# SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION



| CERTIFICATE OF INSTALLATION | | CF2R-PLB-02-E |
|---|---|---|
| Single Dwelling Unit Hot Water System Distribution | | (Page 1 of 5) |
| Project Name: | Enforcement Agency: | Permit Number: |
| Dwelling Address: | City: | Zip Code: |

**A. Design Dwelling Unit Water Heating Systems Information**

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

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Water Heating System ID or Name | Water Heating System Type | Water Heater Type | # of Water Heaters in System | Fuel Type | Rated Input Type | Rated Input Value | Central DHW System Distribution | Dwelling Unit DHW System Distribution Type | Compact Distrib. |
| | | | | | | | | | |
| | | | | | | | | | |

**B. Installed Dwelling Unit Water Heating Systems Information**

This table reports the water heating system features installed in this project.

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| Water Heating System ID or Name | Water Heating System Type | Water Heater Type | # of Water Heaters in System | Fuel Type | Rated Input Type | Rated Input Value | Central DHW System Distribution | Dwelling Unit DHW System Distribution Type | Compact Distrib. |
| | | | | | | | | | |
| | | | | | | | | | |

**C. Design Dwelling Unit Water Heating Efficiency Information**

This table reports the water heater(s) efficiency features specified on the registered CF1R compliance document for this project. (Not needed for central systems)

| 01 | 02 | 03 | 04 | 05 | 06 | 07 |
|---|---|---|---|---|---|---|
| Water Heating System ID or Name | Heating Efficiency Type | Heating Efficiency Value | Standby Loss (%) | Exterior Insulation R-Value | Water Heater Storage Volume (gal) | Tank location |
| | | | | | | |
| | | | | | | |

**D. Installed Dwelling Unit Water Heating Efficiency Information**

This table reports the water heater(s) efficiency features specified on the registered CF1R compliance document for this project. (Not needed for central systems)

| 01 | 02 | 03 | 04 | 05 | 06 | 07 |
|---|---|---|---|---|---|---|
| Water Heating System ID or Name | Heating Efficiency Type | Heating Efficiency Value | Standby Loss (%) | Exterior Insulation R-Value | Water Heater Storage Volume (gal) | Tank location |
| | | | | | | |
| | | | | | | |

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**E. Installed Water Heater Manufacturer Information**

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

**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-12 or combination of R-16 internal and external Insulation. (Section 110.3(c)4). |
| 03 | 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. In addition, the following piping conditions shall have a minimum insulation wall thickness of 1 inch or a minimum insulation R-value of 7.7 (RA4.4.1)<br>• The first 5 feet (1.5 meters) of cold water pipes from the storage tank.<br>• All piping with a nominal diameter of 3/4 inch (19 millimeter) and less than 1 inch.<br>• All hot water piping from the heating source to the kitchen fixtures.<br>• All underground piping.<br>▪ insulation buried below grade must be installed in a water proof and non-crushable casing or sleeve<br>• Piping from the heating source to storage tank or between tanks<br>• 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.<br>• Piping installed in interior or exterior walls that is surrounded on all sides by at least 1 inch (5 cm) of insulation.<br>• Piping installed in crawlspace with a minimum of 1 inches (5 cm) of crawlspace insulation above and below.<br>• Piping installed in attics with a minimum of 4 inches (10 cm) of attic insulation on top<br>• Pipe insulation shall fit tightly and all elbows and tees shall be fully insulated. |
| 04 | For Gas or Propane Water Heaters: Ensure the following are installed (Section 150.0(n))<br>• A dedicated 125V, 20A electrical receptacle connected to the electric panel with a 120/240V 3 conductor, 10 AWG copper branch circuit, within 3 feet from the water heater and accessible with no obstructions;<br>▪ The conductor shall be labeled with the work “Spare” on both ends; and<br>▪ A reserved single pole circuit breaker space next to the circuit breaker next to the branch circuit in A labeled “Future” 240V shall be provided.<br>• A Category III or IV vent, or a Type B vent with straight pipe between outside and water heater<br>• A condensate drain no more than 2 inches higher than the base on water heater for natural draining<br>• A gas supply line with capacity of at least 200,000 Btu/hr |
| **The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

**G. Compact Hot Water Distribution Basic (CHWDS) (RA4.4.6)**
This table reports the inputs and results for CHWDS.

| | | |
|---|---|---|
| 01 | Master Bath distance of furthest fixture to Water Heater in feet | |
| 02 | Kitchen distance from furthest fixture to Water Heater in feet | |
| 03 | Furthest Third furthest fixture to Water Heater in feet | |
| 04 | Weighted Distance | |
| 05 | Qualification Distance | |
| **The responsible person’s signature on this compliance document affirms that all applicable requirements in this table have been met.** | | |

