



Log No. 099  
Revised 8/12/21 8/19/21

STATE OF WASHINGTON

# STATE BUILDING CODE COUNCIL

## Washington State Energy Code Development Standard Energy Code Proposal Form

Code being amended:  Commercial Provisions  Residential Provisions

Code Section # C404.14

Brief Description:

This proposal adds demand responsive control requirements for certain water heaters.

Proposed code change text: (Copy the existing text from the Integrated Draft, linked above, and then use underline for new text and ~~strikeout~~ for text to be deleted.)

*Add new definitions as follow and renumber Section C404.14s:*

**DEMAND RESPONSE SIGNAL.** A signal that indicates a price or a request to modify electricity consumption for a limited time period.

**DEMAND RESPONSIVE CONTROL.** A control capable of receiving and automatically responding to a demand *response* signal.

*Add new section as follows:*

**C404.14 Demand Responsive Water Heating.** ~~All electric water heating systems with an integrated storage tank~~Electric storage water heaters with a tank larger than ~~20-40~~ gallons shall be provided with demand ~~response-responsive~~ controls that comply with ANSI/CTA-2045-B or another equivalent approved demand responsive control.

**Exceptions:**

1. Health care facilities.
2. An electric storage water heater with demand response controls that comply with ANSI/CTA-2045-A and are also capable of initiating water heating to meet the temperature set point in response to a demand response signal.

*Add new reference standard:*

Reference	Title	Section
American National Standards Institute (ANSI) 25 West 43 <sup>rd</sup> Street New York, NY 20036, United States 1-212-642-4900; www.ansi.org		
<u>ANSI/CTA-2045-B</u>	<u>Modular Communications Interface for Energy Management</u>	<u>7.3.4.4</u>

Purpose of revision:

This revision replaces the previous revision. It is based on conversations with discussions with representatives from AHRI, the Advanced Water Heating Initiative and NEEA. The intent is to bring DR requirements in WA as far forward as product availability will allow. The revision does the following:

- It includes editorial changes to align the definitions with the terminology adopted in the demand responsive thermostatic controls.
- It raises the tank size to 40 gallons to align with WA state legislation and limit potential confusion.
- It provides an exception from the requirement for water heaters that meet CTA-2045-A and are capable of the “load-up” function from CTA-2045-B, which is one of the most important functions that differentiate -A from -B. This allows the controls to turn the water heater on and return to its set point based on a demand response signal, making it more likely that the tank will be “loaded up” when there is a need for energy consumption or in advance of a “shed” command. This effectively tells the water heater to go to the top of its dead band.

Currently, Rheem models that comply with CTA-2045-A also have this functionality and and models from AO Smith are expected this fall. The exception will bridge the gap between what is currently available on the market and the adoption of -B. As -B models become more widely available, the exception will not be necessary.

Purpose of code change:

Water heaters can provide significant load shifting and energy storage capacity in many building types. ANSI/CTA-2045 standardizes the socket, and communications protocol, for heat pump water heaters so they can communicate with the electricity grid other demand response signal providers. In addition, 2045 adds control and communications requirements for mixing valves in HPWH to enable them to provide greater storage capacity to support increased load shifting. The addendum also creates a definition of demand responsive control to ensure its consistent use throughout the code. ANSI/CTA-2045 is the industry standard for demand responsive controls for water heaters, but the requirement allows for other protocols to be approved by the building official.

This proposal requires that water heaters with integrated storage tanks have this demand control functionality. The requirement is limited to electric water heaters with integrated storage tanks. It only applies to water heaters over 20 gallons in order to exclude small, point-of-use water heaters; these water heaters also only have very small capacity for demand response. Water heaters in health care facilities are also exempted since the hot water provided can be considered a part of health care. The requirement would also not apply to large water heating systems, as they generally have separate storage tanks. These water heaters subject to this requirement generally serve lavatories and kitchenettes in commercial buildings and some water heating approaches in mid-rise residential.

Grid flexibility is one of the foundations of achieving meaningful decarbonization of building energy as it is an essential element of decarbonizing the electrical grid. Carbon free energy sources like solar and wind have varying production over the course of the day and the year. Demand responsive controls that can respond to demand response signals enable buildings to shape their loads to better align with available energy production. This could come in the form of curtailing energy use when demand is high or utilizing excess production for building tasks like pre-conditioning spaces or service hot water when demand is lower.

