

ANSI/ASHRAE Standard 133-2001



ASHRAE[®] STANDARD

Method of Testing Direct Evaporative Air Coolers

Approved by the ASHRAE Standards Committee June 23, 2001; by the ASHRAE Board of Directors June 28, 2001; and by the American National Standards Institute February 4, 2002.

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ISSN 1041-2336

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(This foreword is not part of this standard but is included for information purposes only.)

FOREWORD

This standard provides rules for the testing of packaged direct evaporative air coolers and also component direct evaporative air coolers. It was prepared by ASHRAE Standard Project Committee SPC 133P. The cognizant technical committee of ASHRAE is TC 5.7, Evaporative Cooling. The purpose of this standard is to provide a uniform method for testing in a laboratory.

The method of testing follows closely ASHRAE 51 (AMCA 210), *Laboratory Methods of Testing Fans for Ratings* [1],* by necessity since the success of any evaporative cooler installation is highly dependent on the total volume of airflow moving through the system (installation). In addition, the committee has incorporated 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.

Suggestions for improvement to this standard will be welcome. They should be sent to the Manager of Standards, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329-2305.

*Bracketed numbers indicate references in Section 13.

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 static pressure differential of the direct evaporative air cooler, density of the air, and speed of rotation of the fan.

2.3 Although based on ASHRAE Standard 51/AMCA 210, *Laboratory Methods of Testing Fans for Ratings* [1], 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; 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 entrained vapor, and temperatures fall and equalize.

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, eaves, that are supplied as a standard component 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 (1) the conversion of the sensible heat of unsaturated air passing through the cabinet to latent heat by the process of evaporating recirculating or non-recirculating water directly exposed to this air, and (2) the movement of this air through the cabinet that allows a portion of this water to evaporate.

cooling effectiveness: see *saturation effectiveness*.

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

ECU: an acronym 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 upon entering air density.

ECU 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 that where a plane, perpendicular to the airstream, first meets the bell mouth or cone.

ECU input power boundary: the interface of the wiring entering its electrically powered equipment.