ADDENDA

ANSI/ASHRAE Addendum l to
ANSI/ASHRAE Standard 62.1-2016

Ventilation for Acceptable Indoor Air Quality

Approved by the ASHRAE Standards Committee on June 26, 2019; by the ASHRAE Board of Directors on August 1, 2019; and by the American National Standards Institute on August 26, 2019.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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.

 ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

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.

(This foreword is not 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. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

The Natural Ventilation Procedure was recently modified to require mechanical ventilation with certain exceptions. Addendum l provides specific requirements for the exceptions by providing a clear compliance path. It also recognizes that there are inherent health issues with outdoor air in many locations in the world and updates the prescriptive requirements based on recent studies and airflow evaluations.

Outdoor air requirements specified in Section 6.2.1 have been applied to naturally ventilated buildings, essentially prohibiting purely naturally ventilated buildings in cities that don't meet national outdoor air standards. Although this is not the best solution, it prioritizes occupant health and follows national guidelines already applied to other Standard 62.1 procedures until a new methodology is developed.

The prescriptive path has been improved by removing the openable area requirement of 4% of net occupiable floor area and introducing two prescriptive paths for sizing the required openable area that better respond to program in the zone and window type.

A four-point definition of a naturally ventilated engineered system has been developed to require designers to more fully document natural ventilation systems that do not meet prescriptive values.

An informative appendix that augments the engineered system definition has also been developed and will be presented as a separate addendum.

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

Addendum l to Standard 62.1-2016

Add the following new definition to Section 3. The remainder of Section 3 is unchanged.

openable area: the net free area of an opening.

Modify Section 6 as shown. The remainder of Section 6 is unchanged.

6.1.3 Natural Ventilation Procedure. The prescriptive or engineered system design procedure presented in Section 6.4, in which outdoor air is provided through openings to the outdoors, shall be permitted to be used for any zone or portion of a zone either solely or in conjunction with mechanical ventilation systems in accordance with Section 6.4.

~~**6.2.1**~~ **6.1.4 Outdoor Air Treatment.** Each ventilation system that provides outdoor air ~~through a supply fan~~ shall

Renumber Section 6.2.1 to 6.1.4 so that the section applies to all procedures, and modify as shown below. Subsections of 6.2.1 will all be renumbered to 6.1.4.x.

comply with ~~the following subsections~~ Sections 6.1.4.1 through 6.1.4.4.

[. . .]

6.4 Natural Ventilation Procedure. ~~Natural ventilation systems shall be designed in accordance with this section and shall include mechanical ventilation systems designed in accordance with Section 6.2, Section 6.3, or both.~~ Natural ventilation systems shall comply with the requirements of either Section 6.4.1 or Section 6.4.2. Designers shall provide interior air barriers, insulation, or other means that separate naturally ventilated spaces from mechanically cooled spaces to prevent high-dew-point outdoor air from coming into contact with mechanically cooled surfaces.

~~**Exceptions:**~~

~~1. An engineered natural ventilation system, where approved by the authority having jurisdiction, need not meet the requirements of Section 6.4.~~
~~2. The mechanical ventilation systems shall not be required where~~
~~a. natural ventilation openings that comply with the requirements of Section 6.4 are permanently open or have controls that prevent the openings from being closed during periods of expected occupancy or~~
~~b. the zone is not served by heating or cooling equipment.~~

6.4.1 Prescriptive Compliance Path. Any zone designed for natural ventilation shall include a mechanical ventilation system designed in accordance with Section 6.2, Section 6.3, or both.

Exceptions to 6.4.1:

1. Zones in buildings that have all of the following:
   a. Natural ventilation openings that comply with the requirements of Section 6.4.1.
   b. Controls that prevent the natural ventilation openings from being closed during periods of expected occupancy, or natural ventilation openings that are permanently open.
2. Zones that are not served by heating or cooling equipment.

6.4.1.4.1 Ceiling Height. For ceilings that are parallel to the floor, ~~T~~the ceiling height (*H*) to be used in Sections 6.4.1.3 through 6.4.1.5 shall be the minimum ceiling height in the zone ~~space~~.

~~Exception:~~ For zones wherein ceiling height increases ~~ceilings that are increasing in height~~ as distance from the ventilation increases~~openings is increased~~, the ceiling height shall be ~~determined as~~ the average height of the ceiling determined over a distance not greater than ~~within~~ 6 m (20 ft) from the ~~operable~~ openings.

