ANSI/ASHRAE Standard 143-2007
(Supersedes ANSI/ASHRAE Standard 143-2000)

ASHRAE STANDARD

Method of Test for Rating Indirect Evaporative Coolers

Approved by the ASHRAE Standards Committee on June 23, 2007; by the ASHRAE Board of Directors on June 27, 2007; and by the American National Standards Institute on June 28, 2007.

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ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
1791 Tullie Circle NE, Atlanta, GA 30329
www.ashrae.org

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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.

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FOREWORD

First published in 2000, ASHRAE Standard 143 provides procedures for testing indirect evaporative cooling devices under laboratory conditions to obtain rating information. As an ASHRAE method-of-test standard, it is intended to offer recommended practices and accurate measurement procedures.

This revision makes two key changes to Standard 143-2000. First, the difference between the primary dry-bulb temperature and secondary wet-bulb temperature has been decreased from 25°F to 20°F (14°C to 11°C). This reduction will increase the times when testing can be accomplished using unconditioned air without reducing the accuracy of the test. Second, to provide greater flexibility, temperature measurement in Section 8.1.1 is no longer limited to specific types of instruments as long as they meet the requirements of ANSI/ASHRAE Standard 41.1, Standard Method for Temperature Measurement.

Various other improvements were made as well. All references were updated to the latest editions, and several typographical errors were corrected. Mandatory language was clarified by changing "will" to "shall."

1. PURPOSE

This standard provides test procedures and calculations for establishing the cooling capacities and power requirements for indirect evaporative cooling equipment.

2. SCOPE

2.1 This standard covers testing under steady-state conditions for rating of indirect evaporative coolers that

a. sensibly cool a primary airstream through heat exchanger(s) by the evaporation of water into a secondary airstream and
b. are self-contained or are components of packaged systems.

2.2 This standard does not cover

a. devices that use mechanical refrigeration or thermal storage to cool the primary airstream, the secondary airstream, or the water provided for evaporation or
b. devices that dry the primary or secondary airstream.

3. DEFINITIONS

adiabatic saturation: evaporating water into air without external gain or loss of heat. Sensible heat in both air and water becomes latent heat in entrained vapor, and temperatures fall and equalize.

air density: the mass per unit volume of the air.

application rating: a rating based on tests performed at application rating conditions (other than standard rating conditions).

component indirect evaporative cooler (IEC module): an indirect evaporative cooling device consisting of an indirect evaporative cooling heat exchanger, a means of delivering and distributing water to the wet passages of the heat exchanger, a basin for collecting water, a recirculating water pump, and the piping that connects the basin and the water distribution system. (See Figure 3.)

cooling effectiveness: the primary air dry-bulb temperature reduction divided by the primary air entering dry-bulb temperature less the entering secondary wet-bulb temperature.

determination: a complete set of measurements for a particular point of operation of an IECU. The measurements must be sufficient to determine all IECU performance variables as defined in this standard.

IECU: an acronym created for use in this document, which stands for a packaged, semi-packaged, or component indirect evaporative cooling unit. The term *cooling unit* is also used interchangeably throughout this document for evaporative cooling unit or evaporative cooler.

IECU air boundaries: indirect evaporative cooling unit inlet and outlet boundaries are defined as the interface between the cooling unit and the remainder of the system and are at a plane perpendicular to the airstream where it enters or leaves the indirect evaporative cooling unit. Various appurtenances, such as filter media assemblies, inlet boxes, inlet vanes, inlet cones, silencers, screens, rain hoods, dampers, discharge cones, and eaves, may be included as part of the cooling unit between the inlet and outlet boundaries.

IECU air density: the density of the air corresponding to the total pressure and dry- and wet-bulb temperatures at the cooling unit inlet.

IECU inlet area: the gross inside area measured in the plane(s) of the inlet connection(s). For converging inlets without connection elements, the inlet area shall be considered to be where a plane, perpendicular to the airstream, first meets the bell mouth or cone.

IECU input power boundary: the interface of the wiring entering electrically powered equipment. Drive or coupling losses are included as part of the input power.

IECU outlet area: the gross inside area measured in the plane(s) of the outlet opening(s).

IECU total power: the sum of the power in watts supplied to the electrical components of the indirect evaporative cooler tested. This includes fan motors, pump motors, and other devices needed to produce the cooling effect. The power to control devices such as thermostats, transformers providing low voltage to control mechanisms, and freeze protection devices need not be included in total power.

IECU total pressure: the difference between the total pressure at the cooling unit outlet and the total pressure at the cooling unit inlet.