STANDARD 62.2 USER'S MANUAL

Based on
ANSI/ASHRAE STANDARD 62.2-2016
Ventilation And Acceptable Indoor Air Quality In Residential Buildings

This manual provides

- Explanation of Standard 62.2's requirements
- Guidance on ventilation systems and the building envelope
- Information on whole-building ventilation, local demand-controlled exhaust, and source control
- Recommendations on single-family houses and dwelling units in multifamily structures, including manufactured and modular houses

ASHRAE®

Standard 62.2
User's Manual

Based on

ANSI/ASHRAE Standard 62.2-2016

Ventilation and Acceptable Indoor Air Quality in Residential Buildings

Atlanta

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ASHRAE is a global society advancing human well-being through sustainable technology for the built environment. Its 55,000 members worldwide are individuals who share ideas, identify the need for and support research, and write the industry's standards for testing and practice. The result of these efforts is that engineers are better able to keep indoor environments safe and productive while protecting and preserving the outdoors for generations to come.

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Preface

General

This user's manual contains explanatory material, examples, and background material intended to aid the user in designing and constructing residential buildings that comply with ASHRAE Standard 62.2-2016, *Ventilation and Acceptable Indoor Air Quality in Residential Buildings.* Standard 62.2 is written in mandatory language in order to be enforceable as a code, except for one informative appendix. This user's manual does not reproduce the text of the standard, but, rather, is a basic volume of knowledge and facts relating to meeting the provisions set forth in Standard 62.2. A person serious about effectively designing, constructing, and regulating buildings and structures included in the scope of ASHRAE Standard 62.2 will find the user's manual to be a reliable source of relevant data and reference materials. The manual is intended to be used in conjunction with the standard and not as a substitute. This document is *advisory only*. Ultimately the user's manual benefits the occupants and owners of dwelling units.

It is important to understand that ASHRAE Standard 62.2-2016 is a minimum requirement standard. Thus, if an organization or program is adhering to the standard, ventilation of equal or greater airflow rates than the standard requires may be installed but not ventilation airflow rates less than specified.

Standard 62.2 was originally published in 2003. This user's manual applies to the version of the standard published in 2016, which is known as ASHRAE Standard 62.2-2016. When using this manual to comply with any codes based on Standard 62.2, check to confirm that the code is based on the 2016 version. If the code is based on a version of 62.2 other than the 2016 edition, this manual might not apply to certain provisions.

Audience

This user's manual is intended to aid many types of residential building professionals, including the following:

- Builders
- Code officials
- Weatherization Assistance Program staff
- Home performance contractors
- Home Energy Rating System (HERS) raters
- HVAC technicians and contractors
- Design professionals

It may also be useful for the following:

- Governmental agencies
- Utility program stakeholders
- Affordable housing stakeholders
- Property owners and managers
- Real estate agents

- Home appraisal professionals
- Homeowners

Addenda

Standard 62.2 is a dynamic document that is maintained and updated by ASHRAE under "continuous maintenance" procedures. Periodically, ASHRAE will develop and publish addenda that modify or add to the standard. ASHRAE publishes a full, updated version of the standard on a three-year cycle, which includes all the addenda that have been approved since the previous publication. Between the published versions of the standard, ASHRAE publishes a supplement, which contains any addenda approved during the first 18 months of the three-year revision cycle.

Official Interpretations of the Standard

In addition to addenda, ASHRAE periodically publishes official interpretations of the standard. Interpretations do not change the standard, but are intended to clarify the meaning of existing provisions. Anyone may submit a request for interpretation to ASHRAE. Interpretations are limited to the meaning of the standard and may not be used for design reviews or requests for changes to the standard. Requests for interpretation should be sent to:

Manager of Standards
ASHRAE
1791 Tullie Circle, NE
Atlanta, GA 30329-2305

When a copy of the standard is purchased, all interpretations that apply to the standard are included in the package. The ASHRAE website also lists interpretations, and users can check there for any interpretations that may have been issued since they purchased the standard. Previous interpretations are posted on the ASHRAE website, at www.ashrae.org/standards-research--technology/standards-interpretations

Errata for the ASHRAE Standard 62.2-2016 can also be found on the ASHRAE website. Where appropriate, published errata have been incorporated into this user's manual, with explanation.

