

STATE BUILDING CODE OPINION 24-Nov03a

CODE: 2021 Washington State Energy Code-Commercial

SECTION: C404.2.1 Service water heating

QUESTION 1: For a building or project area where all proposed service water heating systems, equipment, and other sources of heat energy (that are provided to satisfy the peak service hot water demand) comply with exception(s) to Section C404.2.1, is the project also exempt from the requirements in all sub-sections to C404.2.1?

This includes: C404.2.1.1 Primary heat pump sizing; C404.2.1.2 Primary hot water storage sizing; C404.2.1.3 System design; C404.2.1.3.1 Mixing valve; C404.2.1.4 Supplemental water heating; C404.2.1.5 System fault detection.

ANSWER 1: **Yes. Following standard code language protocol, if a project qualifies for an exception to a provision, then all sub-sections to that provision do not apply to the project as well. Note that some exceptions to C404.2.1 may apply only to a portion of a project and the following subsections may apply to the remainder of the project.**

QUESTION 2: If only a portion of the capacity needed to satisfy the peak service hot water demand in a building or project area is provided by service water heating systems, equipment and other sources of heat energy that qualify for exception(s) to C404.2.1, are the systems provided to satisfy the remaining portion of the needed service water heating capacity the only systems subject to all applicable requirements in Section C404.2.1 and sub-sections C404.2.1.1 through C404.2.1.5?

ANSWER 2: **Yes. For example, if 30% of the needed capacity is provided by electric resistance SWH equipment per the capacity limits defined in Section C404.2.1 Exception 1, then only the remaining 70% of the overall needed capacity is subject to the requirements in C404.2.1 and all applicable sub-sections. This includes the system sizing criteria in Section C404.2.1.1 which requires that to comply prescriptively, at least 50% of the remaining needed capacity (70% of the total required capacity in this case) be provided by a qualifying HPWH system.**

QUESTION 3: Per Section C404.2.1 Exception 2, the available capacity of approved sources of waste heat energy may be applied "...to offset all or any portion of the required heat pump water heater capacity..." Does this mean that service water heating capacity from approved sources of waste heat energy are permitted as an alternative to the requirement that 50% of the primary service water heating capacity be provided by heat pump water heaters?

ANSWER 3: **Yes. Service water heater capacity to satisfy the prescriptive minimum sizing threshold of 50% of peak service hot water demand in Section C402.1.1 may be provided by heat pump water heaters, by an approved source of waste heat energy complying with Section C404.2.1 Exception 2, or a combination of the two heat energy sources.**

Note that Section C404.2.1 Exception 2 is considered an alternative compliance method. It is NOT an exception to the requirements in Section C404.2.1. Therefore, all applicable sub-sections to C404.2.1 would still apply.

QUESTION 4: For a building or project area where all proposed service water heating systems provided to satisfy the peak service hot water demand are heat pump water heating systems that comply with the NEEA Commercial Electric Advanced Water Heating Specification (AWHS) per C404.2.1 Exception 3, is the project then exempt from the requirements in all sub-sections to C404.2.1?

ANSWER 4: **Yes. ~~The criteria in the NEEA Commercial Electric Advanced Water Heating Specification (AWHS) for HPWHs qualifies as a compliance alternative to the requirements in Sections C404.2.1.1 through C404.2.1.5~~ Taking exception 3 for all SWH would exempt the project from the subsections to Section C404.2.1.**

QUESTION 5: For projects complying with Section C404.2.1 Exception 3 for the NEEA Commercial Electric Advanced Water Heating Specification (AWHS), do the proposed heat pump water heaters have to be a product included on the Qualified Products List (QPL) and do all Tier models in this list comply with this exception?

ANSWER 5: **Yes. Only heat pump water heating products from the QPL are eligible for this exception and all Tier models comply.**

QUESTION 6: For projects complying with Section C404.2.1 Exception 3 for the NEEA Commercial Electric Advanced Water Heating Specification (AWHS), what information is required to demonstrate compliance?

