

C407.3 Performance-based compliance. Compliance with this section requires compliance with ASHRAE Standard 90.1 Appendix G, Performance Rating Method, in accordance with Standard 90.1 Section 4.2.1 with the following modifications.

1. The mandatory requirements of the Washington State Energy Code as required to be met, instead of those of Section G1.2.1a of Standard 90.1.
2. Compliance with Section C407 requires meeting ~~both an emissions and~~ both a regulated site energy target and a total site energy target in accordance with the following:
 - 2.1. Regulated site energy ~~Carbon emission~~ target. The regulated site energy ~~carbon emissions~~ target is focused on regulated load energy efficiency, thus shall be met only via regulated load savings without consideration of the contribution of on-site or off-site renewable energy or unregulated load savings. Adjustments to the PCI, to account for the contribution of renewable energy found in ANSI/ASHRAE/IESNA 90.1 Section 4.2.1.1 shall not be used. References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by site energy use ~~carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1)~~. Heating or cooling energy provided by a district energy system may utilize coefficient of performance (COP) ratios acceptable to the code official for the respective district energy sources. The building performance factors in Table 4.2.1.1 of ANSI/ASHRAE/IESNA 90.1 shall be replaced with those in Table C407.3(2).

Note: Strike C403.1.4 and C404.2.1

**TABLE C406.1
ENERGY MEASURE CREDIT REQUIREMENTS**

Required Credits for Projects	Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
New building energy efficiency credit requirement	C406.2	54 XX	44 XX	42 XX	48 XX	74 XX	49 XX
Building additions energy efficiency credit requirement	C406.2	27 XX	20 XX	24 XX	23 XX	36 XX	24 XX
New building load management credit requirement	C406.3	42 XX	45 XX	27 XX	15 XX	13 XX	26 XX

**TABLE C406.2
ENERGY MEASURES CREDITS**

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
32. Heat Pump Space Heating Normalization	C406.2.19	XX	XX	XX	XX	XX	XX
33. Heat Pump Water Heating Normalization	C406.2.20	XX	XX	XX	XX	XX	XX

C406.2.19 Heat Pump Space Heating Normalization HVAC heating energy shall not be provided by electric resistance or fossil fuel combustion appliances. For the purposes of this section, electric resistance HVAC heating appliances include, but are not limited to, electric baseboard, electric resistance fan coil and VAV electric resistance terminal reheat units and electric resistance boilers. For the purposes of this section, fossil fuel combustion HVAC heating appliances include, but are not limited to, appliances burning natural gas, heating oil, propane, or other fossil fuels.

Exceptions:

1. **Low heating capacity.** Buildings or areas of buildings, other than *dwelling units* or *sleeping units*, that meet the interior temperature requirements of Chapter 12 of the *International Building Code* with a total installed HVAC heating capacity no greater than 8.5 Btu/h (2.5 watts) per square foot of *conditioned space* are permitted to be heated using electric resistance appliances.
2. **Dwelling and sleeping units.** Dwelling or sleeping units are permitted to be heated using electric resistance appliances as long as the installed HVAC heating capacity in any separate space is not greater than:
 - 2.1. Seven hundred fifty watts in Climate Zone 4, and 1000 watts in Climate Zone 5 in each habitable space with fenestration.
 - 2.2. One thousand watts in Climate Zone 4, and 1300 watts in Climate Zone 5 for each habitable space that has two primary walls facing different cardinal directions, each with exterior fenestration. Bay windows and other minor offsets are not considered primary walls.
 - 2.3. Two hundred fifty watts in spaces adjoining the *building thermal envelope* but without fenestration.

For the purposes of this section, habitable space is as defined in the International Building Code. For buildings in locations with exterior design conditions below 4°F (-16°C), an additional 250 watts above that allowed for Climate Zone 5 is permitted in each space with fenestration.

