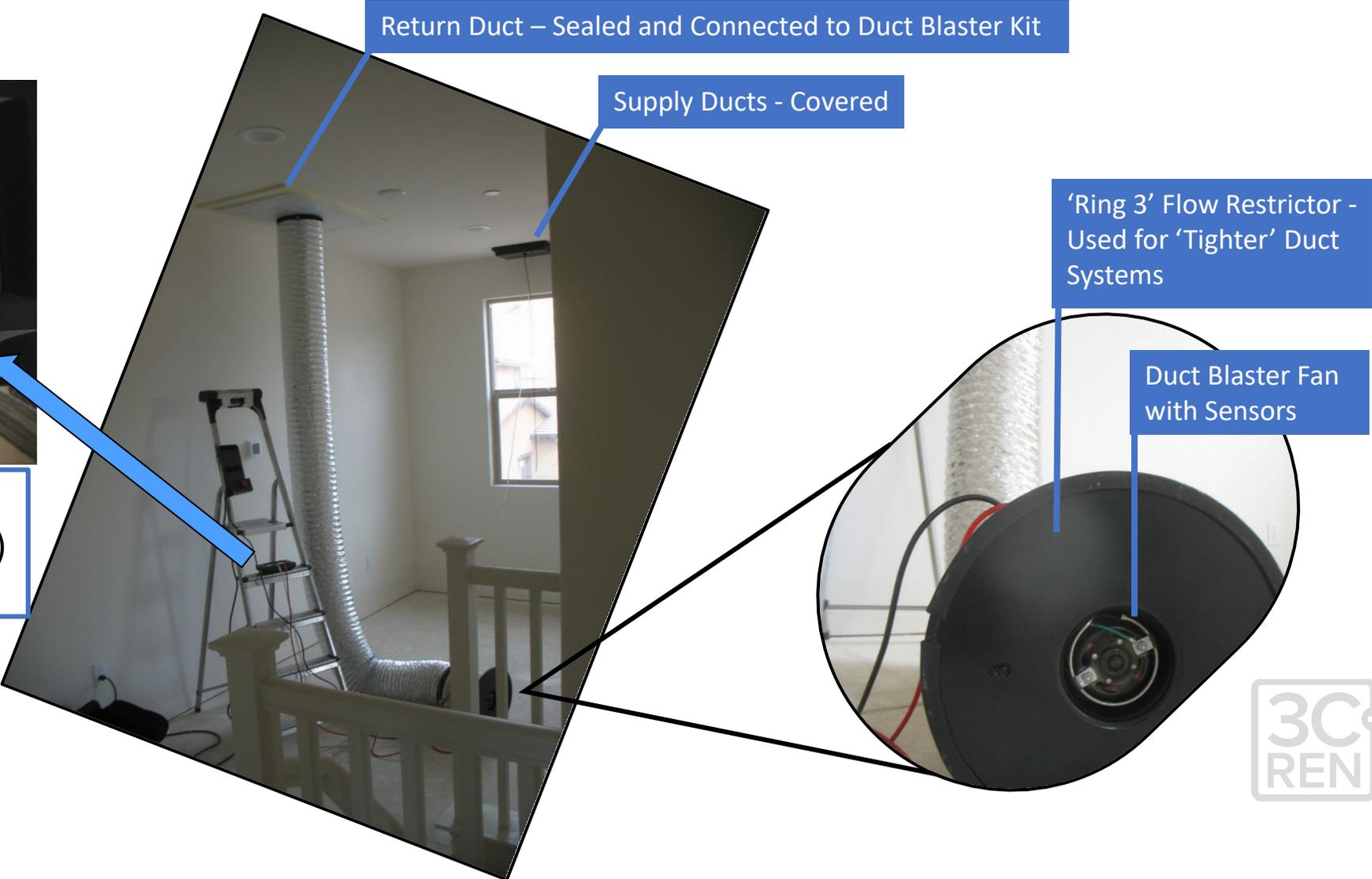
**Trane 2-Stage Gas Furnace S9X2 Series  
 Horizontal Attic Install with Trane "A" Coil**



