



# ENERGY STAR® Program Requirements

## Product Specification for Commercial Heat Pump Water Heaters

### Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR certified products. The ENERGY STAR Partner must adhere to the following partner commitments:

#### Certifying Products

---

1. Comply with current ENERGY STAR Eligibility Criteria, which define performance requirements and test procedures for commercial heat pump water heaters (CHPWHs). A list of eligible products and their corresponding Eligibility Criteria can be found at [www.energystar.gov/specifications](http://www.energystar.gov/specifications).
2. **Prior to associating the ENERGY STAR name or mark with any product**, obtain written certification of ENERGY STAR certification from a Certification Body recognized by the EPA for CHPWHs. As part of this certification process, products must be tested in a laboratory recognized by the EPA to perform CHPWH testing. A list of EPA-recognized laboratories and Certification Bodies can be found at [www.energystar.gov/testingandverification](http://www.energystar.gov/testingandverification).

#### Using the ENERGY STAR Name and Marks

---

3. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at [www.energystar.gov/logouse](http://www.energystar.gov/logouse).
4. Use the ENERGY STAR name and marks only in association with certified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is certified and offered for sale in the U.S. and/or ENERGY STAR partner countries.
5. Provide clear and consistent labeling of ENERGY STAR certified CHPWHs.
  - 5.1. The ENERGY STAR mark must be clearly displayed in product literature (i.e., user manuals, spec sheets, etc.), and on the manufacturer's Internet site where information about ENERGY STAR certified models is displayed.
  - 5.2. For integrated CHPWH the ENERGY STAR mark must also be clearly displayed on the top/front of the product (by placement of the ENERGY STAR logo on the FTC's EnergyGuide label, on product labels, and/or as a permanent mark). It is also recommended that the mark appear on the product packaging.
  - 5.3. For central CHPWH the ENERGY STAR mark must **not** be used in reference to any component of the system (HP unit, tank, pump, etc.) outside the context of a certified systems, unless that component is independently certified by its brand owner (as fired swing tanks may be, for instance). The ENERGY STAR mark must **not** appear in component product literature or on the component manufacturers' Internet sites where information is displayed, be on components themselves, on component labels, or on the component packaging.

#### Verifying Ongoing Product Certification

---

6. Participate in third-party verification testing through a Certification Body recognized by the EPA for CHPWHs, providing full cooperation and timely responses. The EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR certified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

## Providing Information to the EPA

---

7. Provide unit shipment data or other market indicators to the EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:
  - 7.1. Partner must submit the total number of ENERGY STAR certified CHPWHs shipped in the calendar year or an equivalent measurement as agreed to in advance by the EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).
  - 7.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by the EPA.
  - 7.3. Partner must submit unit shipment data for each calendar year to the EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

Submitted unit shipment data will be used by the EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), the EPA will argue that the data is exempt. Any information used will be masked by the EPA so as to protect the confidentiality of the Partner.

8. Report to the EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
9. Notify the EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at [www.energystar.gov/mesa](http://www.energystar.gov/mesa).

## Performance for Special Distinction

---

In order to receive additional recognition and/or support from the EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep the EPA informed on the progress of these efforts:

- Provide quarterly, written updates to the EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR certified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR certified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to the EPA for periodic updates and coordination. Circulate general ENERGY STAR certified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), the EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR certified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR certified products.
- Provide a simple plan to the EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, the EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like the EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR certified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2)

demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR certified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with the EPA on one print advertorial and one live press event.

- Join the EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit [www.epa.gov/smartway](http://www.epa.gov/smartway).
- Join the EPA's Green Power Partnership. The EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel- based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit [www.epa.gov/greenpower](http://www.epa.gov/greenpower).



# ENERGY STAR Program Requirements

## Product Specification for Commercial Heat Pump Water Heaters

### Eligibility Criteria

#### Draft 1 Version 1.0

1 Following is the **Draft 1 Version 1.0** product specification for ENERGY STAR certified commercial heat pump water heaters. A  
2 product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3

4 1) **Definitions:** Below are the definitions of the relevant terms in this document.

5 A. Commercial Water Heater: A product that utilizes gas or electricity to heat potable water for use outside the heater  
6 upon demand, at a thermostatically controlled temperature.

7 B. Commercial Heat Pump Water Heater: A water heater (including all necessary ancillary equipment such as fans,  
8 blowers, pumps, storage tanks, piping, and controls, as applicable) that uses a refrigeration cycle, such as vapor  
9 compression, to transfer heat from a low-temperature source to a higher-temperature sink for the purpose of heating  
10 potable water, and operates with a current rating greater than 24 amperes or a voltage greater than 250 volts. Such  
11 equipment includes, but is not limited to, air-source heat pump water heaters and water-source heat pump water  
12 heaters.

13 1) Split-System Heat Pump Water Heater: A commercial heat pump water heater in which the compressor is  
14 not contained within the same casing as the storage tank(s) and thus is not an integrated heat pump water  
15 heater.

16 2) Integrated Heat Pump Water Heater: A heat pump water heater that has a built-in storage tank contained  
17 within the same casing.

18 C. Air-Source Commercial Heat Pump Water Heater: A commercial heat pump water heater that utilizes indoor or outdoor  
19 air as the heat source.

20 D. Central Heat Pump Water Heater System: A water heating system that uses a commercial split-system heat pump  
21 water heater as the primary water heater (i.e., the water heater that the systems controls seek to maximize the use of).  
22 A central heat pump water heater system can include products that come pre-mounted on a skid or pallet with multiple  
23 components and may require infield plumbing between components.

24 E. Market Delivery Mechanisms: Central HPWH systems are built from a variety of components and are characterized by  
25 how the parts are specified, delivered, and assembled.

26 1) Fully Packaged Systems can be shipped and installed as a single package from the ENERGY STAR partner,  
27 potentially skid-mounted, ordered for a specific application and including primary HPWH(s), primary storage  
28 tank(s), the recirculation loop temperature maintenance system (if part of the design), controls, and all  
29 ancillary piping components. The systems are designed, configured, and built up as a complete functional  
30 domestic hot water system in which all the components in the listing are the same with each installation.  
31 Proper assembly instructions are included when shipped.