3. **Small buildings.** Buildings with less than 2,500 square feet (232 m²) of conditioned floor area are permitted to be heated using electric resistance appliances.
4. **Defrost.** Heat pumps are permitted to utilize electric resistance heating when a heat pump defrost cycle is required and is in operation.
5. **Air-to-air heat pumps.** Buildings are permitted to utilize internal electric resistance heaters to supplement heat pump heating for air-to-air heat pumps that meet all of the following conditions:
 - 5.1. Internal electric resistance heaters have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and setback recovery.
 - 5.2. The heat pump controls are configured to use the compressor as the first stage of heating down to an outdoor air temperature of 17°F (-8°C) or lower except when in defrost.
 - 5.3. The heat pump complies with one of the following:
 - 5.3.1. Controlled by a digital or electronic thermostat designed for heat pump use that energizes the supplemental heat only when the heat pump has insufficient capacity to maintain set point or to warm up the space at a sufficient rate.
 - 5.3.2. Controlled by a multistage space thermostat and an outdoor air thermostat wired to energize supplemental heat only on the last stage of the space thermostat and when outdoor air temperature is less than 32°F (0°C) except when in defrost.
 - 5.3.3. The minimum efficiency of the heat pump is regulated by NAECA, its rating meets the requirements shown in Table C403.3.2(2), and its rating includes all usage of internal electric resistance heating.
 - 5.4. The heat pump rated heating capacity is sized to meet the heating load at an outdoor air temperature of 32°F (0°C) or lower and has a rated heating capacity at 47°F (8°C) no less than 2 times greater than supplemental internal electric resistance heating capacity in Climate Zone 4 and no less than the supplemental internal electric resistance heating capacity in Climate Zone 5, or utilizes the smallest available factory-available internal electric resistance heater.
6. **Air-to-water heat pumps.** Buildings are permitted to utilize electric resistance auxiliary heating to supplement heat pump heating for hydronic heating systems that meet all of the following conditions:
 - 6.1. Controls for the auxiliary electric resistance heating are configured to lock out the supplemental heat when the outside air temperature is above 36°F (2°C), unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.

- 6.2. The heat pump controls are configured to use the compressor as the first stage of heating down to the lowest exterior design temperature for which the equipment is rated except during startup or defrost operation.
- 6.3. The heat pump rated heating capacity at 47°F (8°C) is no less than 75 percent of the design heating load at 29°F (-2°C).
7. **Ground source heat pumps.** Buildings are permitted to utilize electric resistance auxiliary heating to supplement heat pump heating for hydronic heating systems with ground source heat pump equipment that meets all of the following conditions:
 - 7.1. Controls for the auxiliary resistance heating are configured to lock out the supplemental heat when the equipment source-side entering water temperature is above 42°F (6°C), unless the hot water supply temperature setpoint to the building heat coils cannot be maintained for 20 minutes.
 - 7.2. The heat pump controls are configured to use the compressor as the first stage of heating.
 - 7.3. The ground source heat exchanger shall be sized so that the heat pump annual heating output is no less than 70 percent of the total annual heating output in the final year of a 30-year simulation using IGSHPA listed simulation software.
8. **Small systems.** Buildings in which electric resistance, including decorative appliances, either provide less than 5 percent of the total building HVAC system heating capacity or serve less than 5 percent of the conditioned floor area.
9. **Specific conditions.** Portions of buildings that require fossil fuel or electric resistance space heating for specific conditions approved by the code official for research, health care, process or other specific needs that cannot practicably be served by heat pump or other space heating systems. This does not constitute a blanket exception for any occupancy type.
10. **Kitchen make-up air.** Make-up air for commercial kitchen exhaust systems required to be tempered by Section 508.1.1 of the *International Mechanical Code* is permitted to be heated by electric resistance.
11. **District energy.** Steam or hot water district energy systems that utilize fossil fuels as their primary source of heat energy, that serve multiple buildings, and that were already in existence prior to the effective date of this code, including more energy-efficient upgrades to such existing systems, are permitted to serve as the primary heating energy source.
12. **Heat tape.** Heat tape is permitted where it protects water-filled equipment and piping located outside of the *building thermal envelope*, provided that it is configured and controlled to be automatically turned off when the outside air temperature is above 40°F (4°C).
13. **Temporary systems.** Temporary electric resistance heating systems are permitted where serving future tenant spaces that are unfinished and unoccupied, provided that the heating equipment is sized and controlled to achieve interior space temperatures no higher than 40°F (4°C).

14. **Pasteurization.** Electric resistance heat controls are permitted to reset the supply water temperature of hydronic heating systems that serve service water heating heat exchangers during pasteurization cycles of the service hot water storage volume. The hydronic heating system supply water temperature shall be configured to be 145°F (63°C) or lower during the pasteurization cycle.
15. **Freeze protection.** Heating systems sized for spaces with indoor design conditions of 45°F (7°C) and intended for freeze protection are permitted to use electric resistance. The building envelope of any such space shall be insulated in compliance with Section C402.1.
16. **DOAS ERV auxiliary heat.** Dedicated outdoor air systems with energy recovery ventilation are permitted to utilize electric resistance for auxiliary heating to preheat outdoor air for defrost or as auxiliary supplemental heat to temper supply air to 55°F (13°C) or lower for buildings or portions of buildings that do not have hydronic heating systems.
17. **Low-carbon district energy systems.** Low-carbon district energy systems that meet the definitions of *low-carbon district energy exchange system* or *low-carbon district heating and cooling or heating only systems*.

C406.2.20 Heat Pump Water Heating Normalization Water-heating equipment and hot water storage tanks shall meet the requirements of Table C404.2. The efficiency shall be verified through certification and listed under an approved certification program, or if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Water-heating equipment intended to be used to provide space heating shall meet the applicable provisions of Table C404.2.

