



ADDENDA

2017 Supplement

**ANSI/ASHRAE Addenda b, d, k, l, q, and s to
ANSI/ASHRAE Standard 62.2-2016**

Ventilation and Acceptable Indoor Air Quality in Residential Buildings

See annex for approval dates.

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ASHRAE Standing Standard Project Committee 62.2 for addenda b and d

Cognizant TC: 4.3, Ventilation Requirements and Infiltration

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Cognizant TC: 4.3, Ventilation Requirements and Infiltration

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CONTENTS

ANSI/ASHRAE Standard 62.2-2016 2017 Addenda Supplement

SECTION	PAGE
Addendum b:	2
Addendum d:	3
Addendum k:	4
Addendum l:	6
Addendum q:	8
Addendum s:	9
Informative Annex: 18-Month Supplement—Addenda to ANSI/ASHRAE Standard 62.2-2016	10

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FOREWORD

Addendum b modifies the language regarding controls for on-demand ventilation systems to better accommodate cases where the on-demand fan is also used toward the whole-dwelling ventilation requirement.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strike through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum b to Standard 62.2-2016

Add the following new definition to Section 3.

automatic control: a control that operates without the need for manual or remote occupant intervention and operates as a function of one or more input variables or conditions, including, but not limited to, time, humidity, temperature, occupancy, appliance operation, and contaminant concentration.

Revise Section 5.2.1 as shown below.

5.2.1 Control and Operation. ~~A readily accessible manual ON-OFF control shall be provided for each demand-controlled mechanical exhaust system. Automatic control devices, including but not limited to the following, shall be permitted, provided they do not impede manual ON-OFF control: humidity sensors, shut-off timers, occupancy sensors, multiple speed fans, combined switching, IAQ sensors, etc.~~

Exception: ~~For multifamily dwelling units, an automatic control device shall be permitted to override manual OFF control, provided that it does not override manual ON control. Demand-controlled mechanical exhaust systems shall be provided with at least one of the following controls:~~

1. A readily accessible occupant-controlled ON-OFF control.
2. An automatic control that does not impede occupant ON control.

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FOREWORD

Addendum d allows for a single-point blower door test result to be used when determining variable ventilation options.

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Addendum d to Standard 62.2-2016

Revise Sections C2.2.1 and C2.2.2 as shown. Subsequent equations will be renumbered. Note that errata sheet dated November 4, 2016, has been included in the changes shown. Errata for ASHRAE standards are available for free on the ASHRAE website at

<https://www.ashrae.org/standards-research--technology/standards-errata>.

C2.2.1 Annual Average Method. $Q_{inf,i}$ is set equal to the result from Equation 4.5, Section 4.1.2: Q_{inf} . To calculate $Q_{inf,p}$, divide the result from Equation 4.5, Section 4.1.2 Q_{inf} by the number of time steps in a year.

C2.2.2 Smaller Time Step Method. The wind speed (U_{met} [m/s or mph]) and outdoor temperature (T_{out} [°C or °F]) shall be taken from typical meteorological year data or from the nearest available meteorological site. For each time step, the total infiltration shall be calculated as a function of wind and stack effects as provided in this section.

The envelope leakage coefficient C and pressure exponent n shall be determined in one of the following ways:

- ~~taken from~~ blower door measurements using ASTM E7792 or CGSB 149.103.
- Using Alternatively, if ELA is calculated using Section 4.1.2, n is assumed to be 0.65, and C is calculated using Equation C1 or C2:

$$C = 7400 \times ELA \quad (\text{I-P}) \quad (\text{C1})$$

$$C = 1050 \times ELA \quad (\text{SI}) \quad (\text{C2})$$

where

C = envelope leakage coefficient, cfm/(in. of water) ^{n}
(L/s/Pa ^{n})

ELA = effective leakage area, ft² (m²)

- From a single-point envelope leakage test, n is assumed to be 0.65, and C is calculated using Equation C3 or C4:

$$C = 2.84 \times Q_{50} \quad (\text{I-P}) \quad (\text{C3})$$

$$C = 0.786 \times Q_{50} \quad (\text{SI}) \quad (\text{C4})$$

where

C = envelope leakage coefficient, cfm/(in. of water) ^{n} ,
(L/s/Pa ^{n})

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FOREWORD

Addendum k creates a compliance path based on the use of filtered recirculated air to reduce exposure in the interior of the building to particulate matter not exceeding $2.5 \mu\text{m}$ (PM_{2.5}).