ANSWER 6: **Project documentation shall include a list of all applicable AWHS criteria and the proposed design elements that meet the specified criteria.**

QUESTION 7: Hybrid heat pump water heating systems utilize a combination of heat pump and electric resistance elements and storage volume to satisfy the service hot water demand. The heat pump is the primary heating source and the electric resistance elements are used only after approximately 2/3 of the storage tank volume is drawn during peak demand periods. The output heating capacity of the heat pump is less than 20% of the total heating capacity of the system. This combination technology achieves higher efficiency than a standard electric resistance water heater.

Do hybrid heat pump water heating systems satisfy the baseline criteria for heat pump water heaters per Section C404.2.1 (service water heating system type) and C404.2.1.1 (primary heat pump sizing)?

ANSWER 7: **No. Due to the percentage of electric resistance capacity in a hybrid heat pump water heater, this equipment type may not qualify under the code as a heat pump water heater per Section C404.2.1 and C404.2.1.1. This equipment type shall be included in the project calculations and documentation as an electric resistance service water heating**

equipment type. However, the NEEA QPL does include hybrid heat pump water heating products. Therefore, if a service water heating system with hybrid heat pump water heaters complies with all applicable criteria in the NEEA AWHs, then this equipment type would be eligible under Section C404.2.1 Exception 3.

SUPERSEDES: None

REQUESTED BY: King County

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STATE BUILDING CODE OPINION 24-Nov03b

CODE: 2021 Washington State Energy Code-Commercial

SECTION: C404.2.1.1 Primary heat pump system sizing

QUESTION 1: If primary service water heating capacity from heat pump water heaters and/or waste heat recovery sources satisfy at least 50% of the peak service hot water demand of the building or project area, can the remaining needed primary capacity be provided by fossil fuel and/or electric resistance service water heating equipment without triggering the requirement to demonstrate compliance with Section C401.3 fossil fuel compliance path?

ANSWER 1: **Yes. To comply prescriptively, only 50% of the total peak service hot water demand shall be provided by heat pump water heaters or an approved waste heat energy source. All remaining capacity may be provided by any service water heating system or equipment type.**

QUESTION 2: Section C404.2.1.1 states that “*The primary heat pump service water heating system shall be sized to deliver no less than 50 percent of the calculated demand for service hot water production during the peak demand period. Demand shall be calculated using the equipment manufacturer's selection criteria or another approved methodology.*”

Rated output capacity of service water heating equipment includes the gallons per hour production rate for first hour delivery. The capacity of fossil-fuel fired service water heating equipment is based on btu/h output and electric resistance equipment is based on kW output, both exclusive of storage. For heat pump water heaters, the rated output capacity is based on the combination of compressor btu/h output and storage.

For the 50% threshold calculation, is the capacity to be used in this calculation based on the summed output capacity of all proposed primary service water heating systems, inclusive of integral and/or external storage?

ANSWER 2: **Yes. Including integral and external storage equalizes how the different service water heating system types deliver service hot water capacity.**

QUESTION 3: Are heat pump water heaters and/or waste heat recovery sources (per Section C404.2.1 Exception 2) satisfying the requirement to provide at least 50% of the peak service hot water demand required to be used as the first stage of service water heating capacity?

ANSWER 3: **Yes.**

SUPERSEDES: None

REQUESTED BY: King County

STATE BUILDING CODE OPINION 24-Nov03c

CODE: 2021 Washington State Energy Code-Commercial

SECTION: C404.2 / C403.3.2 Service water heating equipment efficiency

QUESTION 1: Table C404.2 Footnote i states that “*There are no minimum efficiency requirements for electric heat pump water heaters greater than 12 kW or for gas heat pump water heaters.*” Do gas heat pump water heaters fall within the category of fossil fuel service water heating equipment?