Organization

This user's manual is organized to follow the organization of the standard. Each section of this user's manual contains explanatory material intended to assist the user in understanding the provisions of the standard and how to comply with them. Many sections also include examples that give specific means of complying with the standard. Some sections also include background material that explains why the standard includes particular requirements, how equipment tests are performed by the manufacturer or testing organizations, or theoretical information intended to provide a deeper understanding of the provisions and means of compliance.

Comments and recommendations are encouraged. Through input from the user, we can improve future editions. Please direct your comments to the manager of standards, as noted above.

Acknowledgments

The 2016 edition of the Standard 62.2 User's Manual is based on content originally developed for the 2010 edition authored by Roger Hedrick of NORESCO. The 2016 version was developed by Rick Karg of R.J. Karg Associates and member of 62.2 committee; Dr. Charlie Holly of Residential Energy Dynamics; Paul Raymer of Heyoka Solutions and member of 62.2 committee; and Paul Francisco of the University of Illinois, chair of the 62.2 committee under contract to ASHRAE. The illustrations were created by Joe Medosch of Energy and Environmental Consulting. Substantial contributions were also made by members of the Project Management Subcommittee chaired by Mike Blanford, U.S. Department of Housing and Urban Development; Michael Lubliner, Washington State University Energy Program; Darren Meyers, P.E., International Energy Conservation Consultants; Dr. Iain Walker, LBNL; and John Dunlap, Dunlap & Partners Engineers.

Current and past members of SSPC 62.2 deserve thanks and credit for the wealth of knowledge, experience, and insight they bring to the standard. This user's manual is based on the solid foundation built by the committee.

1. Purpose

This section of the Standard describes why the Standard exists and what compliance with the standard is expected to achieve. For the 2016 standard, the words “low-rise” were deleted from the one-sentence purpose statement to reflect the expanded scope of the standard from residential buildings of three or fewer stories above grade to the dwelling units in buildings of any height.

The Purpose of the standard has two parts. The first part states “This standard defines the roles of and minimum requirements for mechanical and natural ventilation systems and the building envelope….” This describes the parts of the building that the provisions of the standard address: the ventilation system (mechanical and natural) and the building envelope (air leakage).

The second part of the Purpose states the standard is “. . . intended to provide acceptable indoor air quality (IAQ) in residential buildings.” This short statement describes the purpose of the provisions of the standard. *Acceptable indoor air quality* is a term defined in §3, Definitions, to mean air that is neither irritating nor unhealthy. Indoor air that is not acceptable is air that smells bad; contains irritating contaminants, such as pollen or other allergens; or contains contaminants at concentrations that might have harmful health effects. Unacceptable indoor air can have one, two, or all three of these characteristics. It might have odors only, but not be unhealthy, or it might be air that seems healthy, but contains dangerous concentrations of toxic chemicals that cannot be sensed by the occupants.

In summary, the Purpose states that the standard prescribes mechanical ventilation, building envelope recommendations, and other measures intended to provide residential indoor air quality that is acceptable for human health and comfort.

2. Scope

Changes to §2, Scope

❑ **§2 Scope.** In the 2016 standard ". . . three stories or fewer above grade. . ." was deleted, changing the scope of the standard to include dwelling units in multifamily buildings of any height. Standard 62.1-2016 addresses spaces other than dwelling units in residential occupancies in multifamily buildings, such as corridors, mechanical rooms, and garages.

❑ **§2.3.** Section 2.3 was deleted in the 2016 Standard, which stated "This standard does not address unvented combustion space heaters." As determined appropriate, provisions addressing unvented combustion space heaters will be considered in future editions.

For the specific addenda that define the differences between the 2010 and 2016 editions of Standard 62.2, including the 2013 edition, refer to Standard 62.2-2016, Appendix D.

Expanding Scope of ASHRAE 62.2

ASHRAE Standard 62.2 from its inception in 2003 addressed dwellings in multifamily buildings, but only in low-rise buildings of three stories or fewer above grade.

