

**WAC 51-11C-40407 Section C404.7—Heated-water circulating and temperature maintenance systems.**

**C404.7 Heated-water circulating and heat trace temperature maintenance systems.** Heated-water circulation systems for *temperature maintenance* shall be in accordance with Section C404.7.1. Electric resistance heat trace systems for *temperature maintenance* shall be in accordance with Section C404.7.2. Controls for hot water storage shall be in accordance with Section C404.7.3. Automatic controls, temperature sensors and pumps shall be in a location with access. Manual controls shall be in a location with *ready access*.

**C404.7.1 Circulation systems.** Heated-water circulation systems shall be provided with a circulation pump. The pump shall have an electronically commutated motor with a means of adjusting motor speed for system balancing. The system return pipe shall be a dedicated return pipe. Gravity and thermo-syphon circulation systems are prohibited. Controls shall start the circulation pump based on the identification of a demand for hot water within the occupancy.

**C404.7.1.1 Single riser systems.** Where the circulation system serves only a single domestic hot water riser or zone, the following controls shall be provided:

1. Controls shall be configured to automatically turn off the pump when the water in the circulation loop is at the design supply temperature and shall not turn the pump back on until the temperature is a minimum of 10°F (5°C) lower than the design supply temperature.

2. Controls shall be equipped with a manual switch or other control method that can be used to turn off the circulating pump during extended periods when hot water is not required.

**C404.7.1.2 Multiple riser systems.** Where the circulation system serves multiple domestic hot water risers or piping zones, the following controls shall be provided:

1. Controls shall be configured to automatically turn off the circulation pump during extended periods when hot water is not required.

2. System shall include means for balancing the flow rate through each individual hot water supply riser or piping zone.

3. For circulation systems that use a variable flow circulation pump, each riser and piping zone shall have a self-actuating thermostatic balancing valve.

**C404.7.1.3 Electronic thermostatic mixing valve (TMV).** Where a heated water circulation system utilizes an electronic TMV to control the temperature of hot water supplied to the building, the TMV shall be configured so that it either reverts closed (fully COLD) or maintains its current valve position upon power failure or cessation of circulation flow.

**C404.7.2 Heat trace systems.** Electric heat trace systems shall comply with IEEE 515.1. Controls for such systems shall be able to automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy. Heat trace shall be arranged to be turned off automatically when there is no hot water demand.

**C404.7.3 Controls for hot water storage.** The controls on pumps that circulate water between a water heater and a heated-water storage tank

shall limit operation of the pump from heating cycle startup to not greater than 5 minutes after the end of the cycle.

**C404.7.3.1 Pipe insulation.** For heated water circulation systems, both supply and return pipe insulation shall be at minimum 1.0 inch thicker than that required by Table C403.10.3.

EXCEPTION: Where piping is centered within a wall, ceiling or floor framing cavity with a depth at least 4 inches greater than the diameter of the pipe and that is completely filled with batt or blown-in insulation, additional pipe insulation is not required.

[Statutory Authority: RCW 19.27A.020, 19.27A.025, 19.27A.160 and chapters 19.27A and 19.27 RCW. WSR 22-14-091, 23-12-101, and 23-20-021, § 51-11C-40407, filed 7/1/22, 6/7/23, and 9/25/23, effective 3/15/24. Statutory Authority: RCW 19.27A.020, 19.27A.025, 19.27A.160 and chapter 19.27 RCW. WSR 19-24-040, § 51-11C-40407, filed 11/26/19, effective 7/1/20. Statutory Authority: RCW 19.27A.025, 19.27A.160, and 19.27.074. WSR 16-03-072, § 51-11C-40407, filed 1/19/16, effective 7/1/16. Statutory Authority: RCW 19.27A.020, 19.27A.025 and chapters 19.27 and 34.05 RCW. WSR 13-04-056, § 51-11C-40407, filed 2/1/13, effective 7/1/13.]