Gas heat pump water heaters (GHPWH) are a technology that uses natural gas as the primary fuel source and incorporates the absorption cycle to extract additional heat energy from the surrounding area to achieve a higher overall equipment efficiency.

ANSWER 1: Yes. Gas heat pump water heaters are to be included in the project calculations and documentation as a fossil fuel service water heater equipment type.

QUESTION 2: What equipment efficiency documentation is required for gas heat pump water heaters?

ANSWER 2: Section C403.3.2 states that if no certification program exists for an equipment type, the equipment efficiency rating shall be supported by data furnished by the manufacturer. Section C404.2 contains the same provision.

SUPERSEDES: None

REQUESTED BY: King County

STATE BUILDING CODE OPINION 24-Nov03d

CODE: 2021 Washington State Energy Code-Commercial

SECTION: C404.2.1.4 Supplemental water heating

QUESTION 1: Per Section C404.2.1.4, supplemental heating capacity is permitted to be used for temperature maintenance, defrost of compressor coils, freeze protection, and for back-up capacity during low ambient temperature conditions or in the event of equipment failure. The total summed output capacity of all sources of supplemental water heating energy shall not exceed the total summed output capacity of all primary service water heating systems and equipment during peak service hot water demand. Does the total summed output capacity for supplemental water heating energy include the proposed capacities for all permitted uses combined?

ANSWER 1: **Yes.**

QUESTION 2: For the purpose of determining the supplemental heating output capacity allowance, does this calculation include the output capacities (during peak service hot water demand) of all sources of service hot water energy, including sources that comply with exception(s) to C404.2.1?

ANSWER 2: **No. Only the output capacities of service water heating systems, equipment and sources of waste heat energy that are subject to the requirements of Section C404.2.1 are included in the supplemental heating output capacity allowance calculation.**

QUESTION 3: Can supplemental water heating capacity be provided by fossil fuel and/or electric resistance service water heating equipment without triggering the requirement to demonstrate compliance with Section C401.3 fossil fuel compliance path?

ANSWER 3: **Yes. Per Section C404.2.1, “*Supplemental service water heating equipment is permitted to use electric resistance or fossil fuel in compliance with Section C404.2.1.4.*”**

SUPERSEDES: None

REQUESTED BY: King County

STATE BUILDING CODE OPINION 24-Nov03e

CODE: 2021 Washington State Energy Code-Commercial

SECTION: C505.4.3 / C505.4.4 Mechanical/service water systems and change of occupancy

QUESTION 1: Section C505.4.4-3 states that “*All new and existing service water-heating systems and equipment that serve the new service water-heating needs of the alteration area shall comply with Sections C404, C408.3, C501.6, and C506.1.*”

If an existing building undergoes a change of occupancy as specified in Section C505.3 or space conditioning per Section C505.2, and the new service hot water capacity needs of the project area will be served by existing fossil fuel or electric resistance service water heating equipment, does the alteration project have to demonstrate compliance with the C401.3 fossil fuel compliance path?

ANSWER 1: **Yes. Per Sections C505.4.4-3 and C505.1.1, both new and existing service water heating systems serving the change of occupancy or space conditioning area shall comply with all applicable requirements in Section C404 in the same manner as for a building addition. This includes demonstrating compliance with the number of additional energy credits required per Table C401.3.3 if the existing-to-remain service water heating equipment are fossil fuel or electric resistance equipment types.**

QUESTION 2: Section C505.4.3-2 states that “*All new and existing mechanical systems and equipment that serve the new building heating, cooling and ventilation needs of the alteration area shall comply with Sections C403, C408.2, C501.6, and C506.1.*”

If an existing building undergoes a change of occupancy as specified in Section C505.3 or space conditioning per Section C505.2, and the new mechanical heating capacity needs of the project area will be served by existing fossil fuel or electric resistance mechanical equipment, does the alteration project have to demonstrate compliance with the C401.3 fossil fuel compliance path?

ANSWER 2: **Yes.**

SUPERSEDES: None

REQUESTED BY: King County