32 2) Fully Specified Systems are fully specified assemblages of parts, pieces, controls, and design assistance  
33 provided by a single ENERGY STAR partner that specifies everything needed for a commercial HPWH  
34 system. It includes the heat pump(s), schematics, sequences of operations, piping configuration, and either  
35 part numbers or specifications for all major commercial HPWH system components that comprise a fully  
36 functional system (HPWH(s), storage tank(s) temperature maintenance system, circulation pump(s), mixing  
37 valve, auxiliary heaters, and controls). Specified components may be sourced separately.

- 38 3) Custom Engineered Systems typically require engineering design and support. For these systems, a single  
39 seller, distributor, or company supplies only the CHPWH components without design specifications for the  
40 entire commercial CHPWH system. In custom engineered systems, the project-specific Engineer of Record  
41 selects and specifies the components that make a commercial CHPWH system, including the storage  
42 tank(s), temperature maintenance system, circulation pump(s), mixing valve, auxiliary heaters, and storage  
43 tank controls, which are then typically purchased and installed by a contractor.
- 44 F. Heat Pump Water Heater Coefficient of Performance (COP): The dimensionless ratio of the rate of useful heat transfer  
45 gained by the water (expressed in Btu/h), to the rate of electric power consumed during operation, expressed in Btu/h.
- 46 G. Indoor COP<sub>80.6</sub>: The coefficient of performance of an indoor commercial heat pump water heater unit as calculated in  
47 section 4.5 of the ENERGY STAR Test Method for Central Heat Pump Water Heater Systems.
- 48 H. Compressor Cut-Out Temperature: The temperature below which a heat pump unit's compressor will no longer  
49 operate.
- 50 I. Compressor Cut-In Temperature: The temperature above which a heat pump unit's compressor will begin to function.
- 51 J. Active Defrost: The removal of frost and ice on the evaporator coil by actively heating the evaporator coil. Running the  
52 evaporator fan without additional evaporator coil heat input is not active defrost.
- 53 K. Circulator Energy Rating (CER): The weighted average electric input power to the driver or control of a circulator pump,  
54 over a specific load profile for each control type (expressed in HP).
- 55 L. Circulator Energy Index (CEI): The dimensionless ratio of the circulator energy rating (expressed in HP) to the  
56 circulator energy rating for a circulator pump with the same hydraulic horsepower as the rated pump (expressed in HP)  
57 that is minimally compliant with circulator energy efficiency regulations with a 2028 compliance date.
- 58 M. Commercial Heat Pump Water Heater Unit: The commercial heat pump water heater component of the central HPWH  
59 system (i.e. not including any auxiliary components such as tanks).
- 60 1) Type A Heat Pump Unit: A commercial heat pump water heater unit that does not have active defrost or for  
61 which the specified compressor cut-in and cut-out temperatures are not both less than 40°F.
- 62 2) Type B Heat Pump Unit: A commercial heat pump water heater unit that has active defrost and for which the  
63 specified compressor cut-in and cut-out temperatures are both less than 40°F but not both less than 17°F.
- 64 3) Type C Heat Pump Unit: A commercial heat pump water heater unit that has active defrost and for which the  
65 specified compressor cut-in and cut-out temperatures are both less than 17°F but not both less than 5°F.
- 66 4) Type D Heat Pump Unit: A commercial heat pump water heater unit that has active defrost and for which the  
67 specified compressor cut-in and cut-out temperatures are both less 5°F.
- 68 N. Indoor Heat Pump Unit: A commercial air-source heat pump water heater unit that is labeled on the nameplate or  
69 manufacturer manual as able to be used only for indoor applications (e.g., boiler room/machine room).
- 70 O. Outdoor Heat Pump Unit: A commercial air-source heat pump water heater unit that is labeled on the nameplate or  
71 manufacturer manual as able to be used only for outdoor applications.
- 72 P. Indoor/Outdoor Heat Pump Unit: A commercial air-source heat pump water heater unit that is labeled on the nameplate  
73 or manufacturer manual as able to be used for both indoor and outdoor applications.
- 74 Q. Multi-Pass HPWH: A HPWH that cannot meet the requirements of a Single Pass central HPWH.

- 75 R. Single-Pass HPWH: A HPWH which has equipment that can modulate the flow rate through the heat pump to achieve  
 76 the outlet water temperature at each of the specified inlet temperatures in section 4.2 (E) of the ENERGY STAR Test  
 77 Method for Central Heat Pump Water Heater Systems.
- 78 S. Water Heating Energy Efficiency Ratio (WHEER): The heating energy efficiency of a commercial heat pump water  
 79 heater in British thermal units per watt-hour (Btu/Wh) using the national average temperature fractional bin hours, as  
 80 calculated in section 4.4 of the ENERGY STAR Test Method for Central Heat Pump Water Heater Systems. WHEER  
 81 representations for heat pump units using single pass and multi-pass test conditions are labeled as WHEER<sub>SP</sub> and  
 82 WHEER<sub>MP</sub> respectively.
- 83 1) WHEER<sub>C</sub>: The heating energy efficiency of a commercial heat pump water heater in British thermal units per  
 84 watt-hour (Btu/Wh) using the cold climate temperature fractional bin hours, as calculated in section 4.4 of the  
 85 ENERGY STAR Test Method for Central Heat Pump Water Heater Systems. WHEER<sub>C</sub> representations for  
 86 heat pump units using single pass and multi-pass test conditions are labeled as WHEER<sub>C,SP</sub> and WHEER<sub>C,MP</sub>  
 87 respectively.
- 88 T. Thermal Efficiency (TE)<sup>1</sup>: The ratio of the heat (Btu/hr) transferred to the water flowing through the water heater to the  
 89 amount of energy (Btu/hr) consumed by the water heater during full-firing rate, steady-state operation.
- 90 U. Standby Loss (SL)<sup>1</sup>: The average hourly energy, expressed in Btu per hour, required to maintain the stored water  
 91 temperature.
- 92 V. Unfired Hot Water Storage Tank: A tank used to store water that is heated externally.
- 93 W. Water-Source Commercial Heat Pump Water Heater: A commercial heat pump water heater that utilizes water or a  
 94 brine solution as the heat source. For the purposes of this test procedure, it refers to ground-source closed-loop  
 95 commercial heat pump water heaters, ground water-source commercial heat pump water heaters, and indoor water-  
 96 source commercial heat pump water heaters.
- 97 X. Ground-Source Closed-Loop Commercial Heat Pump Water Heater: A commercial heat pump water heater that utilizes  
 98 a fluid circulated through a closed piping loop as a medium to transfer heat from the ground to the refrigerant in the  
 99 evaporator. The piping loop may be buried inside the ground in horizontal trenches or vertical bores or submerged in a  
 100 surface water body.
- 101 Y. Ground Water-Source Commercial Heat Pump Water Heater: A commercial heat pump water heater that utilizes  
 102 ground water as the heat source.
- 103 1) Indoor Water-Source Commercial Heat Pump Water Heater: A commercial heat pump water heater that  
 104 utilizes indoor water as the heat source.
- 105 Z. Manufacturer Limited Warranty: An assurance by the manufacturer to the consumer that the water heater, including  
 106 purchased system equipment and components, is guaranteed to work for a defined period of time.
- 107 AA. Basic Model<sup>1</sup>: All water heaters, hot water supply boilers, or unfired hot water storage tanks manufactured by one  
 108 manufacturer within a single equipment class, having the same primary energy source (e.g., gas or oil) and that have  
 109 essentially identical electrical, physical and functional characteristics that affect energy efficiency.
- 110 BB. Fault Detection and Display: System is capable of detecting and reporting, in plain text, system faults to the owner  
 111 and/or technical professional. This includes, but is not limited to, the ability to detect leaks which may lead to  
 112 catastrophic failure. Faults are displayed on the system or remotely (preferred). The system is also capable of storing  
 113 at least five faults in a history log.