For the 2016 standard, the scope was significantly expanded to include dwelling units in buildings of any height. This scope change required coordination between SSPC 62.2 and SSPC 62.1. The primary scope statement in 62.2-2016, §2, was altered to "This standard applies to dwelling units in residential occupancies in which the occupants are nontransient." Notice there is no mention of building height.

With regard to multifamily dwellings, Standard 62.1-2013 had responsibility for buildings four stories or more and Standard 62.2-2013 had responsibility for buildings three stories and less. The ventilation rates for dwelling units in Standard 62.1 are different from the rates in Standard 62.2, resulting in different ventilation rates for all units depending on whether there were three stories or four. Additionally, Standard 62.1 does not address moderate retrofits, whereas Standard 62.2 does. Given the growth of the retrofit industry in multifamily dwellings, it is important that these situations are covered in ASHRAE's ventilation standards. This scope did away with the building height separation, bringing the dwelling units themselves into Standard 62.2, regardless of height. This allows for consistency within dwelling units and also allows application of ASHRAE ventilation standards to the multifamily retrofit market. However, spaces within these buildings, other than dwelling units, remain within Standard 62.1.

As part of this significant Standard 62.2-2016 scope change, the title of the standard became Ventilation and Acceptable Indoor Air Quality in Residential Buildings; *it no longer includes the term* Low-Rise.

Section 2 of the standard defines its scope in a number of ways. First, the scope describes the occupancies in which the standard is intended to be applied. Second, the scope describes what the standard addresses, specifically the issues in the dwelling unit that affect acceptable indoor

air quality but not other issues, such as thermal comfort. It also includes a list of reasons why acceptable indoor air quality might not be achieved, despite meeting all appropriate provisions of the standard.

The standard applies to dwelling units in residential occupancies in which occupants are nontransient, including in one- and two-family dwellings, townhouses, and dwelling-unit portions of multifamily buildings of any height. The word *nontransient* means occupancy of a dwelling unit or sleeping unit for more than 30 days. See Figures 2-1 through 2-4 for examples.

Figure 2-1 Single-family dwelling.

Some spaces within residential buildings, such as naturally vented attics or crawlspaces and common hallways in multifamily buildings, are not addressed by the standard in that they are not included when calculating ventilation rates. The envelope requirements of the standard, however, still apply even if they encompass these unaddressed spaces.

For dwelling units in multifamily buildings, the standard includes spaces that are under the daily control of the occupants of a dwelling unit but does not include common areas or spaces, such as mechanical rooms. See Figure 2-4 for a mixed-use example.

Figure 2-2 Duplex residence (attached single family).

Figure 2-3 Row houses.

