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# IECC®: SECTION 202 (New), ~~C404.2.1,~~ C404.2.2 (New), C404.2.2.1 (New), C404.2.2.2 (New), ~~C406.7.4~~

**Proponents:**

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**2021 International Energy Conservation Code**

# Add new definition as follows:

C202 MULTI-PASS. A heat pump water heater control strategy requiring multiple passes of water through the heat pump to reach the final target storage water temperature.

C202 PRIMARY SERVICE WATER HEATING EQUIPMENT. Service water heating equipment intended to supply the majority of the service water heating load.

C202 SINGLE-PASS. A heat pump water heater control strategy using variable flow or variable capacity to deliver water from the heat pump at the final target storage water temperature in a single pass through the heat exchanger with variable incoming water temperatures.

C202 SUPPLEMENTAL SERVICE WATER HEATING EQUIPMENT. Equipment intended to heat any service water heating load that is not successfully heated by the primary service water heating equipment.

C202 TEMPERATURE MAINTENANCE. The system used to maintain the temperature of the building domestic hot water delivery system, typically by circulation and reheating or by a heat trace system.

# ~~Revise as follows:~~

~~C404.2.1 High input service water-heating systems for groups other than R-1 and R-2 occupancies.~~

~~Gas-fired water-heating equipment installed in new buildings shall be in compliance with this section. Where a singular piece of water- heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, E~~*~~t~~*~~, of not less than 92 percent. Where multiple pieces of water-heating equipment serve the building and the combined input rating of the water-heating equipment is 1,000,000 Btu/h (293 kW) or greater, the combined input- capacity-weighted-average thermal efficiency, E~~*~~t~~*~~, shall be not less than 90 percent.~~

# ~~Exceptions:~~

1. ~~Where not less than 25 percent of the annual service water-heating requirement is provided by on-site renewable energy or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply.~~
2. ~~The input rating of water heaters installed in individual dwelling units shall not be required to be included in the total input rating of service water-heating equipment for a building.~~
3. ~~The input rating of water heaters with an input rating of not greater than 100,000 Btu/h (29.3 kW) shall not be required to be included in the total input rating of service water-heating equipment for a building.~~

# Add new text as follows:

C404.2.2 Service water heating for Group R-1 and R-2 occupancies with central service hot water systems.

~~In buildings that include~~ For Group R-1 or R-2 occupancies with central service water heating systems serving not less than six *dwelling units* or *sleeping units*, the *primary service water heating equipmen*t for the residential uses shall not use direct combustion fossil fuel or electric resistance heating. Not less than 80 percent of ~~annual~~ installed building service hot water output capacity shall be provided by air-source heat pump water heating systems. *Supplemental service water heating equipment* shall be permitted in accordance with Section C404.2.2.1.

**Exceptions:**

1. Systems supplying ~~80 percent of annual~~ building service hot water output capacity using renewable energy generated on site or site recovered energy.
2. Systems supplying ~~80 percent of annual~~ building service hot water output capacity using gas-fired ~~absorption~~ heat pumps ~~(GAHP)~~ with a COP greater than 1.0.
3. Solar thermal, wastewater heat recovery, and other approved waste heat recovery, biomass, ground source heat pump, other water-source heat pump system utilizing waste heat, and combinations thereof, ~~may be used to~~ shall offset up to 100~~%~~ percent of the required air source ~~HPWH~~ heat pump water heater capacity where these systems comply with this code and with the International Plumbing Code.

C404.2.2.1 Supplemental service water heating equipment.

Total supplemental water heating equipment shall not have an output capacity greater than the *primary service water heating equipment* at 40°F(4.4°C) and shall not exceed the capacity restrictions below. Supplemental water heating is permitted for the following uses:

1. Temperature maintenance of heated-water circulation systems~~,~~ that are physically separate from the primary service water heating equipment. Temperature maintenance capacity shall be no greater than the primary water heating capacity at 40°F and shall be installed per manufacturer's recommendations.
2. Heat tracing of piping for freeze protection or for temperature maintenance in lieu of recirculation of hot water.
3. Supplemental hot water heating where all of the following are true:
	1. The supplemental heating capacity is no greater than the primary service water heating capacity at 40°F (4.4°C).
	2. During normal operations the supplemental heating is controlled to operate only when the entering air temperature at the air-source heat pump is below 40°F (4.4°C), and the primary ~~HPWH~~ heat pump water heater compressor continues to operate together with the supplemental heating when the entering air temperature is below 40°F (4.4°C) and within the manufacturer's acceptable temperature range.
	3. The primary water heating equipment cannot satisfy the system load due to equipment failure or entering air temperature below 40°F(4.4°C).
4. Supplemental heating downstream from a multi-pass heat pump water heater system, no greater than the nominal output capacity of the heat pump water heaters.
5. Electric resistance or ~~condensing,~~ gas-fired water heaters ~~serving single zones~~ with a combined capacity no greater than 12 kW or 35,000 Btu/h input capacity.
6. Defrost of compressor coils during defrost mode.

C404.2.2.2 Alarms.

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.

# ~~Revise as follows:~~

~~C406.7.4 High efficiency heat pump water heater.~~

~~Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input-capacity weighted-average EF of 3.0. Air-source heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.~~

# Reason Statement:

Requiring the use of heat pump water heaters will significantly reduce the amount of energy required for service water heating. Studies of real buildings utilizing current heat pump water heating technology have shown that heat pump water heaters can provide service water heating with efficiencies greater than 300%, which would cut energy usage down to less than 1/3 of the energy required by a gas-fired or electric resistance water heater. This technology is readily available and has been successfully applied across a wide range of R1 and R2 applications throughout the United States.

# Cost Impact:

The code change proposal will increase the cost of construction.

The service water heating equipment cost will increase, but substantial energy efficiency gains will result. Furthermore, if electric heat pump water heaters allow installers to forego the installation of gas infrastructure in a building, the money saved from gas infrastructure permit and installation will offset the increased cost of water heating equipment.

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