---

<sup>1</sup> 10 CFR Part 431 Subpart G

- 114 CC. Performance Reporting: System is capable of reporting at least three system performance metrics. Examples of  
115 performance metrics include, but are not limited to, fuel usage, hot water usage, and run time.
- 116 DD. Energy Savings Reporting: System is capable of analyzing performance in order to report energy saving opportunities  
117 capable of being addressed via maintenance, firmware updates, or operational changes. Plain text indications and/or  
118 detailed visuals that relay opportunities for improvement to technical professionals are reported.
- 119 EE. Predictive Maintenance Alert: System is capable of tracking water heater use and wear rates to predict and alert the  
120 owner/technical professional when maintenance may be required. Predictions are based on wear rates that are  
121 measured in real time or pre-programmed data that indicate typical lifetimes of water heater components.
- 122 FF. Central Heat Pump Water Heater Product Family: A group of models that have the same major components (though  
123 the number of each may differ), and are offered by the same vendor, but may have different system configurations and  
124 intended applications. Different systems in the same product family may have different expected performance.

125 **2) Scope:**

- 126 A. Included Products: Only products that meet the definition of an air source commercial heat pump water heater, as  
127 specified herein, which are marketed for sale in the commercial market are eligible for ENERGY STAR certification.  
128 For central heat pump water heater systems, this specification includes fully packaged and fully specified systems for  
129 which a single market entity can be identified as an ENERGY STAR partner. Custom Engineered systems may be  
130 certified provided the Engineer of Record becomes a partner and certifies them, in which case they are considered a  
131 Fully Specified System.
- 132
- 133 B. Excluded Products: The following products are not eligible for certification under this specification:  
134
- 135 a. Products that are covered under other ENERGY STAR product specifications, including residential water heaters,  
136 as defined in the ENERGY STAR Residential Water Heaters specification, and commercial gas-fired water  
137 heaters, as defined in the ENERGY STAR Commercial Water Heaters specification. The list of specifications  
138 currently in effect can be found at [www.energystar.gov/specifications](http://www.energystar.gov/specifications).
  - 139 b. Custom Engineered Central Heat Pump Water Heater Systems
  - 140 c. Combined heating/cooling and hot water systems.
  - 141 d. Systems in which the main fuel is gas or oil.

142 **Note:** The EPA has adopted the market delivery definitions from the NEEA Advanced Water Heating Specification (V8.1), with  
143 some modifications, in order to be clear that this specification requires a single vendor (system brand owner) that can be an  
144 ENERGY STAR partner to be responsible for design and specification of the entire system. Even if a product model (which is a  
145 system) is delivered only once, it can be certified as an ENERGY STAR product.

146 One change from AWHs market delivery mechanisms is that specified components may be sourced separately for field  
147 assembly, to allow maximum flexibility. System vendors should think carefully about the business models that allow them to feel  
148 confident about the performance and efficiency of systems they certify.

149 Conventional gas fired products continue to be included in the commercial water heater specification. Gas fired heat pump  
150 systems are excluded because the central HPWH test method will need modification to be able to test them accurately.

151 **3) Certification Criteria:**

- 152 A. Product Performance Requirements for Commercial Integrated Heat Pump Water Heaters:

153 **Table 1: Requirements for Certified Electric Heat Pump Water Heaters**

Criteria	Type	ENERGY STAR Requirements
Coefficient of Performance (COP <sub>h</sub> )	Integrated Commercial Heat Pump	COP <sub>h</sub> ≥ 3.0



- 155  
 156 B. Product Performance Requirements for Commercial Central Heat Pump Water Heaters:  
 157  
 158 a. Component Requirements  
 159 While not all systems will include all components, if a component is part of the system specification, it must  
 160 meet these requirements.