# Gas Furnace Air-Handler and Air-Conditioning Duct Leakage Diagnostic Test

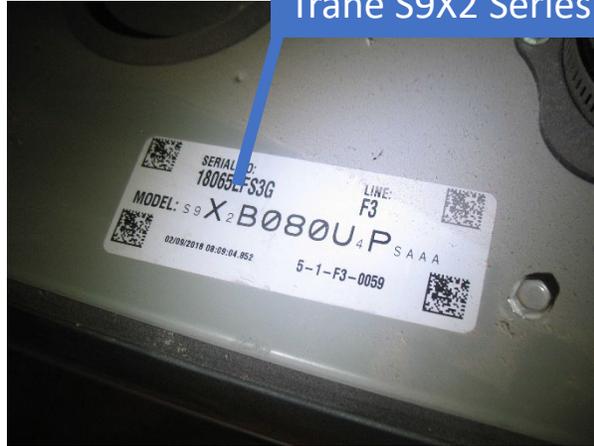


**Flow and Pressure Results:**  
38 cubic feet per minute (cfm)  
at 25.3 Pascals (Pa)



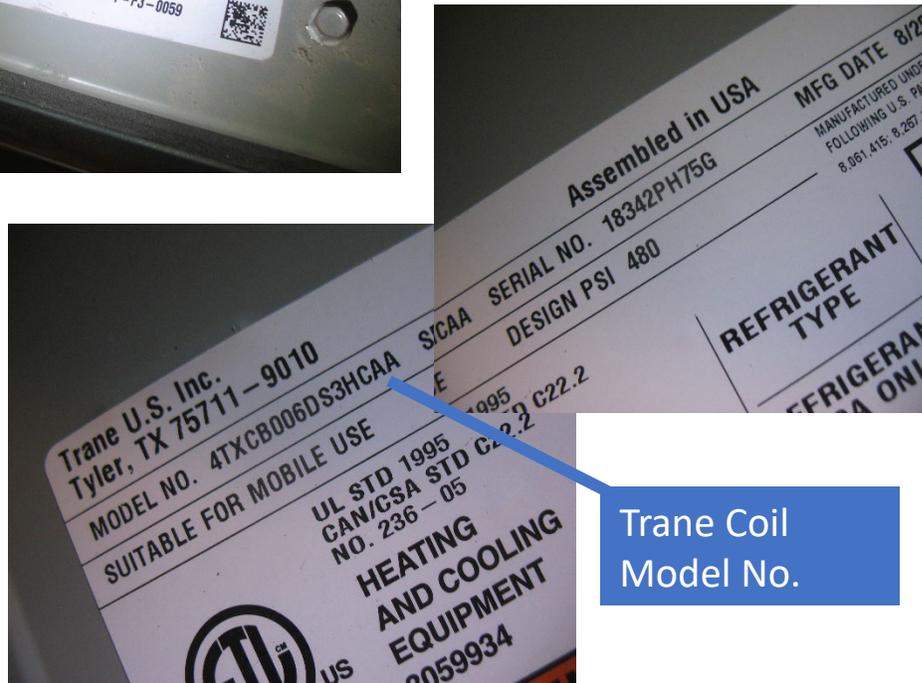
# Gas Furnace Air-Handler and Air-Conditioning Duct Leakage Diagnostic Test

Trane S9X2 Series Furnace Model No.



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

Trane Coil Model No.



**AHRI CERTIFIED**  
www.ahridirectory.org

## Certificate of Product Ratings

AHRI Certified Reference Number : 9973384    Date : 03-17-2024    Model Status : Discontinued    Model Discontinued Date : 03-07-2020

Brand Name : TRANE  
Series Name : TRANE S9X2  
Model Number : S9X2B080U4PSA\*\*

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, (%) : 95.0  
Output Heating Capacity (MBTUH) : 77

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

Input Rating (MBTUH) : 80  
Ef (MMBTU/yr) : 79.4  
Eac including Es0(kWh/yr) : 440  
PE (watts) : 101  
Configuration : Horizontal, Upflow  
Lowboy : No  
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

††Date when model status changed to Discontinued  
‡Models with "Discontinued" Model Status are those that an AHRI Certification Program Participant no longer produces AND is no longer 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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The information for the model cited on this certificate can be verified at [www.ahridirectory.org](http://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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**CERTIFICATE NO.:** 133551888563055521

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AIR-CONDITIONING, HEATING,  
& REFRIGERATION INSTITUTE  
we make life better™