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| **H. Parallel Piping Requirements (PP) (RA4.4.4)** Systems that utilize this distribution type shall comply with these requirements. | |
|---|---|
| 01 | Each central manifold has 15 feet or less of pipe between manifold and water heater |
| 02 | For manifolds that include valves, the manifold must be readily accessible in accordance with the plumbing code. |
| 03 | Hot water distribution system piping from the manifold to the fixtures and appliances must take the most direct path. For instance, piping from a second story manifold cannot supply the first floor |
| 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. |
| **The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

| **I. Point of Use Requirements (POU) (RA4.4.5)** Systems that utilize this distribution type shall comply with these requirements | |
|---|---|
| 01 | All hot water supply pipe run lengths are equal to or less than the maximum values shown below, based on the pipe diameter. If a combination of piping is used in a single run, then one half the allowed length of each size is the maximum installed length.<br>The maximum allowed length of piping for the longest run terminating in:<br><br>3/8 inch - For only one pipe size - max length allowed is 15 feet<br>For combination pipe sizes the max allowed length of 3/8-inch piping is 7.5 feet, of ½ inch piping is 5 feet, and ¾ inch piping is 2.5 feet.<br><br>½ inch - For only one pipe size – max length allowed is 10 feet<br>For combination pipe sizes the allowed length of ½-inch piping is 5 feet, and ¾ inch piping is 2.5 feet.<br><br>¾ inch - For only one pipe size = 5 feet |
| **The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

| **J. Mandatory Requirements for all Recirculation Systems (RA4.4.7)** Systems that utilize this distribution type shall comply with these requirements. | |
|---|---|
| 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. |
| **The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

| **K. Recirculation Non-Demand Controls Requirements (R-ND) (RA4.4.8)** Systems that utilize this distribution type shall comply with these requirements. | |
|---|---|
| 01 | The active control shall be either: timer, temperature, or time and temperature. Timers shall be set to less than 24 hours. The temperature sensor shall be connected to the piping and to the controls for the pump. |
| **The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

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| **L. Demand Recirculation Manual Control (R-DRmc) (RA4.4.9)/Sensor Control Requirements (RDRsc) (RA4.4.10)** Systems that utilize this distribution type shall comply with these requirements. | |
|---|---|
| 01 | The system operates "on-demand", meaning that the pump begins to operate shortly before or immediately after hot water draw begins, and stops when the return water temperature reaches a certain threshold value. For Demand Recirculation Manual Control, the pump shall be turned on using a manual switch system. For Demand Recirculation Sensor Control, the pump shall be turned on using a sensor system. |
| 02 | The controls shall be located in the kitchen, bathroom, and any hot water fixture location that is at least 20 feet from the water heater. |
| 03 | Manual controls may be 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:<br>• 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<br>• 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<br>• 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:<br>• Not more than 10°F (5.6°C) above the initial temperature of the water in the pipe<br>• Not more than 102°F (38.9°C). |
| 07 | Controls shall limit operation to no more than 5 minutes following activation. |
| **The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.** | |

| **M. Compliance Statement** |
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| |

# SINGLE DWELLING UNIT HOT WATER SYSTEM DISTRIBUTION



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| **DOCUMENTATION AUTHOR'S DECLARATION STATEMENT** | |
|---|---|
| 1. I certify that this Certificate of Installation documentation is accurate and complete. | |
| Documentation Author Name: | Documentation Author Signature: |
| Documentation Author Company Name: | Date Signed: |
| Address: | CEA/HERS Certification Identification (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 Installation is true and correct.
2. I am either: a) a responsible person eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation, and attest to the declarations in this statement, or b) I am an authorized representative of the responsible person and attest to the declarations in this statement on the responsible person's behalf.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations and the installation conforms to the requirements given on the Certificate of Compliance, plans, and specifications approved by the enforcement agency.
4. I will ensure that a registered copy of this Certificate of Installation 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 Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

| Responsible Builder/Installer Name: | Responsible Builder/Installer Signature: | |
|---|---|---|
| Company Name: (Installing Subcontractor or General Contractor or Builder/Owner) | Position With Company (Title): | |
| Address: | CSLB License: | |
| City/State/Zip: | Phone: | Date Signed: |

**CF2R-PLB-02-E User Instructions**

**A. Design 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. For information only and requires no user input.

**B. Installed Dwelling Unit Water Heating Systems Information**

This table reports the water heating system information that is being installed. Require one line for each 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 Storage, 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 Fuel Type –The different kinds of fuel types are heat pump, electric resistance, natural gas, and propane.
06 Rated Input Type – Reference information from CF1R. For natural gas and propane, the input type is Btu/hr. For heat pump and electric resistance the input type is kW.
07 Rated Input Value – User input. Numerical value of the rated input. Must be equal to or less than value indicated on the CF1R.
08 Central DHW System Distribution - Reference information from CF1R.
09 Dwelling Unit DHW System Distribution Type - Reference information from CF1R.
10 Compact Distribution - Reference information from CF1R.