Your amendment must meet one of the following criteria. Select at least one:

- |  |   |
|--|---|
| <input type="checkbox"/> Addresses a critical life/safety need.  | <input type="checkbox"/> Consistency with state or federal regulations. |
| <input type="checkbox"/> The amendment clarifies the intent or application of the code.  | <input type="checkbox"/> Addresses a unique character of the state.     |
| <input checked="" type="checkbox"/> Addresses a specific state policy or statute.<br>(Note that energy conservation is a state policy) | <input type="checkbox"/> Corrects errors and omissions.                 |

Check the building types that would be impacted by your code change:

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Single family/duplex/townhome | <input checked="" type="checkbox"/> Multi-family 4 + stories | <input type="checkbox"/> Institutional         |
| <input type="checkbox"/> Multi-family 1 – 3 stories    | <input checked="" type="checkbox"/> Commercial / Retail      | <input checked="" type="checkbox"/> Industrial |

Your name                      Sean Denniston    Email address                      sean@newbuildings.org

Your organization      New Buildings Institute    Phone number                      503-481-7253

Other contact name [Click here to enter text.](#)

## **Economic Impact Data Sheet**

Briefly summarize your proposal’s primary economic impacts and benefits to building owners, tenants and businesses.

Demand control functionality will present a cost-saving opportunity for buildings in the future. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Installing demand-responsive lighting controls now will allow building tenants and owners to better control their utility costs. Since this requirement is part of the construction code, it will not require buildings to participate in any demand response programs. But it will ensure that buildings are capable of participating, so that WA buildings will be able to help integrate building loads with available production.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost [Analysis tool](#) and [Instructions](#); use these [Inputs](#). **Webinars on the tool can be found [Here](#) and [Here](#)**)

\$[Click here to enter text.](#)/square foot (For residential projects, also provide \$[Click here to enter text.](#)/ dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

There are two cost scenarios for CTA-2045-enabled water heaters:

- **Heat Pump Water Heaters:** CTA-2045 has become a largely standard (but not universal) feature of heat pump water heaters. Rheem and AO Smith, the brands carried by Home Depot and Lowes, both include CTA-2045 ports. Therefore, for buildings that are already utilizing unitized HPWHs to meet performance requirements, the incremental cost is \$0 through product selection.
- **Electric Resistance Water Heaters:** CTA-2045 electric resistance water heaters have been produced, but don’t seem to be widely available since HPWHs have taken over the energy efficient segment of the market. Therefore, the most straightforward way to implement CTA-2045 is to move to a HPWH with an incremental cost in the \$1000 range. However, many utilities in WA offer incentives in the \$500 range.

- Rheem 40-gal “Performance” electric resistance: \$379<sup>1</sup>
- Rheem 50-gal “Performance Platinum” HPWH: \$1399<sup>2</sup>

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

kWH/ square foot (or) [Click here to enter text](#).KBTU/ square foot

(For residential projects, also provide [Click here to enter text](#).KWH/KBTU / dwelling unit)

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

Although a HPWH would deliver additional savings (60% on average<sup>3</sup>), the purpose of the CTA-2045 protocol is not to save energy overall, but to serve peak energy.

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

This proposal will add a minimal amount of extra plan review. Spec sheets will need to be checked to ensure that the water heater meets the requirement. There should be no additional inspection time if site inspectors are checking that water heating equipment is consistent with the construction documents.

---

<sup>1</sup> <https://www.homedepot.com/p/Rheem-Performance-40-Gal-Medium-6-Year-4500-4500-Watt-Elements-Electric-Tank-Water-Heater-XE40M06ST45U1/205810725>. Accessed 6/30/2021

<sup>2</sup> <https://www.homedepot.com/p/Rheem-Performance-Platinum-50-Gal-10-Year-Hybrid-High-Efficiency-Smart-Tank-Electric-Water-Heater-XE50T10H45U0/312742081>. Accessed 6/30/2021

<sup>3</sup> <https://hotwatersolutionsnw.org>

**All questions must be answered to be considered complete. Incomplete proposals will not be accepted.**