When the filtration requirements of this addendum are satisfied, a reduction is allowed in the required amount of whole-building ventilation needed to show compliance with Standard 62.2. This reduction in whole-building ventilation is in the form of a credit associated with filtration, which can be used to reduce the amount of whole-building ventilation required by Section 4.1 of the standard.

The filtration requirements consist of a combination of the flow of recirculated air through a filter and that filter's efficiency and are augmented by additional requirements associated with air distribution and the installation and maintenance of the ventilation system.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum k to Standard 62.2-2016

Add a new Section 4.1.4 as shown.

4.1.4 Ventilation-Rate Reduction for Particle Filtration. This section describes the requirements necessary to apply a credit against the minimum total ventilation rate of this standard. This credit applies during any period in which the requirements of Sections 4.1.4.1, 4.1.4.2, and 4.1.4.3 are met. In these cases,

$$Q_{\text{filtration, credit}} = 0.2 \times Q_{\text{tot}} \quad (4.7)$$

where Q_{tot} is the total ventilation rate of Section 4.1.1 as modified by Section 4.1.3 and any required additional airflow of Section A3, and $Q_{\text{filtration, credit}}$ is the credit for filtration, which shall be used to reduce Q_{tot} in Section 4.1 for that period.

4.1.4.1 Air Distribution System. The filtered air shall be supplied to or returned from all rooms in the habitable space through an air-handling system. Systems that combine filtration air distribution and HVAC distribution, such as an air-handling system that supplies air from (or returns air to) the filter from every bedroom and living area, comply with this requirement but are not required.

4.1.4.2 Particle Filtration. Recirculated air shall be passed through a filter with a maximum filtration factor of 4.3 as determined in accordance with Section 4.1.4.2.1. Outdoor and recirculated air are also subject to the requirements of Section 6.7, which may require additional filtration depending on the system design.

4.1.4.2.1 Filtration Factor. The filtration factor of an air filter (f_{fr}) shall be determined using one of the following methods:

- Filters tested to ASHRAE Standard 52.2¹²: Identify the filtration factor from the row in Table 4.3 associated with the MERV designation.
- Filters tested to AHRI 680¹³: Identify the filtration factor from the row in Table 4.4 for which the measured particle size efficiencies are no less than the values listed in the row.
- Filters with an alternative method providing PM_{2.5} efficiency as approved by the authority having jurisdiction: Identify the filtration factor from the row in Table 4.5 for which the PM_{2.5} efficiency is no less than the value listed in the row.

4.1.4.3 Airflow Rate. The minimum airflow rate passing through the filter is given by the following equation:

$$Q_{fr} = f_{fr} Q_{tot} \quad (4.8)$$

where Q_{fr} is the time-averaged flow rate of filtered, recirculated air delivered by the air-handling system. The period of time for averaging the flow shall not exceed one day. If the period exceeds 12 hours, controls shall be provided to ensure that the system also provides at least 10% of Q_{fr} every 12-hour period.

4.1.4.4 Installation and Maintenance. All filters shall be readily accessible from within the occupiable space. Filters shall be installed using methods to minimize air bypass. In addition to the instruction and labeling requirements of Section 6.2, the filter designation required to meet the filtration requirements for this system shall be prominently displayed on or near the filter housing access door.

TABLE 4.3 Filtration Factor for Filters Tested to ASHRAE 52.2¹²

<u>MERV</u>	<u>f_{fr}</u>
11	4.3
12	3.0
13	2.1
14	1.8
15	1.7
16	1.6

TABLE 4.4 Filtration Factor for Filters Tested to AHRI 680¹³

<u>Particle Size Efficiency (0.30 to 1.0 μm)</u>	<u>Particle Size Efficiency (1.0 to 3.0 μm)</u>	<u>f_{fr}</u>
0	65	4.3
0	80	3.0
25	85	2.1
75	90	1.8
85	90	1.7
95	95	1.6

