

ANSI/ASHRAE Standard 137-1995 (RA 2004)



ASHRAE STANDARD

Methods of Testing for Efficiency of Space-Conditioning/ Water-Heating Appliances that Include a Desuperheater Water Heater

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**American Society of Heating, Refrigerating
and Air-Conditioning Engineers, Inc.**

1791 Tullie Circle NE, Atlanta, GA 30329

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1791 Tullie Circle NE
Atlanta, GA 30329
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1. PURPOSE

1.1 This standard provides test methods and calculation procedures for establishing the efficiencies of space-conditioning/water-heating appliances having refrigerant-to-water desuperheaters.

1.2 The procedures may be used as a basis for establishing efficiency ratings for such equipment and for estimating annual energy consumption.

2. SCOPE

This standard covers electric, air-to-air, space-conditioning appliances that include a refrigerant-to-water desuperheater and have rated cooling capacities of less than 65,000 Btu/h.

3. DEFINITIONS

active system: a combined appliance that uses a pump to circulate potable water, either at a varying or a fixed rate, between the desuperheater and the water heater.

appliance: often used in this standard as a one-word substitute for combined appliance, which is defined below.

combined appliance: an assembly consisting of a heat pump or air conditioner, a desuperheater, a water heater, and if required, a potable water pump; the assembly provides space conditioning and domestic hot water.

combined performance factor—cooling season (CPF_{cs}): the seasonal coefficient of performance of the combined appliance when used to meet both the space-cooling and domestic water-heating loads that occur during the space-cooling season. The quantity is dimensionless.

combined performance factor—heating season (CPF_{hs}): the seasonal coefficient of performance of the combined appliance when used to meet both the space-heating and domestic water-heating loads that occur during the space-heating season. The quantity is dimensionless.

combined performance factor—water-heating-only season (CPF_{ws}): the seasonal coefficient of performance of the combined appliance when used to meet the domestic water-heating load that occurs during the water-heating-only season (i.e., days during the year when no space conditioning is provided). For combined appliances having a desuperheater, all water heating during this season is performed by the water heater resistive element(s). The quantity is dimensionless.

combined space-cooling and water-heating (COOL&WH) mode: an operating mode where the heat pump (air conditioner) is space cooling and the desuperheater is heating domestic water.

combined space-heating and water-heating (HEAT&WH) mode: an operating mode where the heat pump is space heating and the desuperheater is heating domestic water.

desuperheater: a refrigerant-to-water heat exchanger that transfers heat from high-pressure, high-temperature refrigerant to domestic water. Heat transfer occurs when the heat pump (air conditioner) operates to satisfy the building space-

conditioning load. Within the refrigeration circuit, the desuperheater is located between the compressor discharge and the reversing valve of a heat pump or between the compressor discharge and the inlet to the refrigerant-to-air condenser of an air conditioner.

energy factor (EF): the ratio of the thermal energy supplied by a water heater to the energy input during a prescribed 24-hour simulated use test. The energy factor is a dimensionless quantity.

factory-installed desuperheater: the heat pump (air conditioner) and desuperheater are supplied with all refrigerant tubing between the heat pump (air conditioner) and the installed desuperheater and all refrigerant connections between these two components are complete. For active and passive systems with a factory-installed desuperheater, the water piping that connects the desuperheater and the water heater may be completed either at the factory or when the system is installed in the field.

field-installed desuperheater: the heat pump (air conditioner) and desuperheater are supplied as separate components; the refrigerant-side additions and modifications that are needed to couple the components are completed when the system is installed in the field. For active and passive systems with field-installed desuperheaters, the water piping that connects the desuperheater and the water heater may be completed either at the factory or when the system is installed in the field.

heating seasonal performance factor (HSPF): for the space-heating season, the ratio of the total space heating delivered to the total electrical energy input if the combined appliance operated exclusively in a space-heating-only (HEAT) mode. The quantity is expressed in units of Btu/W·h.

insert system: a combined appliance where refrigerant tubing is inserted directly into the water heater, usually through one of the ports on the water heater; the inserted tubing is the desuperheater.

manufacturer: the supplier who provides the rating of the combined appliance.

passive system: a combined appliance that does not use a water pump but relies on thermosiphon flow through the desuperheater and water heater; generally the desuperheater is mounted on the side of the water heater or at an elevation lower than the water heater.

pipng: when used alone, refers strictly to water piping.

seasonal energy efficiency ratio (SEER): for the cooling season, the ratio of the total heat removed from the conditioned space to the total electrical energy input if the combined appliance operated exclusively in a space-cooling-only (COOL) mode. The quantity is expressed in units of Btu/W·h.

simulated use test: a laboratory test where water draws are imposed on the water heater while the combined appliance provides space conditioning and desuperheater water heating over specified periods. The test is used to determine a representative inlet water temperature to the desuperheater for use