STANDARD

ANSI/ASHRAE Standard 136-1993 (RA 2006)
(Reaffirmation of ANSI/ASHRAE Standard 136-1993)

A Method of Determining Air Change Rates in Detached Dwellings

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NOTE

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

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FOREWORD

This is a reaffirmation of ASHRAE Standard 136-1993. 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.

The changes made for the 2006 reaffirmation were updates to the references.

1. PURPOSE

The purpose of this standard is to provide a procedure for determining effective outdoor air change rates in detached dwellings. This procedure is intended for use in evaluating the impact of these air change rates on indoor air quality.

2. SCOPE

2.1 The effective outdoor air change rates calculated by use of this standard

a. are based on the use of measured air leakage data,
b. include the effects of infiltration and mechanical ventilation,
c. are annual average values, and
d. apply only to detached single-family dwellings.

2.2 The effective outdoor air change rates determined by the use of this standard are not appropriate for use in estimating peak pollutant levels or energy loss due to infiltration.

2.3 This standard does not specify required air change rates nor take into account the additional infiltration that may result from opening windows and doors or the unintentional ventilation caused by operation of heating and cooling equipment.

3. DEFINITIONS

air change rate: the ratio of the volumetric rate at which air enters or leaves a building to the building volume with identical volume units (normally expressed in units of air changes per hour).

building volume: the volume of a building that exchanges air with outdoor (ambient) air. For the purposes of this standard, the building volume is the space that is deliberately conditioned for human comfort.

detached dwelling: a separate building composed of an interconnected series of rooms operated under a single tenancy, used as a domicile by one or more persons and containing cooking, eating, living, sleeping, and sanitary facilities.

effective air change rate: the constant outdoor air change rate that would result in the same average pollutant concentration over the same period of time as actually occurs under varying conditions.

infiltration: the uncontrolled inward airflow through cracks and openings in the building envelope, caused by the pressure effects of wind and/or differences in indoor and outdoor air density. These openings in the building envelope may be intentional or unintentional, but flow through window and door openings is excluded.

mechanical ventilation: the process of supplying or removing air by mechanical means to or from any space. Such air may or may not have been conditioned. Mechanical means shall include ducts and vents driven by fans and/or blowers but shall exclude any device driven directly by wind action, such as turbine ventilators.

natural ventilation: ventilation using only natural motive forces, such as wind pressure or differences in air density. This takes into account airflow though all openings, including window and door openings.

normalized leakage: the dimensionless value calculated from the leakage area, building height, and floor area (using the method of *ANSI/ASHRAE 119, Air Leakage Performance for Detached Single-Family Residential Buildings*[1]) that describes the relative tightness of the envelope.

outdoor air: air outside a building or taken from the external atmosphere and, therefore, not previously circulated through the ventilation system.

outdoor air change rate: the ratio of the volumetric rate at which outdoor air enters a building space to the building volume with identical volume units (normally expressed in units of air changes per hour).

ventilation: the process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned. For the purposes of this standard, ventilation shall be taken to mean the process of supplying outdoor air to or removing indoor air from a dwelling by natural or mechanical means.

4. DETERMINATION OF EFFECTIVE AIR CHANGE RATE

4.1 Procedure for Calculation of Effective Air Change Rate. The effective air change rate shall be calculated according to the procedures outlined in 4.2, 4.3, and 4.4.

4.2 Ventilation by Infiltration. The normalized leakage, L_n, shall be determined using the method of *ANSI/ASHRAE 119, Air Leakage Performance for Detached Single-Family Residential Buildings*.[1]

The component of the effective air change rate due to infiltration, A_I (air changes per hour), shall be calculated using

$$A_I = L_n \times W$$

where W is a factor accounting for the effect of local weather. W is in air changes per hour.

Values of W are listed in Table 1 for many North American cities. For cities not included in Table 1, values of W may be estimated by using the value for the nearest location.