TABLE 4.5 Filtration Factor for Filters with a PM2.5 Efficiency Designation

<u>PM2.5 Efficiency</u>	<u>f_{fr}</u>
35%	4.3
50%	3.0
70%	2.1
85%	1.8
90%	1.7
95%	1.6

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FOREWORD

The current standard allows single-point blower door testing when determining an infiltration credit. This addendum reduces the equations that are currently in the standard to a single, simple equation that is consistent with the use of a single-point test rather than requiring the user of the standard to go through the entire set of equations, including intermediate steps. This change will make infiltration credit calculations simpler for those using a single-point blower door test.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum I to Standard 62.2-2016

Revise Section 4.1.2 as shown.

4.1.2 Infiltration Credit. If a blower door test has been performed then a credit for estimated infiltration may be taken for nonattached dwelling units using either the procedure in Section 4.1.2.1 4.1.2(a) or 4.1.2.2. Horizontally attached single-family dwelling units shall be permitted to utilize a blower door test result that includes common walls to take this credit, subject to the reduction factor A_{est} in Equation 4.24.6.

If this credit is taken, then the Required Mechanical Ventilation Rate (Q_{fan}) shall be calculated using Equation 4.2

$$Q_{fan} = Q_{tot} - (Q_{inf} \times A_{est}) \quad (4.2)$$

where

- Q_{fan} = required mechanical ventilation rate, cfm (L/s)
- Q_{tot} = total required ventilation rate, cfm (L/s)
- Q_{inf} = ~~may be no greater than $2/3 \times Q_{tot}$ (see Normative Appendix A for exceptions for existing buildings)~~
- A_{est} = 1 for single-family detached homes, or the ratio of exterior envelope surface area that is not attached to garages or other dwelling units to total envelope surface area for single-family attached homes

a.4.1.2.1 Effective Annual Average Infiltration Rate (Q_{inf}) Using a Single-Point Envelope Leakage Test. Effective Annual Average Infiltration Rate (Q_{inf}) shall be calculated using ~~the normalized leakage calculated from measurements of envelope leakage using either ASTM E779² or CGSB 149.10³, a single-point test at 50 Pa from ASTM E1827¹⁹ or~~

~~ANSI/RESNET/ICC Standard 380⁴. The authority having jurisdiction may approve other means of calculating effective leakage area (ELA), such as the RESNET Mortgage Industry National Home Energy Systems Standard.⁴~~

The Effective Annual Average Infiltration Rate (Q_{inf}) shall be calculated using Equation 4.3:

$$Q_{inf} = 0.052 \times Q_{50} \times wsf \times (H/H_r)^z \quad (4.3)$$

where

- Q_{inf} = estimated infiltration rate, cfm (L/s)
- Q_{50} = leakage rate at 50 Pa depressurization or pressurization, cfm (L/s)
- wsf = weather and shielding factor from Normative Appendix B
- H = vertical distance between the lowest and highest above-grade points within the pressure boundary, ft (m)
- H_r = reference height, 8.2 ft (2.5 m)
- z = 0.4 for the purpose of calculating the Effective Annual Average Infiltration Rate

4.1.2.2 Effective Annual Average Infiltration Rate (Q_{inf}) Using a Multipoint Envelope Leakage Test. Effective Annual Average Infiltration Rate (Q_{inf}) shall be calculated using the normalized leakage calculated from measurements of envelope leakage using a multipoint test from either ASTM E779² or CGSB 149.10³.

b. ASTM Procedure. To calculate the ELA from ASTM E779¹, the leakage area for pressurization and depressurization (using a 4 Pa reference pressure) shall be averaged using Equation 4.42:

$$ELA = (L_{press} + L_{depress})/2 \quad (4.42)$$

where

- ELA = effective leakage area, ft² (m²)
- L_{press} = leakage area from pressurization, ft² (m²)
- $L_{depress}$ = leakage area from depressurization, ft² (m²)

c. CGSB Procedure. To calculate the ELA from CGSB 149.10³, the following modifications to the test procedure must be made.