**C. Design Dwelling Unit Water Heating Efficiency 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.

**D. Installed Dwelling Unit Water Heating Efficiency Information**

This table reports the water heating system information that is being installed. Require one line for each system. Not applicable for central systems.

01 Water Heating System ID or Name – Reference information from CF1R
02 Heating Efficiency Type – Reference information from CF1R. Different efficiency types are Energy Factor, AFUE, UEF and Thermal Efficiency.
03 Heating Efficiency Value – User input. Numerical value of the Heating Efficiency. Must be equal to or higher efficiency than value indicated on the CF1R.
04 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.
05 Exterior Insulation 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.
06 Tank location – User input. Must be equal to system type indicated on the CF1R.
07 Water Heater Storage Volume (gal) – User input. Value may be N/A if water heater type is instantaneous with zero storage.

**E. 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. Not applicable for central systems.

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.

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

This table lists the requirements for all DHW systems. Installer must ensure all the requirements on this table are met.

**G. Compact Hot Water Distribution Basic**

If performance compliance is used, this table lists the values used in the performance calculation and require no user input.
If prescriptive compliance is used, fill out this table

01 Enter the Master Bath distance of furthest fixture to Water Heater in feet.
02 Enter the Kitchen distance from furthest fixture to Water Heater in feet
03 Enter Furthest Third fixtures from fixture to Water Heater in feet
04 Calculated value – no user input required
05 Calculated value – no user input required

**Weighted_Distance = x * d_MasterBath + y * d_Kitchen + z * d_FurthestThird**

Where:

x, y, and z = Weighted Distance coefficients (unitless), see Table 4.4.6-1.

d_MasterBath = The plan view, straight line distance from the water heater to the furthest fixture served by that water heater in the master bathroom (feet).

d_Kitchen = The plan view, straight line distance from the water heater to the furthest fixture served by that water heater in the kitchen (feet).

d_FurthestThird = The plan view, straight line distance from the water heater to the furthest fixture served by that water heater in the furthest room in the dwelling unit (feet). Because the Master Bath and Kitchen have unique separate terms, the Furthest Third fixture must be located in neither of these rooms. The laundry room is excluded, and shall not be used as the furthest third fixture. In multifamily cases where there is not another qualifying use point, the Furthest Third term equals zero.

Table 4.4.6-1: Weighted Distance Coefficients

| Distribution System | x | y | z |
|---|---|---|---|
| Non-Recirculating | 0.4 | 0.4 | 0.2 |
| Recirculating | 0.0 | 0.0 | 1.0 |

**Qualification Distance = (a + b * CFA) / n**

Where:

a, b = Qualification distance coefficients (unitless), see Table 4.4.6-2,
CFA = Conditioned floor area of the dwelling unit ($ft^2$), and
n = Number of water heaters in the dwelling unit (unitless).

Table 4.4.6-2: Coefficients for the Qualification Distance Calculation

| | Coefficient a | | Coefficient b | |
|---|---|---|---|---|
| **Building Type** | **Non-Recirculating** | **Recirculating** | **Non-Recirculating** | **Recirculating** |
| **Single Family** | | | | |
| One story | 10 | 22.7 | 0.0095 | 0.0099 |
| Two story | 15 | 11.5 | 0.0045 | 0.0095 |
| Three story | 10 | 0.5 | 0.0030 | 0.014 |

**H. Parallel Piping Requirements**
This table only applies to systems indicated as **Parallel Piping.** In addition to the mandatory requirements in Table H, the installer must ensure the requirements in this table are met.

**I. Point of Use Requirements**
This table only applies to systems indicated as **Point of Use**. In addition to the mandatory requirements in Table H, the installer must ensure the requirements in this table are met.

**J. Mandatory Requirements for all Recirculation System**
The requirements of this table apply to all recirculation systems listed below.

**K. Recirculation Non-Demand Controls Requirements**
This table only applies to systems indicated as **Recirculation Non-demand controls.** In addition to the mandatory requirements in Table H and K, the installer must ensure the requirements in this table are met.

**L. Demand Recirculation Manual Control/Sensor Control Requirements**
This table only applies to systems indicated as **Demand Recirculation Manual Control** or **Demand Recirculation Senor Control.** In addition to the mandatory requirements in Table H and K, the installer must ensure the requirements in this table are met.