



**BSR/ASHRAE/IES Addendum dm
to ANSI/ASHRAE/IES Standard 90.1-2022**

Public Review Draft

Proposed Addendum dm to Standard 90.1-2022, Energy Standard for Sites and Buildings Except Low- Rise Residential Buildings

**First Public Review (July 2025)
(Draft Shows Proposed Changes to Current Standard)**

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

Gas-fired heat pumps for water heating are an emerging technology that can reduce natural gas or propane consumption for users who choose this technology. This equipment can achieve a coefficient of performance (COP) greater than 100 percent, even in cold temperatures, which exceeds even the most efficient service water heating boilers. The existing language in the standard does not recognize gas-fired heat pumps in either Section 7.5.3 – “Large Gas-fired Service Water-Heating Systems,” which requires higher than minimum efficiencies for large capacity systems, or the energy credits in Section 11.5.2.3.1 Improved Service Water Heating Effectiveness.”

This proposal:

- adds ANSI/ASHRAE 118.1-2022 and ANSI/ASHRAE 118.2-2022 as testing methods for gas-fired heat pump water heaters, with the rating point at 50°F.
- inserts text into Section 7.5.3 that allows the use of gas-fired heat pumps to meet the requirements of that section.
- expands Section 11.5.2.3.1 Improved Service Water Heating Effectiveness” to allow the use of gas-fired heat pump water heaters and provides a path for additional credits for equipment that exceeds the 95 E_t threshold.

Cost-effectiveness: This addendum provides an additional path to meet high-efficiency gas service water heating requirements, and does not increase the cost of construction unless users select gas-fired heat pump water heaters.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum dm to 90.1-2022

Add a new definition to Section 3.2

high-capacity gas-fired service water-heating equipment: gas-fired instantaneous water heaters with a rated input both greater than 200,000 Btu/h [56.8 kW] and not less than 4000 Btu/h per gallon [310 W per litre] of stored water, and gas-fired storage water heaters with a rated input both greater than 105,000 Btu/h [30.8 kW] and less than 4000 Btu/h per gallon [310 W per litre] of stored water, and gas-fired heat pump water heaters with an input capacity greater than 50,000 Btu/h [14.2 kW].

Add Section 7.4.4 to Section 7.4 (I-P and SI) as follows:

7.4.7 Performance rating of gas heat pump water heaters. The COP of gas-fired heat pump water heaters with an input capacity greater than 20,000 Btu/h [21.1 MJ/h] shall be rated at 50°F [10°C] ambient air temperature in accordance with ASHRAE Standard 118.1. The COP of gas-fired heat pump water heaters with an input capacity of not more than 20,000 Btu/h [21.1 MJ/h] shall be rated at 67.5°F [19.7°C] ambient air temperature in accordance with ANSI/ASHRAE 118.2.

7.5.3 Large Gas-fired Service Water-Heating Systems. New buildings with service water-heating systems with a total installed input capacity of 1,000,000 Btu/h [293 kW] or greater, provided by *high-capacity gas-fired service water-heating equipment not installed in individual dwelling units*, shall meet ~~either or both~~ the following requirements:

- a. Where a single unit of *high-capacity gas-fired service water-heating equipment* is installed, it shall have a minimum thermal efficiency (E_t) of 92%.
- b. Multiple units of *high-capacity gas-fired service water-heating equipment* connected to the same service water-heating system shall have a total input capacity-weighted average thermal efficiency (E_t) of ~~at least~~ not less than 90%, and a minimum of 30% of the input of the *high-capacity gas-fired service water-heating equipment* in the service water heating system shall have a thermal efficiency (E_t) of ~~at least~~ not less than 92%.
- c. Where gas-fired heat pump water heaters are used, they shall be rated in accordance with Section 7.4.7 and, for the purpose of this section, E_t shall be the rated COP expressed in percent.

~~High-capacity gas-fired service water-heating equipment comprises gas-fired instantaneous water heaters with a rated input both greater than 200,000 Btu/h and not less than 4000 Btu/h per gallon of stored water, and gas-fired storage water heaters with a rated input both greater than 105,000 Btu/h and less than 4000 Btu/h per gallon of stored water.~~

~~Exceptions to 7.5.3:~~

- ~~1. Water heaters installed in individual dwelling units.~~
- ~~2. Individual gas water heaters with input capacity not greater than 100,000 Btu/h.~~

11.5.2.3.1 Improved Service Water Heating Effectiveness. Service water heating effectiveness energy credits are permitted to be achieved in building use types where credits are available in Section 11.5.3 for one of the following:

...