161 **Table 2: Requirements for Components of Central Heat Pump Water Heaters**

Component	Metric	ENERGY STAR Requirements
Heat Pump Unit	WHEER**	WHEER <sub>SP</sub> ≥ 7 WHEER <sub>MP</sub> ≥ 5
	WHEER <sub>C</sub> **	WHEER <sub>SPC</sub> ≥ 5 WHEER <sub>MPC</sub> ≥ 3.75
Heat Pump Unit	Coefficient of Performance (COP <sub>Hk</sub> )**	COP <sub>H95</sub> ≥ 3.25
		COP <sub>H68</sub> ≥ 2.5
		COP <sub>H47</sub> ≥ 2.0
		COP <sub>H35</sub> ≥ 1.75
		COP <sub>H17</sub> ≥ 1.5
	COP <sub>H5</sub> ≥ 1.25	
Electric and Gas Fired Storage backup tanks	Maximum Standby Loss*	SL ≤ 0.84 x [(Input Rate / 800) + 110 x (Volume <sub>r</sub> ) <sup>1/2</sup> ] (expressed in Btu/hr)
Unfired Tank(s)	Maximum Standby Loss*	SL ≤ 0.84 x 110 x (Volume <sub>r</sub> ) <sup>1/2</sup> (expressed in Btu/hr)
Internal pump	Circulator Energy Index (CEI)***	CEI ≥ 1.0

162 \* Volume is the rated volume in gallons. Input Rate (where applicable) is the nameplate input rate in Btu/hr.  
 163 \*\* The HP unit shall meet the required levels for every test condition relevant to its type and application.  
 164 \*\*\* Determine CEI using the following equation:

165 
$$CEI = \frac{CER}{CER_{STD}}$$

166 Where:  
 167 CEI = the circulator energy index (dimensionless);  
 168 CER = the circulator energy rating determined in accordance with section 4.7 of ENERGY STAR Test Method for  
 169 Central Heat Pump Water Heater Systems (hp); and  
 170 CER<sub>STD</sub> = the CER for a circulator pump that is minimally compliant with DOE's energy conservation standards with  
 171 the same hydraulic horsepower as the tested pump, as determined in accordance with [10 CFR 431.465 paragraph](#)  
 172 [\(i\)\(3\)\(ii\)](#).

173 **Note:** Given the feedback on seasonal metrics in the Final Draft ENERGY STAR Test Method for Central HPWH comments, the  
 174 EPA shares potential COP values as well as potential WHEER values, in order to facilitate further discussion. The proposed  
 175 values can be met by most HP units on the market. The COP values are derived from analysis of units listed on the Advanced  
 176 Water Heater Specification Qualified Product List. The WHEER values come from preliminary lab testing in support of the test  
 177 method development. Different HP unit types will report different sets of COPs and WHEERs, including some but not all test



178 points for single-pass and/or multi-pass configurations; units are required to meet the listed levels for each configuration relevant  
179 to their use. Generally, the EPA favors seasonal metrics because they give manufacturers more flexibility in designing products  
180 that meet specification criteria and because they more accurately represent the annual energy use of products. However, if the  
181 market isn't comfortable with WHEER and WHEER<sub>c</sub> yet, EPA believes it is best to move forward with this specification using  
182 COPs instead. We do not anticipate including all of these performance requirements in the final specification and seek  
183 stakeholder feedback on which to require as well as on the values themselves.

184 Several commentors on the draft final test method urged the EPA to delay moving forward with WHEER, instead waiting for the  
185 AHRI 1300 committee to finish its work on seasonal metrics. The EPA and DOE will remain engaged with the committee, and  
186 while the test method will be final, we remain open to amending it if needed for alignment.

187  
188 The proposed COP and WHEER values were developed from manufacturer specification sheets, lab testing, and listings on the  
189 Advanced Water Heater Specification qualified product list.

190  
191 The proposed standby loss requirements for unfired and fired storage tanks are based on ENERGY STAR requirements for  
192 commercial gas storage water heaters; for unfired tanks, with the input rate set to zero. The EPA welcomes feedback on whether  
193 the levels are appropriate for electric and unfired storage tanks. The proposed CEI requirements mirror those in the minimum  
194 standards for pumps for 2028 compliance.

195  
196

#### b. System Product Models and Families

197 Each product model is a system including the heat pump unit(s) and any ancillary equipment including storage  
198 tanks, fans, pumps, blowers and controls. There may be variations within product models serving different  
199 capacities by using additional HP units and storage tanks, but the efficiency performance shall be the same for all  
200 instances of a product. Product families include the same major system components but are designed to serve  
201 different applications and may have different configurations. Product models are defined by a documentation  
202 package including all of the following:

- 203 i. Summary of HPWH system including piping configuration and all required system components.  
204 System configuration shall be one of the qualified piping configurations in Appendix A. Include  
205 discussion of approach to defrost.
- 206 ii. Detailed system schematics reflecting one of the qualified system configurations in Appendix A  
207 showing how the system is connected to the building (hot water supply, hot water return, and city  
208 water), and the location of all components for operation and maintenance. The system schematics  
209 shall conform to all items in the Appendix B checklist.
- 210 iii. Specification of unfired tanks and of any backup or temperature maintenance tanks, as needed.  
211 This may be a list of acceptable model numbers.
- 212 iv. Specification of controls by part number or numbers. If there are several options, the differences in  
213 performance or function shall be clearly described.
- 214 v. Specification of ancillary components such as isolation valves, check valves, balancing valves, wye  
215 strainers, unions, T&P valves, and air vent, including sizing and performance requirements, or lists  
216 of acceptable part numbers.
- 217 vi. Sizing guidelines for output capacity and storage volume based on design loads and (if applicable)  
218 load shift requirements. This will include access to a sizing tool provided by a third party or by the  
219 system vendor.
- 220 vii. Electrical specifications including all available voltage and phases, full load amps (FLA), minimum  
221 circuit ampacity (MCA), maximum overcurrent protection (MOP).

222  
223

#### c. System Design Requirements

- 224 i. Insulation for hot water pipes between elements of the central water heating system shall be  
225 specified to meet the requirements of the IECC Table C403.13.3(1) Minimum Pipe Insulation  
226 Thickness.
- 227 ii. The system controller, whether part of the heat pump unit or separate, shall include control of any  
228 backup (i.e. non-heat pump) heating included in the system, including in separate recirculation  
229 reheat tanks. These elements may also have their own controls which operate unless over-ridden  
230 by the system controller. The system-imposed control may be as rudimentary as a power switch.

