Designation: E 741 – 00

An American National Standard

Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution[1]

This standard is issued under the fixed designation E 741; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes techniques using tracer gas dilution for determining a single zone's air change with the outdoors, as induced by weather conditions and by mechanical ventilation. These techniques are: (*1*) concentration decay, (*2*) constant injection, and (*3*) constant concentration.

1.2 This test method is restricted to any single tracer gas. The associated data analysis assumes that one can characterize the tracer gas concentration within the zone with a single value. The zone shall be a building, vehicle, test cell, or any conforming enclosure.

1.3 Use of this test method requires a knowledge of the principles of gas analysis and instrumentation. Correct use of the formulas presented here requires consistent use of units, especially those of time.

1.4 Determination of the contribution to air change by individual components of the zone enclosure is beyond the scope of this test method.

1.5 The results from this test method pertain only to those conditions of weather and zonal operation that prevailed during the measurement. The use of the results from this test to predict air change under other conditions is beyond the scope of this test method.

1.6 The text of this test method references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered requirements of this test method.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 4480 Test Method for Measuring Surface Wind by Means of Wind Vanes and Rotating Anemometers[2]

E 260 Practice for Packed Column Gas Chromatography[3]

E 779 Test Method for Determining Air Leakage Rate by Fan Pressurization[4]

E 1186 Practice for Air Leakage Site Detection in Building Envelopes[4]

2.2 *Other Documents:*

ASHRAE Handbook of Fundamentals, Chapter 23[5]

ASHRAE Standard 62[5]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *air change flow, Q, n*—the total volume of air passing through the zone to and from the outdoors per unit time (m^3/s, m^3/h, ft^3/h).

3.1.2 *air change rate, A, n*—the ratio of the total volume of air passing through the zone to and from the outdoors per unit of time to the volume of the zone (1/s, 1/h).[6]

3.1.3 *envelope, n*—the system of barriers between a conditioned building zone and the outdoors.

3.1.3.1 *Discussion*—This includes exterior doors, windows, roofs, walls, floors and ductwork. It excludes interior partitions, ducts, etc., that separate conditioned zones.

3.1.4 *tracer gas, n*—a gas that is mixed with air and measured in very small concentrations in order to study air movement.

3.1.5 *tracer gas analyzer, n*—a device used to measure the concentration of tracer gas in an air sample.

3.1.6 *tracer gas concentration, C, n*—the ratio of the quantity of tracer gas in air to the quantity of that air (moles/mole or m^3/m^3).

3.1.7 *single zone, n*—a space or set of spaces wherein the concentration of a tracer gas is maintained uniformly throughout and that only exchanges air with the outside.

3.1.7.1 *Discussion*—Multizone buildings are difficult to treat as single zones and meet the uniformity of tracer gas

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.41 on Air Leakage and Ventilation.

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[2] *Annual Book of ASTM Standards*, Vol 11.03.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 04.11.

[5] Available from American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329.

[6] A common way of expressing air change rate units is ACH = air changes per hour = 1/h.

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