



# ASHRAE STANDARD

## Method of Test for Residential Central-System Humidifiers

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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

This standard provides rules for the testing of central system humidifiers for residential applications. Its purpose is to provide a uniform method for testing in a laboratory environment. Although the method of test originated in ARI Standard 610, Performance Rating of Central System Humidifiers, the project committee has developed this separate method of test to be used independently of the Air Conditioning & Refrigeration Institute (ARI) rating standard so that manufacturers, specifiers, installers, and users of central system residential humidifiers can test a humidifier's capacity under a variety of conditions with uniform results. This method of test was prepared in cooperation with ARI to utilize with ARI Standard 610.

Standard 164.1 is the first in a series of three standards for the testing of humidifiers. Proposed Standard 164.2 will address self-contained humidifiers for residential applications, and proposed Standard 164.3 will address commercial and industrial humidifiers.

## 1. PURPOSE

This standard establishes a uniform method of laboratory testing for rating central-system residential humidifiers.

## 2. SCOPE

**2.1** The scope of this standard covers a method of test for the humidification rate of central-system residential humidifiers intended for use with forced warm air heating and/or cooling systems.

**2.2** This method of test describes the test apparatus, conduct of the test, and information to be recorded.

**2.3** Tests covered include methods for measuring electrical power input, water flow rate, water temperature, and water pressure to the test humidifier. Also included are airflow rate, static pressure, temperature, and relative humidity entering and maintained by the test apparatus.

**2.4** Information resulting from the application of this method of test is intended for use by manufacturers, specifiers, installers, and users of central-system residential humidifiers.

**2.5** This method of test does not apply to self-contained humidifiers, portable humidifiers, or humidifiers for commercial and industrial applications.

## 3. DEFINITIONS

**central-system humidifier:** a humidifier that is installed in, or discharges into, the airstream of an HVAC system.

**humidification rate:** a measure of the ability of a humidifier to add moisture to its surrounding atmosphere, expressed as kg (lb<sub>m</sub>) of water evaporated per unit of time.

**humidifier:** a device designed to add moisture to air.

**heating or cooling unit:** the unit to which the humidifier is connected to, or mounted within.

**portable humidifier:** a type of humidifier that has the characteristics described in *AHAM-HU-1, Household Humidifiers*.<sup>1</sup>

**return duct humidifier:** a humidifier that is connected to a horizontal duct and that has the function of returning humidified air to the central system.

**return plenum central-system humidifier:** a humidifier that is connected to a vertical duct and has the function of returning humidified air to the central system.

**self-contained humidifier:** a humidifier that adds moisture to the air without the need of other mechanical devices and is not connected to the central heating/ventilation system.

**settling means:** a way to provide uniform airflow in the air measurement and supply plenums.

**shall and should:** the word *shall* is to be understood as indicating requirements of this standard, the word *should* as indicating recommendations of this standard.

**supply duct central-system humidifier:** a humidifier that is connected to a horizontal duct and has the function of delivering humidified air from the central system.

**supply plenum central-system humidifier:** a humidifier that is connected to a vertical duct and has the function of delivering humidified air from the central system.

## 4. SYMBOLS AND SUBSCRIPTS

	SI Units	I-P Units
$A_N$	= nozzle area	m <sup>2</sup> ft <sup>2</sup>
$A_t$	= cross-sectional area of test section	m <sup>2</sup> ft <sup>2</sup>
$C$	= nozzle discharge coefficient	dimensionless
$D$	= duct diameter	m ft
$D$	= pressure tap diameter	mm in.
$D_N$	= nozzle exit diameter	m ft
$H_X$	= weight of water at time $X$	kg lb <sub>m</sub>
$H_m$	= humidification rate	kg/h lb <sub>m</sub> /h
$L$	= nozzle throat dimension	m ft
$M$	= equivalent diameter of rectangular duct or diameter of round duct	m ft
$M_{wf}$	= final weight of water	kg lb <sub>m</sub>
$M_{wi}$	= initial weight of water	kg lb <sub>m</sub>
$P$	= static pressure at nozzle, plane $N$	kPa in. Hg
$p_b$	= total pressure at the nozzle and the atmospheric pressure	kPa in. Hg
$p_e$	= saturated vapor pressure at $t_{wx}$	kPa in. Hg
$p_p$	= partial vapor pressure	kPa in. Hg
$R$	= gas constant for air	J/(kg·K) ft·lb <sub>f</sub> /lb <sub>m</sub> ·°R
$Re$	= Reynolds number	dimensionless
$Q_x$	= airflow rate at plane $x$	m <sup>3</sup> /s cfm
$Q_{std}$	= flow rate of standard air	m <sup>3</sup> /s cfm