ASHRAE

STANDARD

ANSI/ASHRAE Standard 215-2018

Method of Test to Determine Leakage of Operating HVAC Air Distribution Systems

Approved by ASHRAE on May 31, 2018; and by the American National Standards Institute on June 1, 2018.

ASHRAE® Standards are scheduled to be updated on a five-year cycle; the date following the Standard number is the year of ASHRAE approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1041-2336

Includes links to downloadable Airtightness Diagnostic Procedure example data and related calculations.

Approved American National Standard

ANSI

www.ansi.org

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

CONTENTS

ANSI/ASHRAE Standard 215-2018
Method of Test to Determine Leakage of Operating HVAC Air Distribution Systems

SECTION **PAGE**

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

As discussed in the 2016 and 2017 ASHRAE Handbook *chapters "Duct Construction" (Chapter 19) and "Duct Design," (Chapter 21), heating, ventilating, and air-conditioning (HVAC) system air leakage significantly increases building energy consumption. For example, a leaky VAV system (e.g., 10% leakage upstream and 10% downstream of terminal box inlet dampers at operating conditions) can use 25% to 35% more fan energy than a tight system (e.g., 2.5% upstream and 2.5% downstream at operating conditions). For an exhaust system with 20% leakage, the fan has to move 25% more air to meet the specified flows at the grilles, which causes fan power to increase up to 95%. Leakage also reduces the system's ability to control and deliver intended flows and pressures and to manage the spread of contaminants. As such, there is a need to minimize leakage airflows during air-handling system operation.*

Leakage test procedures currently used by industry focus on determining component airtightness (e.g., for ductwork located upstream of terminal box inlet dampers). Airtightness alone, however, is insufficient to determine leakage airflows. One must also then estimate system pressures during system operation to determine these flows. Determining the location of every leak and the pressure difference across each leak is practically impossible for most systems and can cause significant uncertainty in leakage airflow estimates using this approach.

To eliminate the uncertainty associated with estimating pressure differences across leaks, this standard provides a method of test for determining leakage airflows, either for the whole system or for selected parts. Flows into and out of the section being tested are measured at a repeatable reference operating condition: the difference is the leakage flow. The operating condition is not necessarily the design operating condition but corresponds to the greatest system inlet flow (outlet flow for exhaust systems) possible without being detrimental to the occupants of the building, the building structure, or the HVAC mechanical components, while maintaining the duct static pressure set point (where applicable) specified in design documents.

This standard does not mandate a calibration method for any instrument, nor does it dictate that the user employ a specific flow measurement technique. Informative Annex A provides a general discussion of airflow measuring instrument technologies and their capabilities. Informative Annex B provides recommended airflow measuring instrument calibration and verification procedures.

A simplified methodology for estimating leakage airflows downstream of terminal-box inlet dampers (Informative Annex G) is also provided in this standard. This methodology can be used to distinguish leakage downstream of terminal-box inlet dampers from total leakage determined by this standard so that the user can determine where to focus potential sealing activities.

1. PURPOSE

This standard specifies a method of test to determine leakage airflow and fractional leakage of operating HVAC air distribution systems and determines the uncertainty of the test results.

2. SCOPE

2.1 This standard is for field application in both new and existing buildings.

2.2 This standard can be applied to determine whole-system or sectional leakage airflow.

2.3 This standard provides

a. test procedures and requirements for measuring inlet and outlet airflows during system operation,
b. methods for calculating leakage airflows to/from system surroundings,
c. methods for calculating leakage test uncertainties,
d. methods for documenting the test plan, and
e. methods for reporting test results.

2.4 The test procedures in this standard are limited to single-duct supply and independent exhaust air systems.

2.5 This standard is not for determining return air leakage.

2.6 This standard is not for determining leakage involving ceiling and floor plenums, systems serving pressure-controlled spaces, or air dispersion systems.

2.7 This standard does not replace ductwork pressurization leakage testing.

2.8 This standard does not specify leakage acceptance criteria.

2.9 This standard shall not be used to override any safety, health, or critical process requirements.

3. DEFINITIONS

accuracy: the degree of conformity of an indicated value to an accepted standard value or true value. The degree of inaccuracy is known as "total measurement error" and is the sum of bias and precision errors.

air dispersion systems: any diffuser system designed to both convey air within a room, space, or area and diffuse air into that space while operating under positive pressure. These systems are commonly, but not exclusively, constructed of fabric, sheet metal, or plastic film.

air terminal: device other than an air valve that modulates the volume of air delivered to or removed from a conditioned space in response to an external demand.

bias error: the difference or offset between the true or actual value to be measured and the mean indicated value from the measuring system that persists and is usually due to the particular instrument or technique of measurement. This error is determined and minimized through calibration.

confidence level: the probability that a stated interval will include the true value. In analyzing measured data, a confidence level of 95% (approximately two standard deviations) is often