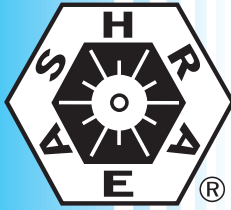


**ANSI/ASHRAE Standard 41.7-1984 (RA 2006)
Reaffirmation of ANSI/ASHRAE Standard 41.7-1984**



ASHRAE STANDARD

Method of Test for Measurement of Flow of Gas

Approved by the ASHRAE Standards Committee on February 9, 2000, and reaffirmed on January 21, 2006; by the ASHRAE Board of Directors on February 9, 2000, and reaffirmed on January 26, 2006; and by the American National Standards Institute on August 9, 2001, and reaffirmed on January 27, 2006.

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ISSN 1041-2336

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(This foreword is not a 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.)

FOREWORD

This is a reaffirmation of ASHRAE Standard 41.7-1984. This standard falls under the Standards Committee classification of Standard Method of Measurement. This standard was prepared under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.

There were no changes made for the 2006 reaffirmation.

1. PURPOSE

The purpose of this standard is to provide recommended practices for the measurement of the flow of dry gas for use in the preparation of ASHRAE standards.

2. SCOPE

This standard provides flow-measuring techniques for the following:

- a. volatile refrigerant, gaseous phase;
- b. air under conditions where the methods for flow measurement set forth in *ASHRAE Standard 41.2, Standard Methods for Laboratory Airflow Measurement*, are inconvenient or unsatisfactory.

3. DEFINITIONS

orifice meter: an assembly of a meter tube, an orifice, and pressure taps for connection to a pressure differential measuring instrument, such as a manometer, for the flow rate measurement of a monophase fluid with known properties.

For other definitions, refer to *ASHRAE Terminology of HVAC&R* (ASHRAE 1991).²

4. CLASSIFICATIONS

4.1 For the purpose of this standard, a gas is classified as wet if greater than 2% of liquid (based on the mass of dry gas flowing) passes through the measuring device.

4.2 A dry gas is a gas wherein the amount of liquid flowing with the gas through the measuring device is less than 2% of the mass of the gas flowing.

5. INSTRUMENTS AND APPARATUS

5.1 Basic Instrument. This standard establishes the flow meter with a square-edged orifice with flange taps as the basic instrument for dry gas flow measurement. Employing this instrument, other instruments, more convenient to use, can be calibrated in the desired range of use. Flow measurements of unvarying flows, made in accord with the procedures set forth herein, can be expected to have a standard error-of-the-mean not exceeding 1%.

5.1.1 The square-edged orifice is selected because of its simplicity, its long established reliability, and the convenience with which any size can be constructed.

5.1.2 Flange taps are selected despite the merits of other tap locations because of the assurance with which the location of taps of this type can be checked.

5.2 Meter Tube and Orifice Selection. Follow the procedure in 10.1 for the selection of meter tube and orifice diameter.

5.3 Meter

5.3.1 The orifice plate can be made of any metal not corroded by the measured fluid and can have a coefficient of thermal expansion not exceeding 1.0×10^{-5} in./in. $^{\circ}$ F (1.8×10^{-5} m/(m \cdot K)) and shall have a thickness in accord with Table 3. The inlet edge of the orifice shall be square and sharp, free from either burrs or rounding.

5.3.2 Orifice plates over 1/8 in. (3 mm) thick should be beveled as shown in Figure 1.

5.3.3 The inlet face of the orifice plate shall be flat and shall remain so within 1% of inside pipe diameter adjacent to the orifice.

5.3.4 The length of the inlet section in inches should be equal to or greater than the value given in Table 5 as "in length" for the nominal pipe diameter selected. Interpolation for intermediate values of B is satisfactory.

5.3.5 The length of the outlet section should be $10 \times D_i$ or 3 ft (0.9 m), whichever is greater.

5.3.6 The orifice diameter shall be measured with the necessary accuracy in four equally spaced meridian planes to ensure that no single diameter shall differ from the mean by more than 0.05%.

5.3.7 The ratio B of the orifice diameter D_o to orifice meter diameter D_i shall not be less than 0.20 nor greater than 0.70.

5.3.8 The orifice must have a valved drain hole flush with the bottom of the pipe adjacent to the inlet side of the orifice. The diameter of the drain hole shall be determined from Table 2.

5.3.9 The meter assembly, including the required straight inlet and discharge section, shall be insulated to prevent more than 2 $^{\circ}$ F (1.1 K) change of fluid temperature within the assembly.

5.3.10 The assembly shall be made in accord with Figures 1 and 2.

5.3.11 The inside of 4 in. (100 mm) and larger pipe (nominal size) assembly shall be bored to the diameters and tolerances shown in Table 4 for a distance of at least 4 pipe diameters, D_i , preceding the orifice and for a distance of at least 2 pipe diameters beyond the inlet face of the orifice. The bored portions shall be faired into the unbored portion at an included angle not greater than 30 $^{\circ}$.

5.3.12 The unbored internal surface of the pipe shall be straight, free from mill scale, pits or holes, reamer scores or rifling, bumps, or other irregularities.

5.3.13 The meter assembly may use Type M copper tube, as indicated in the headings of Tables 1A through 1H.

5.3.14 The center of the orifice shall be concentric with the axis of the tube or pipe. The flanges shall be recessed and the orifice plates made to fit the recess to ensure concentricity.

5.3.15 The gasket material shall be stiff rather than soft. In all cases, the inside diameter of the gasket shall be made large