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STATE OF CALIFORNIA

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CEC-CF3R-PLB-22-H (Revised 09/18)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 1 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

A. General Information

01	Dwelling Unit Name	

B. Design HERS Verified Dwelling Unit Water Heating Systems Information

This table reports the water heating system features that were specified on the registered CF1R compliance document for this project.

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Water Heating System ID or Name	Water Heating System Type	Water Heater Type	# of Water Heaters in System	Water Heater Storage Volume (gal)	Fuel Type	Rated Input Type	Rated Input Value	Heating Efficiency Type	Heating Efficiency Value	Standby Loss (%)	Exterior Insul. R-Value	Central DHW System Distribution Type	Dwelling Unit DHW System Distribution Type

C. Installed HERS Verified Dwelling Unit Water Heating Systems Information

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Water Heating System ID or Name	Water Heating System Type	Water Heater Type	# of Water Heaters in System	Water Heater Storage Volume (gal)	Fuel Type	Rated Input Type	Rated Input Value	Heating Efficiency Type	Heating Efficiency Value	Standby Loss (%)	Exterior Insul. R-Value	Central DHW System Distribution Type	Dwelling Unit DHW System Distribution Type
15	Compliance Statement												

D. Installed Water Heater Manufacturer Information

01	02	03
Water Heating System ID or Name	Manufacturer	Model Number

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 2 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

E. Mandatory Measures for All Domestic Hot Water Distribution Systems		
01	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: (RA4.4.1) • The first 5 feet (1.5 meters) of hot and cold water pipes from the storage tank. • All piping with a nominal diameter of 3/4 inch (19 millimeter) or larger. • All piping associated with a domestic hot water recirculation system regardless of the pipe diameter, except when cold water return is used in a demand system. • Piping from the heating source to storage tank or between tanks. • Piping buried below grade. • All hot water pipes from the heating source to the kitchen fixtures. The following sections of pipe do not have to be insulated: (RA4.4.1) • Piping installed in interior or exterior walls that is surrounded on all sides by at least 1 inch of insulation. • Piping installed in attics with a minimum of 4 inches (10 cm) of attic insulation on top • Piping that penetrates framing members shall not be required to have pipe insulation for the distance of the framing penetration. Metal 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.	
02	Piping buried below grade must be installed in a water proof and non-crushable casing or sleeve that allows for installation, removal, and replacement of the enclosed pipe and insulation. (Section 150.0(j))	
03	All elbows and tees shall be fully insulated. (RA4.4.1)	
04	Where insulation is required, no piping shall be visible due to insulation voids, and all insulation shall fit tightly to the pipe. (RA4.4.1)	
05	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
06	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.		

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 3 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

F. HERS-Verified Pipe Insulation Credit Requirements
Systems that utilize this distribution type shall comply with these requirements.

01	All hot water piping shall comply with the insulation requirements in Table 120.3-A. (RA 4.4.14)	
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.

G. HERS-Verified Parallel Piping Requirements
Systems that utilize this distribution type shall comply with these requirements.

01	Each central manifold has 5 feet or less of pipe between manifold and water heater. (RA 4.4.15)	
02	For manifolds that include valves, the manifold must be readily accessible in accordance with the plumbing code. (RA 4.4.4)	
03	Hot water distribution system piping from the manifold to the fixtures and appliances must take the most direct path. For example, piping from a second story manifold cannot supply the first floor. (RA 4.4.4)	
04	The hot water distribution piping must be separated by at least 2 inches from any other hot water supply piping, and at least 6 inches from any cold water supply piping. Alternatively, the hot water supply piping must be insulated to the thicknesses shown in TABLE 120.3-A. (RA 4.4.4)	
05	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
06	Correction Notes:	

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CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 4 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

H. HERS-Verified Compact Hot Water Distribution System Requirements
Systems that utilize this distribution type shall comply with these requirements

01	Total Conditioned Floor Area (ft^2):	
02	Maximum allowed pipe run length from the water heater to the furthest point of use For the floor area served (feet):	
03	The pipe run length from each water heater to the furthest fitting served by that water heater must be no greater than the maximum pipe run length above.	
04	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
05	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.