6.4.1.2 Floor Area to be Ventilated. ~~Spaces,~~ The naturally ventilated area in zones or portions of ~~spaces,~~ zones shall extend from the ~~operable~~ ~~wall~~ openings to ~~to be naturally~~

Table 6.4.1.6.1-1 Minimum Openable Areas: Single Openings [a]

$V_{bz}/A_z \leq$ ([L/s]/m²)	$V_{bz}/A_z \leq$ (cfm/ft²)	Total Openable Areas in Zone as a Percentage of A_z		
		$H_S/W_S \leq 0.1$	$0.1 < H_S/W_S \leq 1$	$H_S/W_S > 1$
1.0	0.2	4.0	2.9	2.5
2.0	0.4	6.9	5.0	4.4
3.0	0.6	9.5	6.9	6.0
4.0	0.8	12.0	8.7	7.6
5.5	1.1	15.5	11.2	9.8

where
V_{bz} = breathing zone outdoor airflow, per Table 6.2.2.1.
A_z = zone floor area, the net occupiable floor area of the ventilation zone.
W_S = aggregated width of all single outdoor openings located at the same elevation.
H_S = vertical dimension of the single opening or the least vertical dimension of the openings where there are multiple openings.

a. Volumetric airflow rates used to estimate required openable area are based on the following:
- Dry-air density of 0.075 lbda/ft³ (1.2 kgda/m³) at a barometric pressure of 1 atm (101.3 kPa) and an air temperature of 70°F (21°C)
- Temperature difference between indoors and outdoors of 1.8°F (1°C)
- Gravity constant of 32.2 ft/s² (9.81 m/s²)
- Window discharge coefficient of 0.6

Table 6.4.1.6.1-2 Minimum Openable Areas: Two Vertically Spaced Openings [a]

$V_{bz}/A_z \leq$ (L/s/m²)	$V_{bz}/A_z \leq$ (cfm/ft²)	Total Openable Areas in Zone as a Percentage of A_z					
		$H_{vs} \leq 8.2$ ft (2.5 m)		8.2 ft (2.5m) $< H_{vs} \leq 16.4$ ft (5 m)		16.4 ft (5 m) $< H_{vs}$	
		$A_s/A_l \leq 0.5$	$A_s/A_l > 0.5$	$A_s/A_l \leq 0.5$	$A_s/A_l > 0.5$	$A_s/A_l \leq 0.5$	$A_s/A_l > 0.5$
1.0	0.2	2.0	1.3	1.3	0.8	0.9	0.6
2.0	0.4	4.0	2.6	2.5	1.6	1.8	1.2
3.0	0.6	6.0	3.9	3.8	2.5	2.7	1.7
4.0	0.8	8.0	5.2	5.0	3.3	3.6	2.3
5.5	1.1	11.0	7.1	6.9	4.5	4.9	3.2

where
V_{bz} = breathing zone outdoor airflow, per Table 6.2.2.1.
A_z = zone floor area, the net occupiable floor area of the ventilation zone.
H_{vs} = vertical separation between the center of the top and bottom openings' free operable area; in case of multiple horizontally spaced pairs of openings, use shortest distance encountered.
A_s = openable area of smallest opening (top or bottom); in case of multiple horizontally spaced pairs of top-and-bottom openings, use aggregated areas.
A_l = openable area of largest opening (top or bottom); in case of multiple horizontally spaced pairs of top-and-bottom openings, use aggregated areas.

a. Volumetric airflow rates used to estimate required operable area are based on the following:
- Dry-air density of 0.075 lbda/ft³ (1.2 kgda/m³) at a barometric pressure of 1 atm (101.3 kPa) and an air temperature of 70°F (21°C)
- Temperature difference between indoors and outdoors of 1.8°F (1°C)
- Gravity constant of 32.2 ft/s² (9.81 m/s²)
- Window discharge coefficient of 0.6

~~ventilated shall be located within~~ a distance ~~based on the ceiling height, as~~ determined by Sections ~~6.4.1.1, 6.4.1.2, or~~ 6.4.1.3, 6.4.1.4, or 6.4.1.5~~, from operable wall~~ Openings shall ~~that~~ meet the requirements of Section ~~6.4.2~~ 6.4.1.6. For ~~spaces~~ zones where ~~with~~ ceilings ~~that~~ are not parallel to the floor, the ceiling height shall be determined in accordance with Section 6.4.1.~~5~~1.

6.4.1.~~1.~~3 Single Side Opening. For ~~spaces~~ zones with ~~operable~~ openings on only one side of the ~~space~~ zone, the ~~maximum distance from the operable openings to the extent of~~ naturally ventilated area shall ~~be not more than~~ extend to a distance not greater that two times the height of the ceiling from the openings. ~~2~~*H*~~, where *H* is the ceiling height.~~

6.4.1.2~~4~~ Double Side Opening. For ~~spaces~~ zones with ~~operable~~ openings on two opposite sides of the zone ~~space~~, the naturally ventilated area shall extend between the openings separated by a distance not greater than five times the height of the ceiling.~~, which shall be separated by maximum distance from the operable openings shall be not more than 5*H*, where *H* is the ceiling height.~~

6.4.1.3~~5~~ Corner Openings. For ~~spaces~~ zones with ~~operable~~ openings on two adjacent sides of a zone ~~space~~, the naturally ventilated area shall extend to a distance not greater than five times the height of the ceiling ~~maximum distance from the operable openings shall be not more than~~ ~~5~~*H* ~~a~~long a line drawn between the outside edges of the two openings that are

the farthest apart. Floor area outside that line shall comply with Section 6.4.1.~~1~~3 as a zone having openings on only one side of the zone.