- 1-a. All vents and intentional openings must be in the same configuration as specified in ASTM E779¹ (i.e., HVAC dampers and registers should be in the normal operating position, fireplace and other dampers should be closed unless they are required for test operation).
- 2-b. Height and floor area must be reported consistently with the definitions of this standard.
- 3-c. The leakage area as calculated from the CGSB procedure must be converted using Equation 4.53:

$$ELA = 0.61 \times (0.4)^{n-0.5} \times L_{cgsb} \quad (4.53)$$

where

- n = exponent measured from the CGSB 149.10²
- L_{cgsb} = CGSB leakage area, as modified above, ft² (m²)

d. Normalized Leakage. Normalized leakage shall be calculated using Equation 4.64:

$$NL = 1000 \times \frac{ELA}{A_{floor}} \times \left[\frac{H}{H_r} \right]^z \quad (4.64)$$

where

- NL = normalized leakage
- ELA = effective leakage area, ft² (m²)
- A_{floor} = floor area of residence, ft² (m²)
- H = vertical distance between the lowest and highest above-grade points within the pressure boundary, ft (m)
- H_r = reference height, 8.2 ft (2.5 m)
- z = 0.4 for the purpose of calculating the Effective Annual Infiltration Rate below

e. Effective Annual Average Infiltration Rate (Q_{inf}). Effective Annual Average Infiltration Rate (Q_{inf}) shall be calculated using Equation 4.75a or Equation 4.75b:

$$Q_{inf} \text{ (cfm)} = \frac{NL \times wsf \times A_{floor}}{7.3} \quad \text{(I-P) (4.75a)}$$

where

- NL = normalized leakage
- wsf = weather and shielding factor from Normative Appendix B
- A_{floor} = floor area of residence, ft²

$$Q_{inf} \text{ (L/s)} = \frac{NL \times wsf \times A_{floor}}{1.44} \quad \text{(SI) (4.75b)}$$

where

- NL = normalized leakage
- wsf = weather and shielding factor from Normative Appendix B
- A_{floor} = floor area of residence, m²

f. Required Mechanical Ventilation Rate (Q_{fan}). Required Mechanical Ventilation Rate (Q_{fan}) shall be calculated using Equation 4.6:

$$Q_{fan} = Q_{tot} - (Q_{inf} \times A_{est}) \quad (4.6)$$

where

- Q_{fan} = required mechanical ventilation rate, cfm (L/s)
- Q_{tot} = total required ventilation rate, cfm (L/s)
- Q_{inf} = may be no greater than 2/3 × Q_{tot} (see Normative Appendix A for exceptions for existing buildings)
- A_{est} = 1 for single family detached homes, or the ratio of exterior envelop surface area that is not attached to garages or other dwelling units to total envelop surface area for single family attached homes

Revise Reference 4 in Section 9 as shown below. The remainder of Section 9 is unchanged.

4. ~~RESNET. 2013. Mortgage Industry National Home Energy Rating Systems Standard. Residential Energy Services Network. RESNET. 2016. ANSI/RESNET/ICC Standard 380, Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems. Oceanside, CA: Residential Energy Services Network, Inc.~~

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FOREWORD

This addendum adds an alternative combustion safety testing method based on performance in lieu of the prescriptive requirements that were the sole basis previously. ANSI/BPI-1200 is a consensus standard that addresses combustion safety testing.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strike through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum q to Standard 62.2-2016

Revise Section 6.4 as shown below.

6.4 Combustion and Solid-Fuel Burning Appliances.

6.4.1 Combustion and solid-fuel burning appliances must be provided with adequate combustion and ventilation air and installed in accordance with manufacturers' installation

instructions; NFPA 54/ANSI Z223.1, *National Fuel Gas Code*⁵; NFPA 31, *Standard for the Installation of Oil-Burning Equipment*⁶; or NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances*,⁷ or other equivalent code acceptable to the building official.

6.4.2 Where atmospherically vented combustion appliances or solid-fuel burning appliances are located inside the pressure boundary, the total net exhaust flow of the two largest exhaust fans (not including a summer cooling fan intended to be operated only when windows or other air inlets are open) shall not exceed 15 cfm per 100 ft² (75 L/s per 100 m²) of occupiable space when in operation at full capacity. If the designed total net flow exceeds this limit, the net exhaust flow must be reduced by reducing the exhaust flow or providing compensating outdoor air. Gravity or barometric dampers in nonpowered exhaust makeup air systems shall not be used to provide compensating outdoor air. Atmospherically vented combustion appliances do not include direct-vent appliances. Combustion appliances that pass safety testing performed according to ANSI/BPI-1200, *Standard Practice for Basic Analysis of Buildings*²¹, shall be deemed as complying with Section 6.4.2.