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 5 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

I. HERS-Verified Demand Recirculation Manual Control Requirements

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. (RA4.4.9/RA4.4.13)	
02	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: (RA4.4.9(f)/RA4.4.13(d)) • 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).	
03	The controls shall limit pump operation to a maximum of 5 minutes for single dwellings, and 10 minutes for multiple dwellings, following any activation. This is provided in the event that the normal means of shutting off the pump have failed. (RA4.4.9(f)3/RA4.4.13(d)3)	
04	Pump and control placement shall meet one of the following criteria: (RA4.4.9(d)/RA4.4.13(b)) • 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).	
05	Insulation is not required on the cold water line when it is used as the return. (RA4.4.9(e)/RA4.4.13(c))	
06	Each control shall have standby power of 1 Watt or less. Controls may be located in individual units or on the loop. Controls may be activated by wired or wireless mechanisms, including buttons, motion sensors, door switches and flow switches. (RA4.4.9(c)/RA4.4.13(a))	
07	If more than one loop installed each loop shall have its own pump and controls	
08	Automatic air release valve is installed on the inlet side of the recirculation pump per Section 110.3(c)5A.	
09	A check valve, or similar device, is located between the recirculation pump and the water heater per Section 110.3(c)5B.	
10	Hose bibb is installed between the pump and the water heating equipment with an isolation valve between the hose bibb and the water heating equipment per Section 110.3(c)5C.	
11	Isolation valves are installed on both sides of the pump. One of the isolation valves may be the same isolation valve as in item 10 above per Section 110.3(c)5D.	
12	The cold water supply piping and the recirculation loop piping is not connected to the hot water storage tank drain port per Section 110.3(c)5E.	
13	A check valve is installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply line per Section 110.3(c)5F.	
14	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
15	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.

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 6 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

J. HERS-Verified Demand Recirculation Sensor Control Requirements

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. (RA4.4.10/RA4.4.13)	
02	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: (RA4.4.10(f)/RA4.4.13(d)) • 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).	
03	The controls shall limit pump operation to a maximum of 5 minutes for single dwellings, and 10 minutes for multiple dwellings, following any activation. This is provided in the event that the normal means of shutting off the pump have failed. (RA4.4.10(f)3/RA4.4.13(d)3)	
04	Pump and control placement shall meet one of the following criteria: (RA4.4.10(d)/RA4.4.13(b)) • 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).	
05	Insulation is not required on the cold water line when it is used as the return. (RA4.4.10(e)/RA4.4.13(c))	
06	Each control shall have standby power of 1 Watt or less. Controls may be located in individual units or on the loop. Controls may be activated by wired or wireless mechanisms, including buttons, motion sensors, door switches and flow switches. (RA4.4.10(c)/RA4.4.13(a))	
07	If more than one loop installed each loop shall have its own pump and controls	
08	Automatic air release valve is installed on the inlet side of the recirculation pump per Section 110.3(c)5A.	
09	A check valve, or similar device, is located between the recirculation pump and the water heater per Section 110.3(c)5B.	
10	Hose bibb is installed between the pump and the water heating equipment with an isolation valve between the hose bibb and the water heating equipment per Section 110.3(c)5C.	
11	Isolation valves are installed on both sides of the pump. One of the isolation valves may be the same isolation valve as in item 10 above per Section 110.3(c)5D.	
12	The cold water supply piping and the recirculation loop piping is not connected to the hot water storage tank drain port per Section 110.3(c)5E.	
13	A check valve is installed on the cold water supply line between the hot water system and the next closest tee on the cold water supply line per Section 110.3(c)5F.	
14	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
15	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.

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CERTIFICATE OF VERIFICATION		CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution		(Page 7 of 8)
Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City:	Zip Code:

K. Determination of HERS Verification Compliance

All applicable sections of this document shall indicate compliance with the specified verification protocol requirements in order for this Certificate of Verification as a whole to be determined to be in compliance.

01	

HERS VERIFIED SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION

CERTIFICATE OF VERIFICATION	CF3R-PLB-22-H
HERS Verified Single Dwelling Unit Hot Water System Distribution	(Page 8 of 8)

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

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Verification documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Company:	Date Signed:
Address:	CEA/HERS Certification Information (if applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Verification is true and correct.
2. I am the certified HERS Rater who performed the verification identified and reported on this Certificate of Verification (responsible rater).
3. The installed features, materials, components, manufactured devices, or system performance diagnostic results that require HERS verification identified on this Certificate of Verification comply with the applicable requirements in Reference Appendices RA2, RA3, and the requirements specified on the Certificate of Compliance for the building approved by the enforcement agency.
4. The information reported on applicable sections of the Certificate(s) of Installation (CF2R) signed and submitted by the person(s) responsible for the construction or installation conforms to the requirements specified on the Certificate(s) of Compliance (CF1R) approved by the enforcement agency.
5. I will ensure that a registered copy of this Certificate of Verification shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Verification is required to be included with the documentation the builder provides to the building owner at occupancy.