# Split System Heat Pump with Indoor Air-Handler

## Duct Leakage Diagnostic Test CF3R-MCH-20-H

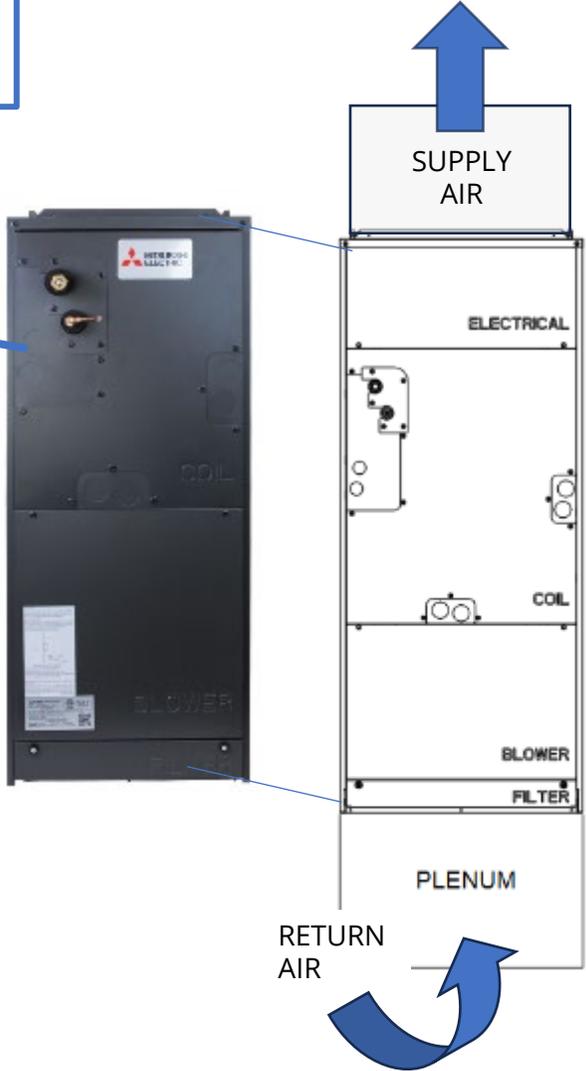


**Flow and Pressure Results:**  
30 cubic feet per minute (cfm)  
at 25.0 Pascals (Pa)



Return Duct –  
Sealed and  
Connected to  
Duct Blaster Kit

Indoor Air-  
Handler



Outdoor Unit –Heat Pump  
Condenser/Compressor



Supply Ducts - Covered

# Split System Heat Pump with Indoor Air-Handler

## Rated Equipment Performance Verification CF3R-MCH-26-H

Mitsubishi Electric  
PUZ Series Model No.

**Rated Space Conditioning System Equipment Verification**  
 CALIFORNIA ENERGY COMMISSION CEC-CF3R-MCH-26-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. System Information**

Procedures for verification of High SEER/SEER2 and EER/EER2 Equipment are described in Reference Appendix RA3.4. Each HVAC system requiring verification must use a separate form.

01	Space Conditioning System Identification or Name	
02	Space Conditioning System Description of Area Served	
03a	Efficiency Metric	
03	Status: SEER/SEER2 Performance Compliance Credit Check	
04	Status: EER/EER2 Performance Compliance Credit Check	
05	Status: Heat Pump Heating Output Performance Compliance Check	
06	Status: HSPF/HSPF2 Performance Compliance Credit Check	
07	Directory Used to Certify Product Performance	
08	AHRI Certification Number for the Installed Space Conditioning System from <a href="http://www.ahridirectory.org">http://www.ahridirectory.org</a>	
09	Does the directory used to certify product performance require a specific air handler, furnace or fan coil make and model?	
10	Does the directory used to certify product performance require a time delay relay (+TDR)?	
11	Does the directory used to certify product performance require a TXV (+TXV)?	

**B. Rated Space Conditioning System Equipment Information from Nameplate of the Installed System**

The data on the nameplate of the installed component shall conform to the data for the component as shown in the Directory used to certify product performance in order to demonstrate compliance.