Add the following new normative reference to Section 10.

21. ANSI/BPI-1200-S-2015, *Standard Practice for Basic Analysis of Buildings*. Building Performance Institute, Inc., Malta, NY.

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FOREWORD

Standard 62.2 has never previously distinguished between balanced and unbalanced ventilation, despite it being well-known that these interact with natural infiltration in different ways to produce different overall air exchange rates. This addendum provides a mechanism for accounting for the differences between balanced and unbalanced ventilation.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strike through~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum s to Standard 62.2-2016

Revise the definition of “balanced system” in Section 3 as shown.

balanced system: a ventilation system where the total supply fan flow and total exhaust fan flow are within 20% of each other. The balanced system airflow shall be the average of the

~~supply and exhaust flows. one or more fans that supply outdoor air and exhaust building air at substantially equal rates.~~

Revise Section 4.1.2 as shown. The remainder of Section 4.1.2 is unchanged.

£ **Required Mechanical Ventilation Rate (Q_{fan}).** Required Mechanical Ventilation Rate (Q_{fan}) shall be calculated using Equation 4.6:

$$Q_{fan} = Q_{tot} - \Phi(Q_{inf} \times A_{ext}) \quad (4.6)$$

where

- Q_{fan} = required mechanical ventilation rate, cfm (L/s)
- Q_{tot} = total required ventilation rate, cfm (L/s)
- Q_{inf} = infiltration, cfm (L/s) ~~may be no greater than 2/3 $\times Q_{tot}$~~ (see Normative Appendix A for exceptions for existing buildings)
- A_{ext} = 1 for single-family detached homes, or the ratio of exterior envelope surface area that is not attached to garages or other dwelling units to total envelope surface area for single-family attached homes
- Φ = 1 for balanced ventilation systems and Q_{inf}/Q_{tot} otherwise

Exception: A ventilation fan is not required when Q_{fan} is less than 10 cfm (5 L/s).

(This annex 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 objections on informative material are not offered the right to appeal at ASHRAE or ANSI.)

**INFORMATIVE ANNEX—
18-MONTH SUPPLEMENT: ADDENDA TO ANSI/ASHRAE STANDARD 62.2-2016**

This supplement includes addenda b, d, k, l, q, and s to ANSI/ASHRAE Standard 62.2-2016. The following table lists each addendum and describes the way in which the standard is affected by the change. It also lists the ASHRAE and ANSI approval dates for each addendum.

Addendum	Section(s) Affected	Description of Change(s)*	ASHRAE Standards Committee Approval	ASHRAE Tech. Council Approval	ANSI Approval
b	3; 5.2.1	Modifies the language regarding controls for on-demand ventilation systems to better accommodate cases where the on-demand fan is also used toward the whole-dwelling ventilation requirement.	June 23, 2017	June 28, 2017	June 29, 2017
d	Appendix C	Allows for a single-point blower door test result to be used when determining variable ventilation options.	June 23, 2017	June 28, 2017	June 29, 2017
k	4	Creates a compliance path based on the use of filtered recirculated air to reduce exposure in the interior of the building to particulate matter not exceeding 2.5 µm (PM2.5).	June 25, 2016	June 29, 2016	June 30, 2016
l	4; 9	Makes infiltration credit calculations simpler for those using a single-point blower door test.	January 28, 2017	February 1, 2017	February 2, 2017
q	6.4	Adds an alternative combustion safety testing method, based on performance, in lieu of the prescriptive requirements that were the sole basis previously.	June 25, 2016	June 29, 2016	June 30, 2016
s	3; 4.1.2	Provides a mechanism for accounting for the differences between balanced and unbalanced ventilation.	January 28, 2017	February 1, 2017	February 2, 2017

* These descriptions may not be complete and are provided for information only.

NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at <http://www.ashrae.org>.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

About ASHRAE

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability. Through research, Standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

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