BUILDER OR INSTALLER INFORMATION AS SHOWN ON THE CERTIFICATE OF INSTALLATION

Company Name (Installing Subcontractor, General Contractor, or Builder/Owner):	
Responsible Builder or Installer Name:	CSLB License:

HERS PROVIDER DATA REGISTRY INFORMATION

Sample Group Number (if applicable):	Dwelling Test Status in Sample Group (if applicable):

HERS RATER INFORMATION

HERS Rater Company Name:	
Responsible Rater Name:	Responsible Rater Signature:
Responsible Rater Certification Number w/ this HERS Provider:	Date Signed:

CF3R-PLB-22-H User Instructions

A. Dwelling Unit Name

01 This identifies the dwelling unit on this form and is reference from the CF1R. One form is required for each dwelling unit in the building.

B. Design Central Water Heating Systems Information

This table reports the water heating system features that were specified on the registered CF1R compliance document for this project. For information only and requires no user input.

C. Installed Central Water Heating Systems Information

This table reports the water heating system information that is being installed. Require one line for each central system.

01 Water Heating System ID or Name – Reference information from CF1R.
02 Water Heating System Type – Reference information from CF1R. The different kinds of water heating system type are DHW or Combined Hydronic.
03 Water Heater Type – Information from CF1R. The different kinds of water heaters are Large/Commercial Storage, Small/Consumer Storage, Residential-Duty Commercial Sotrage, Heat Pump, Boiler, Large/Commercial Instantaneous, Small/Consumer Instantaneous, Residential-Duty Commercial Instantaneous or Indirect.
04 # of Water Heaters in system – Reference information from CF1R.
05 Water Heater Storage Volume (gal) – User input. Value may be N/A if water heater type is instantaneous with zero storage.
06 Fuel Type – Reference information from CF1R. The different kinds of fuel types are natural gas, propane, oil, or electricity.
07 Rated Input Type – Reference information from CF1R. For natural gas, propane and oil fuel type the input type is Btu/Hr. For electric the input type is kW.
08 Rated Input Value – User input. Numerical value of the rated input. Must be equal to or less than value indicated on the CF1R.
09 Heating Efficiency Type – Reference information from CF1R. Different efficiency types are Energy Factor, AFUE, UEF and Thermal Efficiency.
10 Heating Efficiency Value – User input. Numerical value of the Heating Efficiency. Must be equal to or higher efficiency than value indicated on the CF1R.
11 Standby Loss – User input. Must be equal to or less than value indicated on the CF1R. Value may be N/A if CF1R value is N/A.
12 Exterior Insul. R-Value – User input. Must be equal to or higher than value indicated on the CF1R. Value may be N/A if CF1R value is N/A.
13 Central DHW System Distribution Type - Reference information from CF1R.
14 Dwelling Unit DHW System Distribution Type - Reference information from CF1R.

D. Installed Water Heater Manufacturer Information

This table reports the manufacturer information of the installed water heater(s). Require one line for each installed water heater.

01 Water Heating System ID or Name – Reference information from CF1R.
02 Manufacturer – User input. Enter the name of the water heater manufacturer.
03 Model Number – User input. Enter the model number of the water heater.

E. Mandatory Measures for All Domestic Hot Water Distribution Systems

This table lists the requirements for all central recirculation systems. HERS rater must ensure all the requirements in this table are met.

F. HERS-Verified Pipe Insulation Credit Requirements
This table only applies to systems indicated in B14 and C14 as **HERS-Verified Pipe Insulation Credit.** In addition to the mandatory requirements in Table E, the HERS rater must ensure the requirements in this table are met.

G. HERS-Verified Parallel Piping Requirements
This table only applies to systems indicated in B14 and C14 as **HERS-Verified Parallel Piping.** In addition to the mandatory requirements in Table E, the HERS rater must ensure the requirements in this table are met.

H. HERS-Verified Compact Hot Water Distribution System Requirements
This table only applies to systems indicated in B14 and C14 as **HERS-Verified Compact Hot Water Distribution System.** In additional the mandatory requirements in Table E, the HERS rater must ensure the distance between the water heater to furthest point of water use does not exceed the maximum indicated in Table H1 below. Calculated the Floor Area Served by dividing the conditioned floor area by the number of installed water heaters (Floor Area Served= CFA/# of WH). In addition all hot water lines shall be insulated.

TABLE H1
Compact Hot Water Distribution System-(CHWDS)

Floor Area Served (ft2)	Maximum Measured Water Heater To Use Point Distance (ft)
< 1000	28
1001 – 1600	43
1601 – 2200	53
2201 – 2800	62
>2800	68

I. HERS-Verified Demand Recirculation Manual Control Requirements
This table only applies to systems indicated in B14 and C14 as **HERS-Verified Demand Recirculation Manual Control.** In addition to the mandatory requirements in Table E, the HERS rater must ensure the requirements in this table are met.

J. HERS-Verified Demand Recirculation Sensor Control Requirements
This table only applies to systems indicated in B14 and C14 as **HERS-Verified Demand Recirculation Sensor Control.** In addition to the mandatory requirements in Table E, the HERS rater must ensure the requirements in this table are met.