STANDARD

ANSI/ASHRAE Standard 143-2015
(Supersedes ANSI/ASHRAE Standard 143-2007)

Method of Test for Rating Indirect Evaporative Coolers

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NOTE

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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.

In this new 2015 edition, references have been updated and the reporting forms have been moved to the informative appendices.

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 exchangers 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 shall be sufficient to determine all IECU performance variables as defined in this standard.

energy factor: the ratio of the total kinetic energy of the flow to the kinetic energy corresponding to the average velocity.

evaporative cooling: cooling that evaporates water to cool air by one of two methods: (1) direct, which is adiabatic and humidifies the air, and (2) indirect, which is nonadiabatic and cools the air being treated.

fan: a device for moving air that utilizes a power-driven rotating impeller. A fan shall have at least one inlet opening and at least one outlet opening. The openings may or may not have elements for connection to ductwork.

fan motor power: the electric power required to drive the fan and any elements in the drive train that are considered a part of the fan.

fan speed: the rotative speed of the impeller. If a fan has more than one impeller, fan speeds are the rotative speeds of each impeller.

free delivery: the point of operation where the external static pressure is zero.

IECU: a term created for use in this document that refers to a packaged, semipackaged, 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