

ANSI/ASHRAE Standard 118.1-2008
(Supersedes ANSI/ASHRAE Standard 118.1-2003)



ASHRAE STANDARD

Method of Testing for Rating Commercial Gas, Electric, and Oil Service Water Heating Equipment

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**American Society of Heating, Refrigerating
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1791 Tullie Circle NE, Atlanta, GA 30329
www.ashrae.org

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** For the 2008 revision in which minor changes were performed (i.e., updating references),
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CONTENTS

ANSI/ASHRAE Standard 118.1-2008 Method of Testing for Rating Commercial Gas, Electric, and Oil Service Water Heating Equipment

SECTION	PAGE
Foreword	2
1 Purpose	2
2 Scope	2
3 Definitions and Symbols	2
4 Classifications by Mode of Operation	4
5 Requirements	5
6 Instruments	5
7 Apparatus	5
8 Methods of Testing	10
9 Test Procedures	11
10 Calculation of Results	13
11 References	15
Informative Appendix A: Correction Applied to the Heating Value, H , for a Fuel Gas	16
Informative Appendix B: Method of Estimating Energy Required for Heating a Daily Quantity of Hot Water, U , in Gallons (Liters) Exclusive of Distribution Piping System Losses	16

NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at <http://www.ashrae.org>.

(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

This is a revision of ANSI/ASHRAE Standard 118.1-2003.

This standard was prepared under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.

The changes made for the 2008 revision were:

- *references were updated*
- *value conversion made consistent in Sections 7.2.2 and 7.7.4.1*
- *SI unit value added where needed in Section 10.2.3*

1. PURPOSE

The purpose of this standard is to provide test procedures for rating directly heated commercial-service water-heating equipment.

2. SCOPE

2.1 This standard provides test procedures for determining the efficiency and hot water delivery capability of the water-heating equipment to which it applies.

2.2 This standard applies to electric resistance, electric air-source heat pump, gas-fired, and oil-fired water-heating equipment, including hot water supply boilers with input ratings less than 12,500,000 Btu/h (3660 kW) and greater than:

Electric Resistance	12 kW
Electric Heat Pump	6 kW (including all 3 phase regardless of input)
Gas-Fired	75,000 Btu/h (22 kW) (see Section 2.3)
Oil-Fired	105,000 Btu/h (31 kW)

2.3 This standard does not apply to gas-fired service water-heating equipment that meets all of the following:

- a. has a storage capacity of less than two gallons,
- b. is designated to deliver water at a controlled temperature of less than 180°F (82°C), and
- c. has an input rating less than 200,000 Btu/h (59 kW).

3. DEFINITIONS AND SYMBOLS

3.1 Definitions

boiler, hot water supply: a boiler used to heat water for purposes other than space heating.

cutout: the time when a thermostat has acted to reduce the energy or fuel input to the heating elements or burners under its control to a minimum.

heating cycle: the period of operation including prepurge, primary heat-producing energy flow, and postpurge.

heat pump water heater: a device using the vapor compression cycle to transfer heat from a low-temperature source to a higher-temperature sink for the purpose of heating potable water, including all necessary ancillary equipment fans, blowers, pumps, storage tanks, piping, and controls.

input rating: the rating that appears on the water heater's rating plate, expressed in kW or Btu/h, as appropriate.

mean tank temperature: the mean of the water temperatures determined using the water-heating equipment tank thermocouple described in Section 7.3.1.

service water heating: heating water for purposes other than space heating or pool heating.

3.2 Symbols

C_{fg}	=	volume conversion factor, 7.48055 gal/ft ³ (1,000 L/m ³)
C_{ge}	=	conversion factor from kWh to Btu = 3,412 Btu/kWh
COP_h	=	the average coefficient of performance for heat pump water heaters: a dimensionless ratio of useful water-heating energy output to input energy
C_p	=	specific heat of water at 140°F (60°C) in Btu/(lb·°F) = 1.00 Btu/(lb·°F) [4,184 J/kg·°C]
C_{pg}	=	nominal specific heat of water, 8.25 Btu/(gal·°F) [4.14 kJ/L·K]
C_s	=	correction factor applied to gas if it is not at standard temperature and pressure (see Appendix A)
C_{WJ}	=	conversion of electric power = 3,600,000 J/kWh
EB	=	energy balance: the heat pump water heater overall energy balance calculated in Section 9.4.3
Eg_{min}	=	equivalent gallons (liters) per hour, continuous
E_t	=	thermal efficiency as calculated in Section 10.2.1
E_{tp}	=	thermal efficiency during reduced input as calculated in Section 10.2.2
FR	=	flow rate: the water flow rate established at full input rating in Section 8.7, gal/min (L/min)
FR_a	=	flow rate average of FR for the duration of the thermal efficiency test in Section 9.1.1, gal/min (L/min)
FR_h	=	flow rate: the water flow rate during the heat pump water heater water heating mode test, Type IV, in Section 9.4.4, gal/min (L/min)
FR_{min}	=	water flow rate established at minimum input rating in Section 8.7.2, gal/min (L/min)
FR_p	=	tested flow rate at partial input: the average of FR_{min} for the duration of the thermal efficiency test in Section 9.1.2, gal/min (L/min)
H	=	actual higher heating value for the test gas, Btu/ft ³ (kJ/m ³)