Informative Note: *The floor area outside that line* refers to the remaining area of the zone that is not bounded by the walls that have the openings and the line drawn between the openings.

~~6.4.2~~6.4.1.6 Location and Size of Openings. ~~Spaces~~ Zones or portions of ~~spaces~~ zones to be naturally ventilated shall have a permanently open airflow path ~~be permanently open~~ to ~~operable wall~~ openings directly connected to the outdoors. ~~The openable area shall be not less than 4% of the net occupiable floor area.~~ The minimum flow rate to the zone shall be determined in accordance with Section 6.2.2.1. This flow rate shall be used to determine the required openable area of openings, accounting only for buoyancy-driven flow. Wind-driven flow shall be used only where it can be demonstrated that the minimum flow rate is provided during all occupied hours. Openings shall be sized in accordance with Section 6.4.1.6.1 (Path A) or Section 6.4.1.6.2 (Path B).

Informative Note: *Permanently open airflow path* refers to pathways that would allow airflow unimpeded by partitions, walls, furnishings, etc.

6.4.1.6.1 Sizing Openings—Path A. Where the zone is ventilated using a single opening or multiple single openings located at the same elevation, the openable area as a percent of the net occupiable floor area shall be greater than or equal to the value indicated in Table 6.4.1.6.1-1. Where the zone is ventilated using two openings located at different elevations or multiple pairs of such openings, the openable area as a percent of the net occupiable floor area shall be greater than or equal to the value indicated in Table 6.4.1.6.1-2.

Where openings are obstructed~~covered with~~ by louvers~~,~~ or screens~~, or otherwise obstructed~~, the openable area shall be based on the net free ~~unobstructed~~ area of ~~through~~ the opening. Where interior zones ~~rooms~~, or portions of zones ~~rooms~~, without direct openings to the outdoors are ventilated through adjoining zones ~~rooms~~, the opening between zones ~~rooms~~ shall be permanently unobstructed and have a free area of not less than ~~not less than8% of the area of the interior room~~ twice the percent of occupiable floor area used to determine the opening size of adjacent exterior zones, or ~~less than~~ 25 ft^2 (2.3 m^2), whichever is greater.

Informative Note: Tables 6.4.1.6.1-1 and 6.4.1.6.1-2 are based solely on buoyancy-driven flow and have not been created to address thermal comfort.

6.4.1.6.2 Sizing Openings—Path B. The required openable area for a single zone shall be calculated using AM10-2005, Section 4.3.

6.4.2 Engineered System Compliance Path. For an engineered natural ventilation system, the designer shall

a. determine hourly environmental conditions, including outdoor air dry-bulb temperature; dew-point temperature; outdoor concentration of contaminants, including PM2.5, PM10, and ozone where data are available; wind speed and direction; and internal heat gains during expected hours of natural ventilation operation.
b. determine the effect of pressure losses along natural ventilation airflow paths on the resulting flow rates, including inlet openings, air transfer grills, ventilation stacks, and outlet openings during representative conditions of expected natural ventilation system use.
c. quantify natural ventilation airflow rates of identified airflow paths accounting for wind induced and thermally induced driving pressures during representative conditions of expected natural ventilation system use.
d. design to provide outdoor air in quantities sufficient to result in acceptable indoor air quality as established under Section 6.2.2.1 or 6.3 during representative conditions of expected natural ventilation system use.

6.4.3 Control and Accessibility. The means to open required ~~operable~~ openings shall be readily accessible to building occupants whenever the space is occupied. Controls shall be designed to coordinate operation of the natural and mechanical ventilation systems.

6.4.4 Documentation. Where the Natural Ventilation Procedure is used, the designer shall document the values and calculations that demonstrate conformance with the compliance path and the controls systems and sequences required for operation of the natural ventilation system, including coordination with mechanical ventilation systems. Where the Prescriptive Compliance Path is used for buildings located in an area where the national standard for one or more contaminants is exceeded, any design assumptions and calculations related to the impact on indoor air quality shall be included in the design documents.

[. . .]

6.6 Design Documentation Procedures. Design criteria and assumptions shall be documented and made available for operation of the system after installation. See Sections 4.3, 5.1.3, 5.16.4, 6.2.7.1.3, ~~and~~ 6.3.6, and 6.4.4 regarding assumptions to be detailed in the documentation.

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.

ASHRAE · 1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org

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.

For more information or to become a member of ASHRAE, visit www.ashrae.org.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous version. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.

8/19