b. **W02: Electric Heat-Pump Water Heater.** To achieve this credit, electric air source heat-pump water heaters shall be installed according to the manufacturer's instructions, and at least 30% of design end-use service water heating requirements shall be met using only heat-pump heating at an ambient condition of 67.5°F [19.7°C] db without supplemental electric resistance or fossil fuel heating. For a hybrid heat-pump water heater, the heat-pump-only capacity shall be deemed at 40% of the first hour draw. Where the heat-pump-only capacity exceeds 50% of the design end-use load, excluding recirculating system losses, the credits from the Section 11.5.3 tables shall be prorated as follows:

$ECW02_calc$ where = $ECW02_base \times CapHPWH/EndLoad \times 0.5$ (not greater than 2)

Where:

$ECW02_calc$ = energy credits achieved for heat-pump water heater

$ECW02_base$ = W02 base energy credit from Section 11.5.3

$CapHPWH$ = heat-pump-only capacity at 50°F [10°C] entering air and 70°F [21°C] without supplemental electric resistance or fossil fuel heat, Btu/h

$EndLoad$ = end-use peak hot-water load, excluding load for heat trace or recirculation, Btu/h

The heat-pump service water heating system shall comply with the following requirements:

1. For central systems with an installed total output capacity of more than 100,000 Btu/h at an ambient condition of 67.5°F [19.7°C] db, a preheat storage tank with ≥ 0.75 gal per 1000 Btu/h [9.7 L/kW] of design end-use service water heating requirements shall be heated only with heat-pump heating when the ambient temperature is more than 45°F [7.2°C].
2. For systems with piping temperature maintenance, either a heat trace system or a separate water heater in series for recirculating system and final heating shall be installed.
3. Heat-pump water heater efficiency shall meet or exceed one of the following:
 - i. Output-capacity-weighted-average uniform energy factor (UEF) of 3.0 with a medium draw pattern in accordance with 10 CFR 430 Appendix E.
 - ii. Output-capacity-weighted-average COP of not less than 4.0 tested at 50°F [10°C] entering air and 70.0°F [21.1°C] entering water in accordance with Standard 1300.

Informative Note: Service water heating system control settings and operating temperatures should be determined in accordance with the ASHRAE Standard 188 building water systems water management program for the building or with generally accepted engineering standards and guidance (e.g., ASHRAE Guideline 12).

c. **W03: Efficient Gas Water Heater.** To achieve this credit, the combined input-capacity-weighted-average equipment rating of all gas water heating equipment in the building shall be not less than 95% E_t or 0.93 UEF. Gas-fired heat pump water heaters shall be rated in accordance with Section 7.4.7. For the purpose of this section, the E_t of gas-fired heat pump water heaters with an input capacity of more than 20,000 Btu/h [5.68 kW] shall be the rated COP expressed in percent.

Buildings required to comply with Section 7.5.3 shall receive 29.6% of the Section 11.5.3 W03 credit. Buildings where the installed service water heating capacity is less than 200,000 Btu/h [56.8 kW] and weighted UEF is not less than 0.82 shall achieve 25% of the base table W03 credit.

For gas-fired water heating equipment that exceeds 95% E_t or .93 UEF, credits shall be adjusted according to the following equation:

$$ECW03_{adj} = ECW03_{base} \times E_{t_{des}}/E_{t_{min}}$$

Where:

$ECW03_{adj}$ = adjusted energy credits

$ECW03_{base}$ = base energy credits from Tables 11.5.3-1 through 11.5.3-9

$E_{t_{des}}$ = rated efficiency of proposed water heating equipment

$E_{t_{min}}$ = 95% E_t or 0.93 UEF as applicable to the gas-fired service water heating equipment

- d. Combination service water heating systems shall achieve credits as follows:
 1. (W01 + W02) Where service water heating employs both energy recovery and heat-pump water heating, W01 is permitted to be combined with W02 and receive the sum of both credits.
 2. (W01 + W03) Where service water heating employs both energy recovery and efficient gas water heating, W01 is permitted to be combined with W03 and receive the sum of the W01 credit and the portion of the W03 credit based on item (4).
 3. (W02 + W03) Where service water heating employs both heat-pump water heating and efficient gas water heating, W02 is permitted to be combined with W03 and receive the sum of the W02 credit and the portion of the W03 credit based on item (4).
 4. For items (2) and (3), the portion of W03 credit shall be the Section 11.5.3 W03 credit multiplied by the share of total water heating installed capacity served by gas water heating with not less than 95% E_t or 0.93 UEF. In no case shall it exceed 60% of the W03 credit in Section 11.5.3. In buildings that have a service water heating design generating capacity greater than 900,000 Btu/h, that proportioned W03 credit shall be further multiplied by 29.6%.

Add to Section 13 (I-P and SI) as follows:

ASHRAE

<u>ANSI/ASHRAE 118.1-2022</u>	<u>Method of Testing for Rating Commercial Gas, Electric, and Oil Service Water-Heating Equipment</u>
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<u>ANSI/ASHRAE 118.2-2022</u>	<u>Method of Testing for Rating Residential Water Heaters and Residential-Duty Commercial Water Heaters</u>
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