- 231 iii. The system shall include water temperature read-outs at a minimum of three different levels in the  
232 water storage volume, so as to detect different temperatures from stratified tanks. Best practice is  
233 to include one sensor per HP unit.  
234 iv. Minimum requirements for the master mixing valve (if present), to include ANSI/ASSE 1017-2009.  
235 v. The system shall provide a visible alarm for any compressor that is not operating when called, as  
236 well as an additional alarm that is either audible or electronic.  
237 vi. All installations shall be carried out by a factory-authorized installer. Factory authorized  
238 commissioning and/or system monitoring for the first 30 days shall be offered for all installations.  
239 vii. Vendors shall provide a three-year warranty on any parts they provide and a three-year labor  
240 warranty, commencing upon startup.  
241  
242 d. Purchaser information requirements.  
243 i. Documentation shall indicate to the purchaser that the efficiency of the system may be strongly  
244 affected by the flow rate of the recirculation loop (if present), and that well-balanced and well-  
245 insulated recirculation loops will have lower flow rates and result in higher efficiency. Refer to IECC  
246 Table C403.13.3(1) Minimum Pipe Insulation Thickness for recirculation loop insulation, or to  
247 similar reference.  
248 ii. Maximum water flow through HPWH, at maximum operating outside air temperature and minimum  
249 temperature lift.  
250 iii. Documentation shall clearly indicate any wiring needed to control backup (i.e. non-heat pump)  
251 water heating.  
252 iv. Air source design guidance such as minimum airflow, maximum allowable static pressure as  
253 applicable, best practices for placement and orientation of outdoor units, and ductwork connection  
254 details if applicable.  
255 v. Physical installation requirements.  
256 vi. Maintenance checklist including detailed description of task and recommended cadence for  
257 performing tasks, include recommended maintenance for the entire system and for all components.  
258 vii. Equipment operating manuals and warranty documentation, including detailed startup procedures  
259 for the system.  
260

261 **Note:** Several elements of the system specification rely on the model work completed by the Northwest Energy Efficiency  
262 Associates (NEEA) and their contractors and stakeholders, as recommended by several stakeholders in conversations following  
263 the release of the discussion guide. In particular, the qualified piping configurations included in Appendix A of this draft are a  
264 direct copy of those in the NEEA Advanced Water Heater specification Version 8.1, Section 3.3.5.

265 Several commentors brought up factory authorized commissioning and/or system monitoring in discussion. Because EPA holds  
266 partners responsible for ENERGY STAR products meeting specification requirements, we felt that requiring factory authorized  
267 installers was necessary. We are aware that this imposes a business model on the industry but consider it necessary for  
268 purchasers to have assurance of system performance. Other system requirements and purchaser information requirements  
269 reflect comments on the discussion guide and subsequent conversations.  
270

271 The EPA proposes that a system product has flexibility in terms of the number of HP units and the amount of storage, provided  
272 that the efficiency of the systems, for the hot water delivery each is sized for, is expected to be similar. Product families include  
273 the same components, but, for instance, a different balance of HP capacity and storage volume, or balance of heat pump  
274 capacity and backup heat capacity, or a different system configuration. Thus, the component data would already be present in  
275 another certified product from the same Partner and all that will be required for the new model in the product family is definition of  
276 the system configuration, which the EPA expects to be a best practice for system design. This proposal is the starting point of a  
277 discussion – the EPA seeks further feedback on how product models and families can be best used to minimize certification  
278 burden while maintaining the integrity of ENERGY STAR certification.  
279

- 280  
281 e. Additional Reporting Requirements:  
282 i. All refrigerants used in the HPWH unit, and their charge.  
283 ii. Demand flexibility:  
284 1. AHRI 1530 compliance;  
285 2. Ability to store time of use utility rates and control based on them; or  
286 3. Other demand flexibility functions.

287  
288  
289  
290  
291  
292  
293  
294

**Note:** The EPA plans to require reporting of refrigerant type and demand flexibility features because some purchasers or implementors will need this information for purchase decisions. The information will be displayed on the list of certified products on energystar.gov. The EPA also intends to offer vendors the opportunity to report other features purchasers may be interested in, such as fault detection and display, performance reporting, energy savings reporting, and predictive maintenance alerts. These features will also be listed for certified products. The EPA welcomes feedback about additional features purchasers may be interested in.

295 **4) Test Requirements:**

296  
297  
298  
299  
300  
301  
302  
303  
304  
305  
306  
307  
308  
309  
310  
311  
312  
313  
314  
315  
316

- A. One of the following sampling plans shall be used for purposes of testing each component for ENERGY STAR certification:
  - a. A single unit is selected, obtained, and tested. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional individual model variations within a basic model as long as the definition for basic model provided in Section 1, above, is met; or
  - b. Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.44. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional model variations within a basic model as long as the definition for basic model provided in Section 1, above, is met. Further, all individual models within a basic model must have the same certified rating based on the applicable sampling criteria. This rating must be used for all manufacturer literature, the qualified product list, and certification of compliance to DOE standards.
- B. When testing commercial heat pump water heaters, the following test methods shall be used to determine ENERGY STAR certification:

**Table 3: Test Methods for ENERGY STAR Certification**

ENERGY STAR Requirement	Test Method Reference	Applicable Products
Coefficient of Performance	10 CFR Part 431.106, Subpart G, Appendix E	Integrated Commercial Heat Pump Water Heaters
WHEER, COP	ENERGY STAR Test Method for Central Heat Pump Water Heater Systems	Heat Pump Units for Central Heat Pump Water Heaters
CER	ENERGY STAR Test Method for Central Heat Pump Water Heater Systems	Circulator Pumps (internal to Central HPWHs)
SL	ENERGY STAR Test Method for Central Heat Pump Water Heater Systems	Electric Storage and Unfired backup tanks for Central HPWHs
SL	10 CFR Part 431.106	Gas-fired Storage backup tanks for Central HPWHs

317  
  
318  
319  
320  
321  
  
322  
323

- C. Significant Digits and Rounding:
  - a. All calculations shall be carried out with actual measured (unrounded) values. Only the final result of a calculation shall be rounded.
  - b. Unless otherwise noted in this section, compliance with specification limits shall be evaluated using exact values without any benefit from rounding.

