ANSI/ASHRAE Standard 120-2017
(Supersedes ANSI/ASHRAE Standard 120-2008)

Method of Testing to Determine Flow Resistance of HVAC Ducts and Fittings


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.

© 2017 ASHRAE    ISSN 1041-2336
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.
ANSI/ASHRAE Standard 120-2017,
Method of Testing to Determine Flow Resistance of HVAC Ducts and Fittings

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>2</td>
</tr>
<tr>
<td>1 Purpose</td>
<td>2</td>
</tr>
<tr>
<td>2 Scope</td>
<td>2</td>
</tr>
<tr>
<td>3 Definitions, Symbols, and Subscripts</td>
<td>2</td>
</tr>
<tr>
<td>4 Compliance Requirements</td>
<td>3</td>
</tr>
<tr>
<td>5 Applicability</td>
<td>3</td>
</tr>
<tr>
<td>6 Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>7 Flow Measuring Systems and Test Setups</td>
<td>6</td>
</tr>
<tr>
<td>8 Observations and Conduct of Test</td>
<td>8</td>
</tr>
<tr>
<td>9 Calculations</td>
<td>9</td>
</tr>
<tr>
<td>10 Test Results and Report</td>
<td>13</td>
</tr>
<tr>
<td>11 References</td>
<td>13</td>
</tr>
<tr>
<td>Informative Annex A—Time-Weighted Average</td>
<td>33</td>
</tr>
<tr>
<td>Informative Annex B—Leakage Measurement</td>
<td>35</td>
</tr>
<tr>
<td>Informative Annex C—Flexible Duct Test Setup Guide</td>
<td>41</td>
</tr>
<tr>
<td>Informative Annex D—Example Test Systems</td>
<td>45</td>
</tr>
</tbody>
</table>

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

© 2017 ASHRAE
1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org · All rights reserved.

ASHRAE is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ANSI is a registered trademark of the American National Standards Institute.
FOREWORD

First published in 1999, ASHRAE Standard 120 establishes uniform methods of laboratory testing of HVAC ducts and fittings to determine their resistance to airflow. The fitting losses, which are reported as local loss coefficients, are used to update and refine the ASHRAE Duct Fitting Database. To date, at least eight research projects have used the test methods of Standard 120 to improve this database. The significant change to this edition of the standard is that the length upstream of the test duct or fitting was increased from 10 to 15 hydraulic diameters.

1. PURPOSE

This standard establishes uniform methods of laboratory testing of HVAC ducts and fittings to determine their resistance to airflow.

2. SCOPE

2.1 This standard may be used to determine the change in total pressure resulting from airflow in HVAC ducts and fittings.

2.2 The test results can be used to determine duct flow losses in pressure loss per unit length. Fitting losses are reported as local loss coefficients.

2.3 This standard does not cover interpretation of test data.

3. DEFINITIONS, SYMBOLS, AND SUBSCRIPTS

3.1 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 error and precision error.

bias error (systematic error): the difference between the true or actual value to be measured and the indicated value from the measuring system that persists and is usually due to the particular instrument or technique of measurement. These errors can be corrected through calibration.

confidence level: the probability that a stated interval will include the true value. In analyzing experimental data, a level of 95% is usually used.

duct, flexible: any duct constructed of flexible materials, such as polymeric films, metal foils, and impregnated fabrics.

duct, rigid: any duct constructed of rigid materials, such as metal and fiberglass duct board.

error: the difference between the true value of the quantity measured and an observed value. Because the true value is often not known, it is estimated by the mean. The difference between the mean and the observed value is often called its “deviation.” All errors can be classified as one of two types: bias error or random error.

flow area, fitting inlet: the measured total inside area determined at the plane(s) of the inlet connection(s). The area shall be based on physical measurements for rigid fittings and physical measurements minus twice the lining thickness for lined fittings.

flow area, fitting outlet: the total inside area determined at the plane(s) of the outlet connection(s). The area shall be based on physical measurements for rigid fittings and physical measurements minus twice the lining thickness for lined fittings.

flow area, flexible duct: the area calculated using the nominal inside dimensions supplied by the duct manufacturer.

flow area, lined duct: the area calculated by subtracting the cross-sectional area of the liner from the flow area of the rigid duct envelope. The duct flow area shall be calculated from measured inside dimensions of the rigid duct envelope. For fully lined ducts, the nominal area is that calculated by reducing the cross-sectional dimensions of the rigid duct by twice the nominal liner thickness. The envelope dimensions shall be measured at a minimum of three representative sections of the test duct.

flow area, rigid duct: the area calculated by using the average inside duct dimensions determined by measurement of a minimum of three representative sections of the duct envelope.

precision: the closeness of agreement among repeated measurements of the same characteristic by the same method under the same conditions.

pressure loss: the decrease in total pressure due to friction and turbulence. It is a measure of the mechanical energy lost by the flow per unit volume of the fluid.

random error (precision error): a statistical error that is caused by chance and is not recurring.

static pressure: pressure that exists only by virtue of the degree of compression. If expressed as gage pressure, it may be negative or positive.

test: a complete series of test points defining the flow behavior over a selected range of velocities.

test air density: the density of the air entering the test duct or fitting.

test flow rate: the volumetric flow rate entering the test duct or fitting at the test air density.

test pressure determination: a complete set of measurements required to determine the total pressure loss at a test point.

test pressure loss: the differential in total pressure between the inlet and the outlet sections of a test duct or across a test fitting. For test fittings, the fitting is assumed to have zero length. For multiflow fittings, the total pressure loss shall be determined for each stream separately.

test system: the prescribed flow rate measurement system and prescribed test setup for the duct or fitting test.