01	02	03	04	Data from nameplate of installed system component					
SC System ID/Name from CF1R	SC System Description of Area Served	Indoor Unit Name or Description of Area Served	Installed Indoor Unit Type	Outdoor Condenser or Package Unit - Installed Manufacturer Name	Outdoor Condenser or Package Unit - Installed Model Number	Indoor Unit - Installed Manufacturer Name	Indoor Unit - Installed Model Number	Installed Furnace Manufacturer Name	Installed Furnace Model Number



**HERS Work Flow:**

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



**Certificate of Product Ratings**

AHRI Certified Reference Number : 201754547 Date : 03-18-2024 Model Status : Active  
 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-A36NKA7\*\*\*  
 Indoor Type : Mini-Splits (Ducted)  
 Indoor Model Number(s) : PVA-A36AA\*

Rated as follows in accordance with the latest edition of AHRI 210/240 - 2017 with Addendum 1, 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 (A2) - Single or High Stage (95F), btuh : 36000  
 SEER : 19.30  
 EER (A2) - Single or High Stage (95F) : 9.80  
 Heating Capacity (H12) - Single or High Stage (47F) : 38000  
 HSPF (Region IV) : 9.50

Rated as follows in accordance with the latest edition of AHRI 210/240 - 2023, 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<sub>1+2</sub>) - Single or High Stage (95F), btuh : 36000  
 SEER2 : 19.80  
 EER2 (A<sub>1+2</sub>) - Single or High Stage (95F) : 11.00  
 Heating Capacity (H<sub>1+2</sub>) - Single or High Stage (47F), btuh : 42000  
 HSPF2 (Region IV) : 8.70

Sold in?: USA, Canada

\*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.

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**CERTIFICATE VERIFICATION**

The information for the model cited on this certificate can be verified at [www.ahridirectory.org](http://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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CERTIFICATE NO.: 133552620569036750



# Refrigerant Charge – MCH-25-H Series

Paul says, “Please, coordinate the HERS Rater and 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)?	



Installing Contractor

Heat Pump – Outdoor Unit

Refrigerant

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

DUCT LOCATION	
 CALIFORNIA ENERGY COMMISSION <b>SAMPLE FORM – NOT VALID FOR SUBMISSION TO BUILDING DEPARTMENTS</b>	
CEC-CF3R-MCH-21-H	
<b>CERTIFICATE OF VERIFICATION</b>	
<b>Note:</b> This table completed by HERS Registry.	
Project Name:	Enforcement Agency:
Dwelling Address:	Permit Number:
City and Zip Code:	Permit Application Date:
<b>A. General Information</b>	
<b>Note:</b> 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>B. 12 Linear Feet or Less of Duct Located Outside of Conditioned Space - RA3.1.4.1.2</b>	
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: <ul style="list-style-type: none"> <li><input type="checkbox"/> Pass - all applicable requirements are met; or</li> <li><input type="checkbox"/> Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or</li> <li><input type="checkbox"/> All N/A - This entire table is not applicable</li> </ul>
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.	
<b>C. Ducts Located In Conditioned Space - RA3.1.4.1.3</b>	
01	A visual inspection shall confirm the space conditioning system is located entirely in conditioned space.
02	Verification Status: <ul style="list-style-type: none"> <li><input type="checkbox"/> Pass - all applicable requirements are met; or</li> <li><input type="checkbox"/> Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or</li> <li><input type="checkbox"/> All N/A - This entire table is not applicable</li> </ul>
03	Correction Notes:

## 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

## HERS Scope:

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

Drywall and Taped Ceiling for Continuous Air Barrier -- Soffit needs a 'Lid' at Ceiling



Ducts in Soffit Below Ceiling



# 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:	<input type="checkbox"/> Pass - all applicable requirements are met; or <input type="checkbox"/> Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or <input type="checkbox"/> 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:	<input type="checkbox"/> Pass - all applicable requirements are met; or <input type="checkbox"/> Fail - one or more applicable requirements are not met. Enter reason for failure in corrections notes field below; or <input type="checkbox"/> All N/A - This entire table is not applicable
03	Correction Notes:	



Forced Air Unit (FAU) / Air Handler and Return Plenum in Garage



Forced Air Unit (FAU) / Air Handler and Return Plenum in Crawlspace

- Less than 12 Linear Feet Duct in Unconditioned Space
- Measure Includes Air Handler and Plenum

# Variable Capacity Heat Pump Compliance Credit

## CF3R-MCH-33-H

CERTIFICATE OF VERIFICATION	CF3R-MCH-33-H
Variable Capacity Heat Pump Compliance Credit	(Page 2 of 4)

**C. Verification: Ducted Indoor Units Located Entirely in Directly Conditioned Space - RA3.1.4.3.8**

This section does not apply to this project.