324 c. Reporting on the ENERGY STAR website shall be performed using measured or calculated values that are  
325 rounded to the nearest unit in the last right-hand digit as specified in the corresponding specification requirements.  
326 Standby Loss shall be rounded to the nearest whole number.

327 **5) Effective Date:**

328  
329 The ENERGY STAR Commercial Heat Pump Water Heaters specification shall take effect **TBD**. To certify for ENERGY STAR, a  
330 product model shall meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of  
331 manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.  
332

333 **Note:** New specifications are effective once they are finalized, and products may be certified to them immediately. In cases such  
334 as this with new partners and new test methods, it typically takes some time for laboratories to gain accreditation, companies to  
335 conduct testing, and CBs to prepare to certify models. As the specification nears completion, the EPA will work with interested  
336 labs and CBs to minimize the delay. The EPA will provide a transition period before removing currently certified CHPWHs from  
337 the qualified product list under the Commercial WH Version 2 specification.

338  
339 **6) Considerations for Future Revisions:**

340  
341 The EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to  
342 consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through  
343 industry discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not  
344 automatically granted for the life of a product model.

- 345  
346 A. The EPA envisions eventually including metrics based on simulation of total system efficiency, using component data  
347 as required in this version. A system like this is used in the ENERGY STAR Solar Water Heaters specification.  
348 B. The EPA may add water source heat pumps in future versions of the specification.  
349 C. The EPA will continue to consider integrated CHPWHs and may consider amendments to the test method or  
350 specification requirements for those units in the future.  
351 D. The EPA will evaluate whether to include gas fired CHPWHs in this specification once test methods are available for  
352 them.

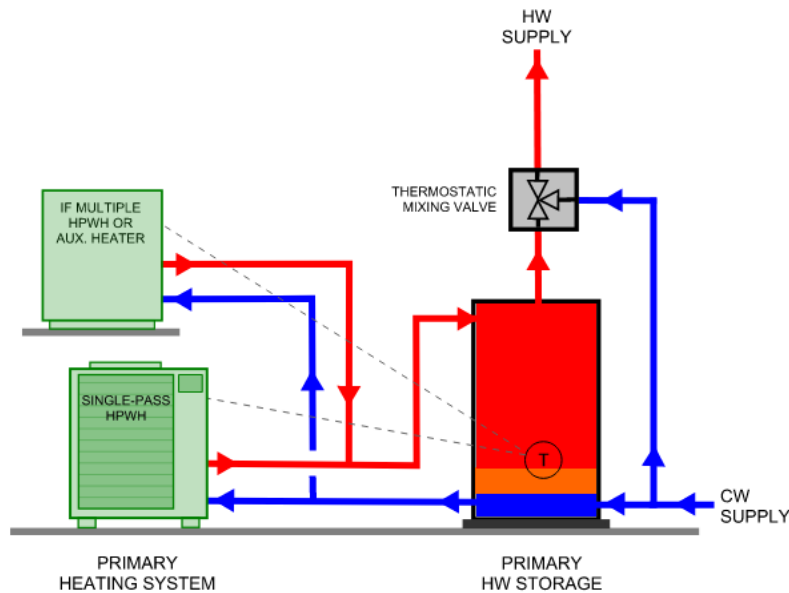
353 **Appendix A: Qualified System Piping Configurations**

354 Vendor-provided HPWH system piping schematics shall align with one or more of the following qualified piping configurations as  
355 illustrated in Figures 1 through 5. Although not shown in the diagrams, a primary loop using a heat exchanger between the heat  
356 pumps and the primary storage may be used to provide a freeze-protected glycol loop and/or to protect the heat pump’s internal  
357 heat exchanger.

- 358 1. Split system Single-pass HPWH  
359 a. No hot water circulation, primary heat pump water heating only (Figure 1)  
360 b. Hot water circulation returned to primary storage (Figure 2)  
361 c. Hot water circulation returned to a fired temperature maintenance tank in series, also referred to as a “swing  
362 tank” (Figure 3)  
363 d. Hot water circulation returned to a temperature maintenance storage tank in parallel with multi-pass HPWH  
364 for reheat (Figure 4)  
365 2. Split system multi-pass HPWH, hot water circulation returned to primary storage (Figure 5)  
366

367 **Note:** Two of the qualified piping configurations identified in the Advanced Water Heating Specification (AWHS) use integrated  
368 HPWHs that may be ENERGY STAR certified as an integrated HPWH product regardless of their application. The proposed  
369 specification does not allow them to be certified as central HPWH systems because they can’t be tested according to the  
370 ENERGY STAR central HPWH test method. However, the EPA sees some advantages of allowing them to be certified in the  
371 context of a system with ancillary components, connections to the building, and startup procedures clearly defined. It would be  
372 possible to write the specification such that they could be certified both ways. The EPA welcomes comments on whether it would  
373 be helpful to have this option.