C406.2.20.1 Service water heating system type. Service hot water shall be provided by an electric air-source heat pump water heating (HPWH) system meeting the requirements of this section. Supplemental service water heating equipment is permitted to use electric resistance or fossil fuel in compliance with Section C404.2.1.4.

Exceptions:

1. 24 kW plus 0.1 watts per square foot of building area of electric resistance service water heating capacity is allowed per building.
2. Solar thermal, wastewater heat recovery, other approved waste heat recovery, ground source heat pumps, water-source heat pump systems utilizing waste heat, and combinations thereof, are permitted to offset all or any portion of the required HPWH capacity where such systems comply with this code and the Uniform Plumbing Code.
3. Systems that comply with the Northwest Energy Efficiency Alliance (NEEA) Commercial Electric Advanced Water Heating Specification.
4. Service hot water systems served by a district energy system that serves multiple buildings and that was in service before the effective date of this code.
5. Commercial dishwashers, commercial food service equipment, and other approved process equipment are permitted to utilize electric booster heaters for supply water temperatures 120°F (49°C) or higher.

6. Systems connected to a low-carbon district energy exchange system or a low-carbon district heating and cooling or heating only system.
7. Essential facilities. Groups I-2 and I-3 occupancies that by regulation are required to have in place redundant emergency backup systems.

C406.2.20.1.1 Primary heat pump system sizing. The system shall include a primary service output of 50 percent load at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps, or 44°F (7°C) ground temperature for ground-source heat pumps that provides sufficient hot water as calculated using the equipment manufacturer's selection criteria or another approved methodology. Electric air source heat pumps shall be sized to deliver no less than 25 percent of the calculated demand for hot water production during the peak demand period when entering dry bulb or wet bulb outdoor air temperature of 24°F (-4°C). The remaining primary service output may be met by fossil fuel, electric resistance, or heat pump water heating systems. Exception: Twenty-five percent sizing at entering dry bulb or wet bulb air temperature of 24°F (-4°C) is not required for air-source heat pumps located in a below-grade enclosed parking structure or other ventilated and unconditioned space that is not anticipated to fall below 40°F (4°C) at any time.

C406.2.20.1.2 Primary hot water storage sizing. The system shall provide sufficient hot water to satisfy peak demand period requirements.

C406.2.20.1.3 System design. The service water heating system shall be configured to conform to one of the following provisions:

1. For single-pass heat pump water heaters, temperature maintenance heating provided for reheating return water from the building's heated water circulation system shall be physically decoupled from the primary service water heating system storage tank(s) in a manner that prevents destratification of the primary system storage tanks. Temperature maintenance heating is permitted to be provided by electric resistance, fossil fuel, or a separate dedicated heat pump system.
2. For multi-pass heat pump water heaters, recirculated temperature maintenance water is permitted to be returned to the primary water storage tanks for reheating.
3. For unitary heat pump water heaters, located in conditioned space, are permitted, where they are sized to meet all calculated service water heating demand using the heat pump compressor, and not supplementary heat.

C406.2.20.1.3.1 Mixing valve. A thermostatic mixing valve capable of supplying hot water to the building at the user temperature setpoint shall be provided, in compliance with requirements of the Uniform Plumbing Code and the HPWH manufacturer's installation guidelines. The mixing valve shall be sized and rated to deliver tempered water in a range from the minimum flow of the temperature maintenance recirculation system up to the maximum demand for the fixtures served.

C406.2.20.1.4 Supplemental water heating. Total supplemental water heating equipment shall not have an output capacity greater than the primary water heating equipment at 40°F (4°C) entering dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps. Supplemental heating is permitted for the following uses:

1. Temperature maintenance of heated-water circulation systems, physically separate from the primary service water heating system. Temperature maintenance heating capacity shall be no greater than the primary water heating capacity at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps.
2. Defrost of compressor coils.
3. Heat tracing of piping for freeze protection or for temperature maintenance in lieu of recirculation of hot water.
4. Backup or low ambient temperature conditions, where all of the following are true:
 - 4.1. The supplemental heating capacity is no greater than the primary service water heating capacity at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps.
 - 4.2. During normal operations, the supplemental heating is controlled to operate only when the entering air temperature at the air-source HPWH is below 40°F (4°C), and the primary HPWH compressor continues to operate together with the supplemental heating.
 - 4.3. The primary water heating equipment cannot satisfy the system load due to equipment failure or entering air temperature below 40°F (4°C).

C406.2.20.5 System fault detection. The control system shall be capable of and configured to send automatic error alarms to building or maintenance personnel upon detection of equipment faults, low leaving water temperature from primary storage tanks, or low hot water supply delivery temperature to building distribution system.