**D. Verification: Ductless Indoor Units Located Entirely in Directly Conditioned Space - RA3.1.4.1.8**  
 A visual inspection shall confirm that ductless indoor units are located entirely in conditioned space in accordance with the procedures of SC3.1.4.1.8.

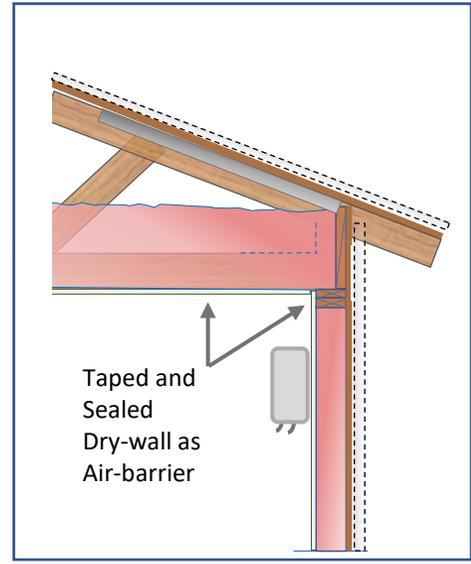
01	02	03
Indoor Unit Name or Description of Area Served	Indoor Unit Installation Location Verification	Compliance Statement
Living Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies
Right Bed Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies
Left Bed Unit	Indoor unit mounted entirely on the surface of walls, ceilings, or floors	Complies

Notes:

**E. Verification: Wall Mounted Thermostats - SC3.4.5**  
 Field verification according to the procedure in SC3.4.5 shall confirm that VCHP space conditioning zones that are greater than 150 ft<sup>2</sup>, are controlled by a permanently installed wall-mounted thermostat.

01	02	03	04	05
Indoor Unit Name or Description of Area Served	Is a Wall-mounted Thermostat Installed in the Zone Served by the Indoor Unit?	Does the Thermostat Control the Zone's Indoor Unit?	Is the Thermostat Mounted Permanently to the Wall?	Compliance Statement
Living Unit	Yes	Yes	Yes	Complies
Right Bed Unit	Yes	Yes	Yes	Complies
Left Bed Unit	Yes	Yes	Yes	Complies

Notes:

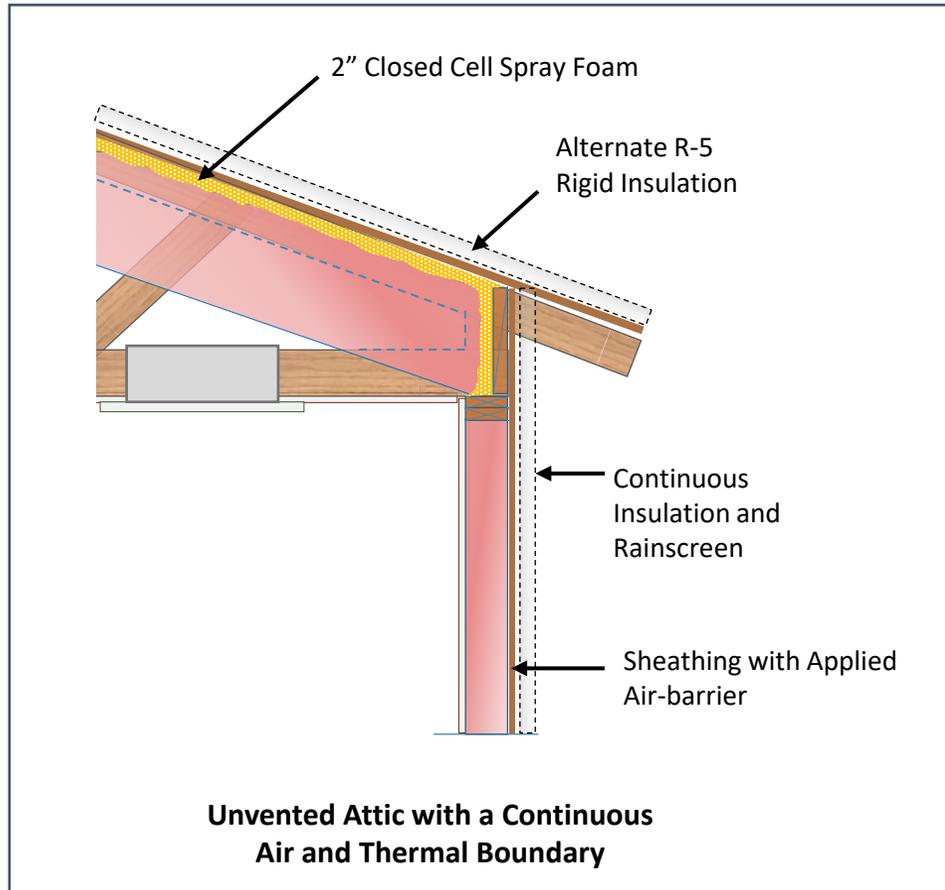


**Ductless Indoor Unit within the Air and Thermal Boundary**

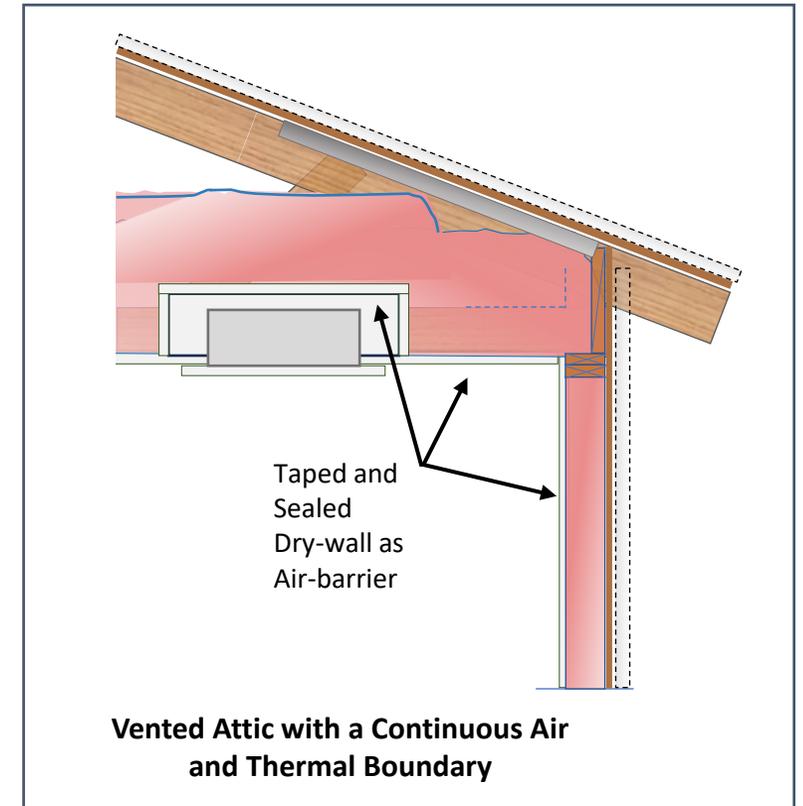
- HERS Work Flow:**
- Triggered on CF1R
  - Framing Stage - Construction Site Meeting
  - Triggers MCH-25-H Refrigerant Charge
  - Verification at both Install and Final