374



375  
376  
377

**Figure 1: Single-Pass Primary HPWH System without HW Circulation**

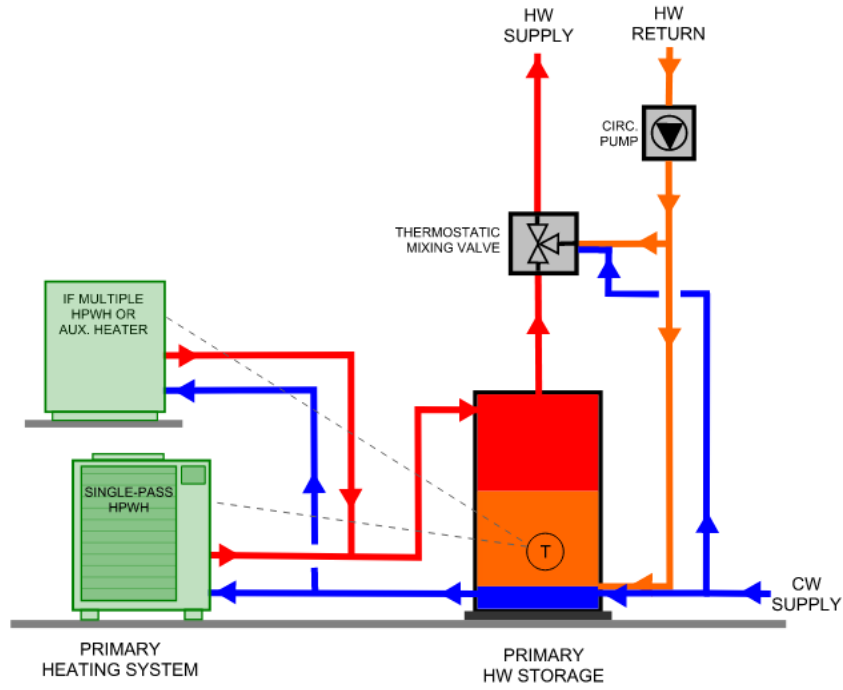


Figure 2: Single-pass returned to primary

378  
379  
380

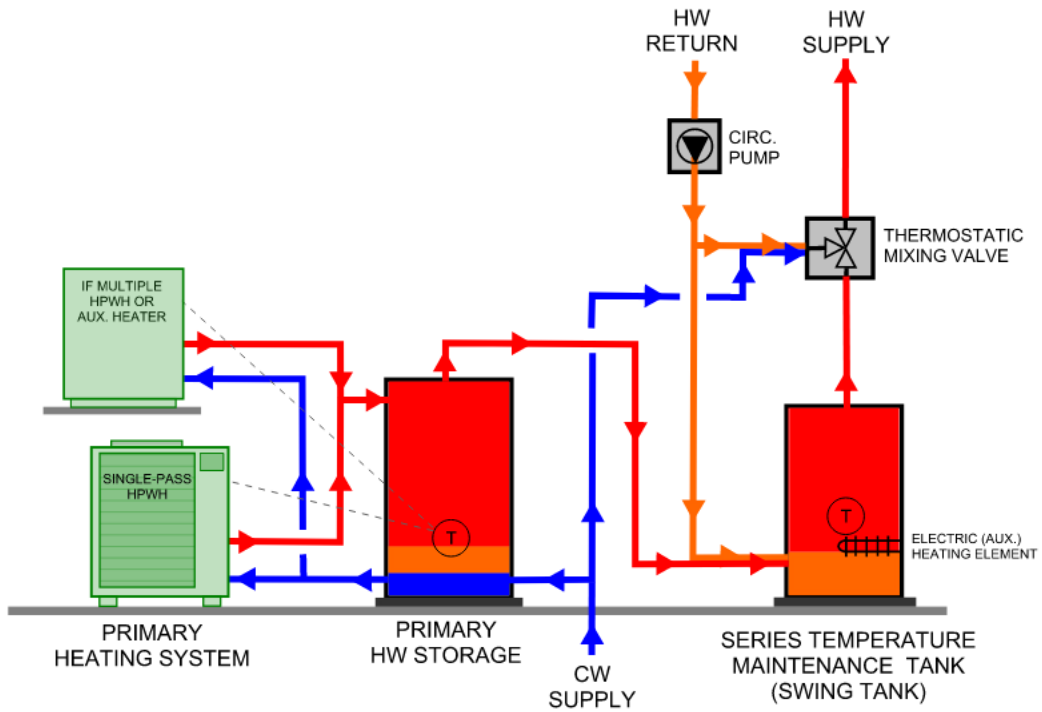


Figure 3: Single-pass with swing tank

381  
382

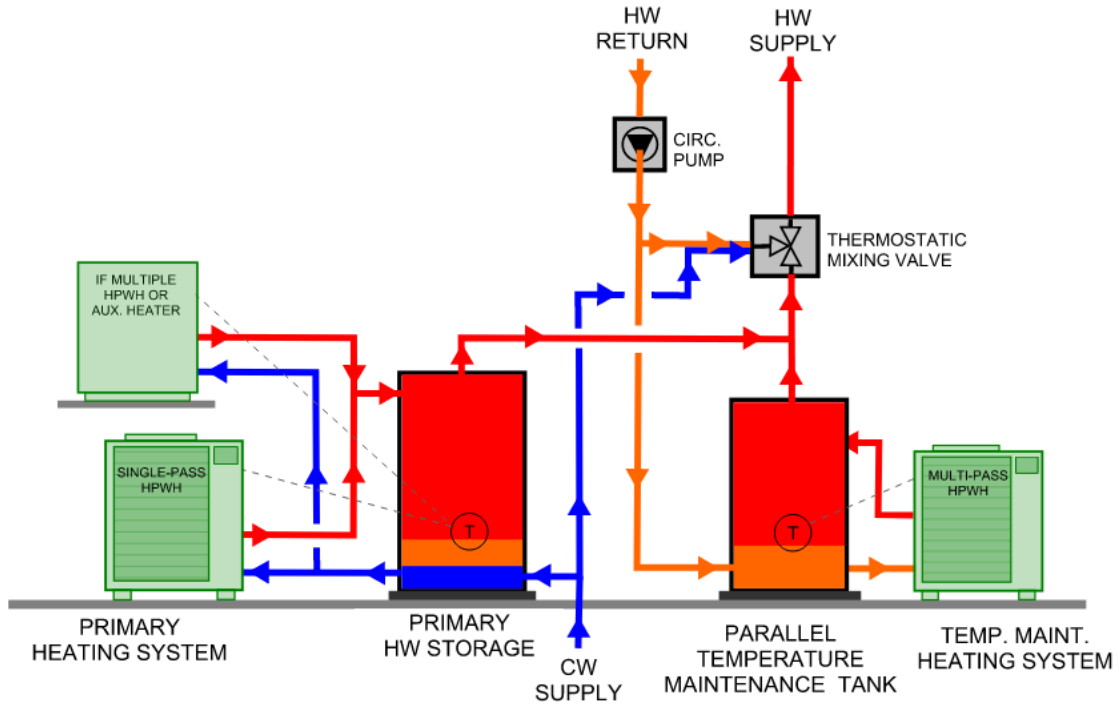


Figure 4: Single-pass parallel loop tank

383  
384  
385  
386

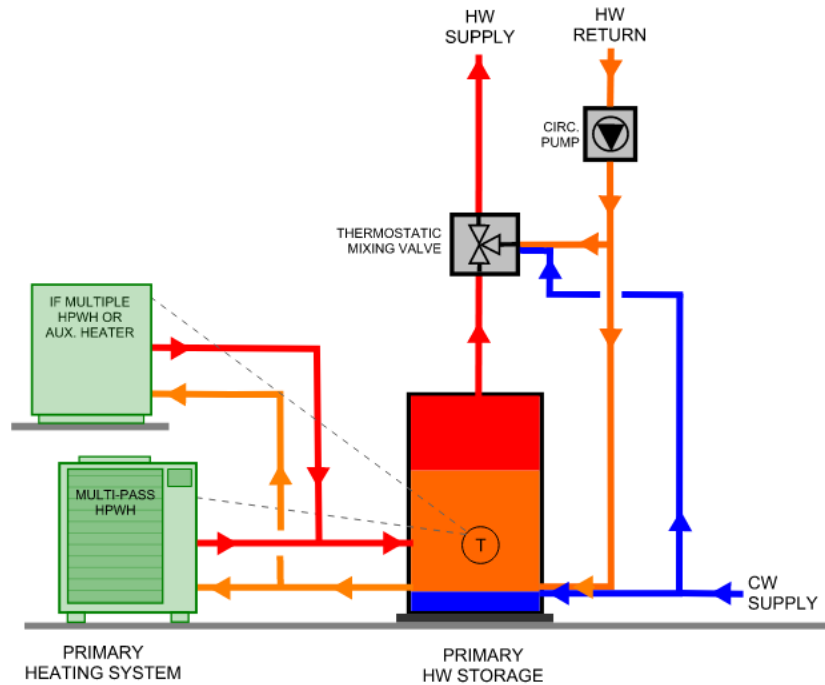


Figure 5: Multi-pass with return to primary

387  
388  
389  
390



391 **Appendix B: Detailed System Diagram Checklist**

392

393 **Note:** A fillable spreadsheet version of this checklist will be available on the energstar.gov website when the specification is  
 394 finalized and will be linked from this Appendix. The EPA thanks NEEA for their help with this checklist and invites stakeholder  
 395 feedback on its content.

Detailed System Diagram	The piping schematic shows a complete system and how the system is connected to the building — entering city water, hot water supply, and hot water return. Schematic aligns with one of the Qualified Piping Configurations listed Appendix A and identifies location of all required system components for operation and maintenance (as applicable) including valves, strainers, mixing valve(s), storage tank(s), temperature maintenance tanks(s), pumps, and control instrumentation.
Example Diagrams	<a href="#">Single-Pass Return to Primary</a> <a href="#">Single-Pass Swing Tank</a> <a href="#">Multi-pass Return to Primary</a>
Air Relief	<ul style="list-style-type: none"> <li>• Automatic air relief valve is included at system high point.</li> <li>• When thermal storage tanks are installed in-series, an air relief valve is included between each storage tank.</li> <li>• An automatic air relief valve is installed on the inlet side of the recirculation pump no more than 4 feet from the pump. The valve is mounted on top of a vertical riser at least 12 inches in length and is accessible for replacement and repair.</li> </ul>
Heat Traps	<ul style="list-style-type: none"> <li>• Method of heat trap is included on inlet and outlet of primary storage tanks.</li> </ul>
System Isolation	<ul style="list-style-type: none"> <li>• Isolation valves are shown on all connections to the CHPWH plant: entering city water, hot water supply, hot water return.</li> </ul>
Temperature and Pressure Gauges	<ul style="list-style-type: none"> <li>• Temperature and pressure gauges are included on the cold water inlet, hot water supply, and recirculation return piping entering the plant.</li> <li>• Temperature gauges are included on all sides of the mixing valve.</li> </ul>
