STANDARD

ANSI/ASHRAE Standard 133-2015
(Supersedes ANSI/ASHRAE Standard 133-2008)

Method of Testing Direct Evaporative Air Coolers

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CONTENTS

ANSI/ASHRAE Standard 133-2015,
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NOTE

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FOREWORD

First published in 2001, Standard 133 provides procedures for testing direct 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 addition, the committee incorporates the effects of ambient conditions, testing error, instrument accuracy, and the need to make certain that no other sources of heat transfer are taking place during the testing.

This revision makes a key change to Standard 133- 2008. The density correction to saturation effectiveness has been simplified by clarifying that it shall be reported only as a function of actual test standard airflow.

Various other improvements were made as well. References were updated to the latest editions, and mandatory language was clarified.

1. PURPOSE

This standard establishes a uniform method of laboratory testing for rating packaged and component direct evaporative air coolers.

2. SCOPE

2.1 The scope of this standard covers a method of testing for rating the saturation effectiveness, airflow rate, and total power of packaged and component direct evaporative air coolers.

2.2 Covered tests also include the methods for measuring the static pressure differential of the direct evaporative air cooler, density of the air, and speed of rotation of the fan.

2.3 This standard requires that packaged and component direct evaporative air coolers be simultaneously tested for airflow, total power, and saturation effectiveness.

2.4 The ratings resulting from application of this standard are intended for use by manufacturers, specifiers, installers, and users of evaporative air cooling apparatus for residential, commercial, agricultural, and industrial ventilation; for air-cooling applications; and for commercial, industrial, and agricultural processing applications.

3. DEFINITIONS AND ACRONYMS

adiabatic saturation: evaporating water into air without external gain or loss of heat. Sensible heat in both air and water becomes latent heat in evaporated vapor. The air is cooled and humidified.

appurtenance device power: the electric power to drive accessories—not including fans, pumps, or rotary devices—supplied as a standard component of the production model of the evaporative cooling unit (ECU) and the appurtenances that are necessary for, contribute to, or enhance the cooling capacity of the ECU. Appurtenance device power includes, but is not limited to, water metering devices, conductivity controllers, timers, dump cycle pumps, and solenoids. Devices such as thermostats, transformers providing low voltage to control mechanisms, and freeze protection devices shall not be included.

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

component direct evaporative cooler: a self-contained cabinet without a fan whose primary functions are (a) the conversion of the sensible heat of unsaturated air passing through the cabinet to latent heat by the process of evaporating recirculating or nonrecirculating water directly exposed to this air and (b) the movement of this air through the cabinet that allows a portion of this water to evaporate. An example of a component direct evaporative cooler is shown in Informative Appendix B, Figure B-7.

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

ECU: a term created for use in this document that stands for "evaporative cooling unit." The term *cooling unit* is also used interchangeably throughout this document for evaporative cooling unit, evaporative air cooler, and evaporative cooler.

ECU airflow rate: the volumetric airflow rate based on entering air density.

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

ECU static pressure differential: the static pressure differential measured across the ECU and its appurtenances at each point of operation.

ECU total power: the sum of the power in watts supplied to the electrical components of the 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 shall not be included in total power.

ECU water flow rate: the water supplied to the ECU header.

evaporative air cooling: two methods using evaporating water to cool air: *direct*, which is adiabatic and humidifies the air, and *indirect*, which is not adiabatic and cools the air being treated without adding moisture.