# Reminder: VCHP Compliance Option –Ceiling Recessed Units Impacts Envelope Enclosure

Indoor units shall be installed within the air and thermal boundaries

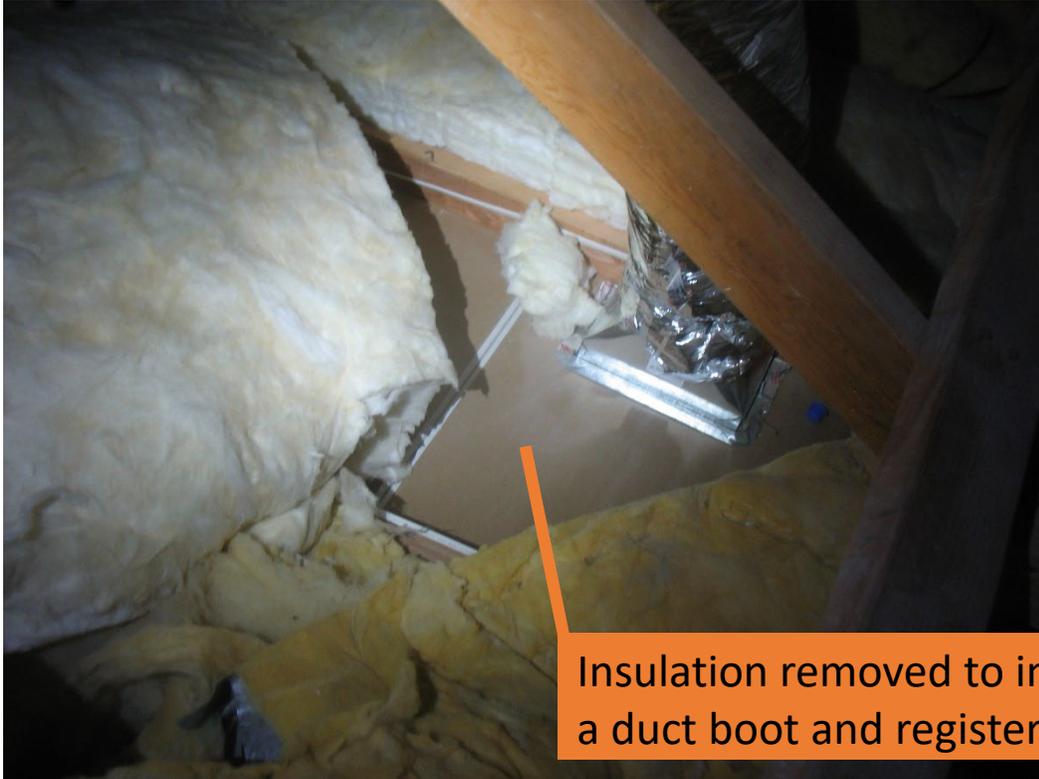


**Ductless Recessed-Ceiling**



# 'Design – Construction – Verification' is a Team Sport

- Well executed job site work flow makes 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.



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

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



Happy  
HERS Rater



# Consider Including Key HERS Measures on the Cover Sheet

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

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

**EXAMPLE PROJECT**  
4630 NOGALES AVE., ATASCADERO, CA 93422  
INITIAL SUBMITTAL DATE: [REDACTED]  
PMT # [REDACTED]

**GENERAL NOTES**

**PROJECT DATA**

**SHEET INDEX**

**GOVERNING CODE**

**SUPPORTING DOCUMENTS**

**VICINITY MAP**

**SUPPORTING DOCUMENTS**

- TITLE 24 ENERGY REPORT
- NOTE: HERS MEASURES REQUIRED ON THIS PROJECT:
  - ALL PIPES INSULATED -HERS
  - EQUIPMENT VERIFICATION -HERS
  - VCHP - CREDIT

EXAMPLE PROJECT

# Questions about Title 24?

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



Online:  
[3c-ren.org/codes](https://3c-ren.org/codes)

Call:  
805.781.1201

Energy Code Coaches are local experts who can help answer your Title 24 questions. Coaches have decades of experience in green building and energy efficiency improvements. They can provide citations and offer advice for your project to help your plans and forms earn approval the first time.

# Closing

- Continuing Education Units Available
  - Contact [shuskey@co.slo.ca.us](mailto:shuskey@co.slo.ca.us) for AIA and ICC LUs
- Coming to Your Inbox Soon!
  - Slides, Recording, & Survey – Please Take It and Help Us Out!
- Upcoming Courses:
  - March 21<sup>st</sup> - [Detailing for High Performance Roofs and Walls](#)
  - March 28<sup>th</sup> - [Multi-Family Domestic Hot Water](#)
  - April 2<sup>nd</sup> - [Introduction to Passive House Standard](#)
  - April 4<sup>th</sup> - [Why Energy Consultants Should Learn to do Residential HVAC Design](#)
  - April 9<sup>th</sup> - [Blower Door Basics and Beyond](#)
- Visit [www.3c-ren.org/events](http://www.3c-ren.org/events) for our full catalog of trainings.





**Thank you!**

For more info:  
[3c-ren.org](https://3c-ren.org)

For questions:  
[info@3c-ren.org](mailto:info@3c-ren.org)



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SAN LUIS OBISPO • SANTA BARBARA • VENTURA