Hot Water Circulation (HWC) Pump Assembly	<ul style="list-style-type: none"> <li>• The HWC pump is variable speed and/or a balance valve is included on the HWC line after the pump.</li> <li>• The HWC pump includes an integrated check valve or a check valve is included after the HWC pump.</li> <li>• A y-strainer is included before the HWC pump.</li> <li>• Isolation valves are included before and after the HWC pump and a drain valve is included between the isolation valves. Drain valve can be provided off y-strainer at pump inlet (recommended).</li> <li>• Recommended method(s) of balancing distribution system are provided.</li> </ul>
HWC Flow Balancing	<ul style="list-style-type: none"> <li>• HWC flow splits at a tee or y-fitting between the mixing valve and the primary storage or temperature maintenance tank. A balancing valve is included on the branch which returns HWC to the primary storage or temperature maintenance tank. A description of how to set the balancing valve to minimize HWC flow through tanks, and maximize HWC flow through the mixing valve is provided.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Means of isolation and flushing are provided on all primary heating equipment and heat exchangers.</li> <li>• Isolation and drain valve are provided on expansion tank for replacement.</li> <li>• Drain valves on lowest tank connection for flushing and means of isolation are provided on primary storage tanks.</li> <li>• Means of isolation is provided around mixing valve.</li> </ul>
Storage Tanks	<ul style="list-style-type: none"> <li>• Storage tanks are piped in parallel or series, but not combination of parallel and series.</li> <li>• Maximum recommended number of tanks is specified.</li> <li>• Each storage tank includes a T&amp;P valve.</li> </ul>
Freeze protection (Required when CHPWH is approved for install in freezing temperatures)	<ul style="list-style-type: none"> <li>• Recommended method(s) of freeze protection are included in diagram.</li> <li>• Freeze protection method provides minimum of 24-hours freeze protection in case of a power outage.</li> </ul>
Control Points	<ul style="list-style-type: none"> <li>• All temperature sensors, flow switches, and other control points used in the sequence of operation are included in the diagram. At a minimum, a temperature sensor used to control the HPWHs</li> </ul>

396

	<p>ON/OFF is shown. Three temperature sensors are required.</p> <ul style="list-style-type: none"><li>• Location of control points are clearly indicated. The location of temperature sensors within storage tanks are indicated with an acceptable aquastat fraction range.</li></ul>
--	--