



STANDARD

ANSI/ASHRAE Standard 152-2014
(Supersedes ANSI/ASHRAE Standard 152-2004)

Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems

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NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

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FOREWORD

The objective of this method of test is to provide estimates of the efficiency of thermal distribution systems. This efficiency may be used in energy consumption or system capacity estimates. This method of test provides thermal distribution system efficiencies for both heating and cooling systems. Thermal distribution system efficiency is calculated for seasonal conditions (for energy consumption) or design conditions (for system sizing). This results in a total of four outputs from the method of test. This standard does not address the effectiveness of the tested system to provide comfort in the conditioned space or to deliver the designed or required airflow to individual rooms within the conditioned space.

1. PURPOSE

This standard prescribes a method of test to determine the efficiency of space heating and/or cooling thermal distribution systems under seasonal and design conditions. The objective is to facilitate annual energy calculations and heating and cooling equipment capacity calculations.

2. SCOPE

2.1 This standard applies to single-family detached and attached residences with independent thermal systems.

2.2 This standard applies to air, hydronic, and electric distribution systems.

3. DEFINITIONS

buffer zone: unconditioned part of a building containing some or all of the distribution system.

conditioned space: the portion of a building whose air temperature or operative temperature (combined air and radiant temperatures) is intentionally controlled for human occupancy.

delivery effectiveness: the ratio of the thermal energy transferred to or from the conditioned space to the thermal energy transferred at the equipment-distribution system heat exchanger. Energy delivered to or from the conditioned space includes distribution system losses to the conditioned space.

distribution system efficiency: the ratio between the energy consumption by the equipment if the distribution system had no losses (gains) to the outdoors or effect on the equipment or building loads, and the energy consumed by the same equipment connected to the distribution system under test.

electric distribution system: a thermal distribution system that uses electric wiring as the distribution medium in the building.

equipment: a thermal energy conversion device (furnace, boiler, or water heater) or heat-pumping device (air conditioner or heat pump) that serves all or part of the building.

equipment capacity: the manufacturer's rated capacity at the 35°C (95°F) AHRI rating point for air conditioners and 8°C (47°F) AHRI rating point for heat pumps. Furnace capacity shall be adjusted for altitude effects. For the low-capacity stages of multistaged equipment, consult manufacturers' data.

equipment efficiency: the ratio between the thermal energy transferred at the equipment heat exchanger and the thermal (or its equivalent) energy consumed by the equipment.

equipment factor: the ratio of the equipment efficiency, including the effects of the distribution system to the equipment efficiency without the distribution system.

finned-tube baseboard: a heating-terminal unit that primarily consists of one or more finned tubes and a casing cabinet.

floor area: the conditioned floor area of the building.

forced-air distribution system: forced-air systems are heating and/or cooling systems that use motor-driven blowers to distribute heated, cooled, and otherwise treated air for comfort of individuals in confined spaces.

hydronic distribution system: a thermal distribution system that uses water or a mixture of water and additives as the distribution medium in the building.

infiltration factor: the ratio of the building infiltration load without including distribution effects to the load, including distribution system effects.

radiant barrier: a surface of low emissivity (less than 0.1) placed inside an attic or roof space above (but not touching) the distribution system to reduce radiant heat transfer.

radiant panel: a heating or cooling surface that delivers 50% or more of its heat transfer by radiation that may be either an integral part of the building (e.g., floor or ceiling heating) or detached from the building elements (e.g., suspended ceiling panel).

reduced-absorptivity exterior coating: an exterior finish applied to roof systems in order to reduce the absorption of solar radiation. The solar absorptivity must be 0.4 or less.

thermal regain: the fraction of distribution system losses (gains for cooling) that are returned to the conditioned space.

tile roof: a ventilated barrel tile roofing system.

variable-capacity equipment: some heating and cooling equipment operates in stages of different capacity that depend on building load, e.g., electric furnaces with several separate heater elements.

vented crawlspace: a crawlspace with an open vent area $\geq 1/150$ th of its floor area, with vents distributed over all exterior surfaces.

well-vented attic: an attic with an open vent area $\geq 1/300$ th of its floor area distributed high and low over attic surfaces.