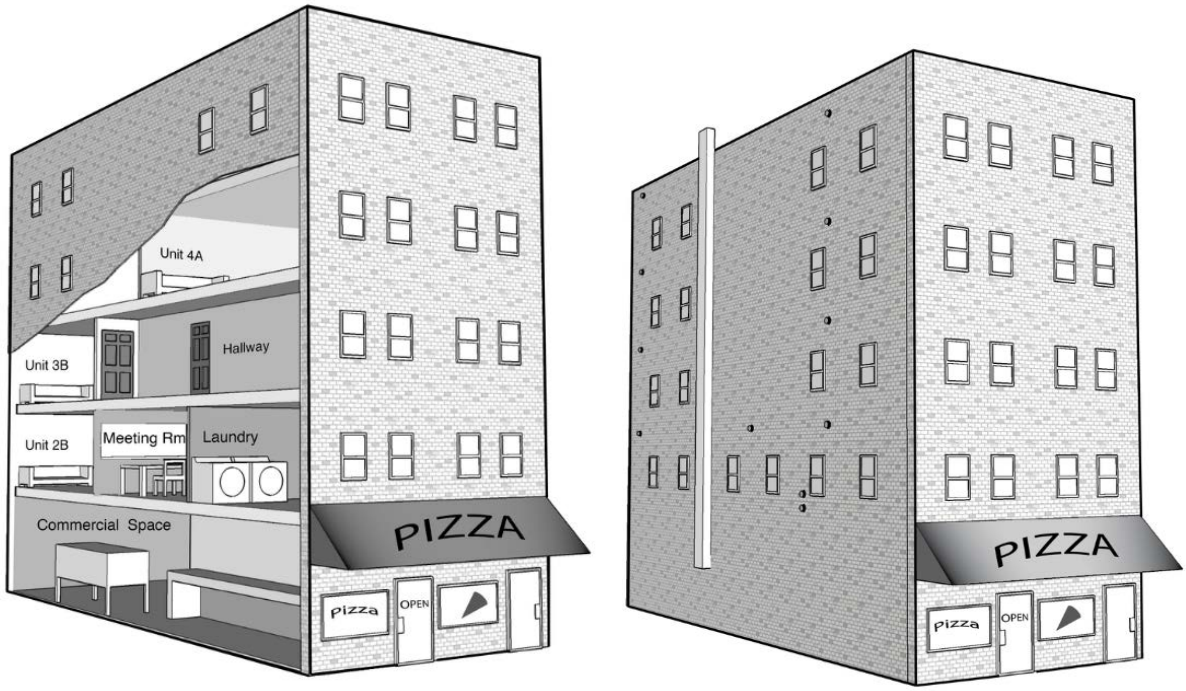

Figure 2-4 Five-story, mixed-use multifamily building. ASHRAE Standard 62.2-2016 applies only to dwelling spaces over which occupants have daily control. Common and commercial-use spaces are addressed by ASHRAE Standard 62.1-2016.

In urban areas, a common building type has retail or other commercial space on the first floor with residential apartments above, a mixed-use building. This standard applies to the residential dwelling units only, while the nondwelling-unit portions are covered by ASHRAE Standard 62.1-2016, *Ventilation for Acceptable Indoor Air Quality*.

The standard does not apply to buildings with transient occupancies, including hotels and motels. A building used as a group home[1] will most likely fall within the scope of Standard 62.2. A halfway house is not within the scope of the standard if the occupants reside there for fewer than 30 days, qualifying them as *transient* in the standard. When there is a question regarding whether the occupants are transient or nontransient, the intent of the facility management will usually serve as a good indicator.

§2.1

The scope of the standard also addresses the impact of chemical, physical, and biological air contaminants on acceptable indoor air quality. The standard does not consider thermal comfort, which is addressed by ASHRAE Standard 55-2013, *Thermal Environmental Conditions for Human Occupancy*.

The standard includes provisions for dwelling-unit ventilation and local exhaust ventilation, specifying minimum rates for acceptable indoor air quality. To make the performance of the ventilation systems more robust, other provisions are addressed, including the following:

- Control strategies
- Sound levels
- Make-up air
- Duct design
- Isolation of garages
- Duct tightness
- Alternative compliance for certain existing buildings with no or inadequate existing local exhaust fans

ASHRAE defines these provisions of Standard 62.2 as the minimum needed to accommodate ordinary residential air-contaminant sources, including indoor-generated high humidity. Water vapor is not a contaminant in itself, but high humidity often results in mold issues, which can become an indoor air quality hazard.

§2.2

Meeting the provisions of the standard does not guarantee acceptable indoor air quality in a dwelling. The standard lists a number of possible causes:

a) The provisions of the standard were developed to provide minimum standards of practice for ventilating typical dwellings. However, there is a range of conditions in dwelling units that might result in higher-than-typical contaminant loads, with the result that a compliant mechanical ventilation system might not be adequate to provide acceptable IAQ at all times.

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[1] A group home is a private residence of varying size that might house children, adolescents, or adults who are not able to live with their families or on their own because of developmental disorders, intellectual disabilities, long-term psychiatric disorders, or a combination of disabilities. Group homes might also be occupied by people of any age with chronic physical disabilities or addictions. Typically these facilities have six or more residents and at least one caregiver on duty at all times.

There is also a wide range of susceptibility to various contaminants among occupants. A person who is sensitive to a particular contaminant might perceive the air to be unacceptable despite the installation and operation of systems in accordance with the standard.

b) Research has shown that occupants who are uncomfortable or under stress are more susceptible to the hazards of air contaminants.

c) When the outdoor air has high air contaminant levels, the mechanical ventilation system can introduce contaminated air that might result in poorer IAQ. A common example is when a house is located near a pollution source, such as a busy highway.

d) A building that meets the standard might have the ventilation equipment turned off, the equipment might be performing poorly, or the equipment might be broken due to lack of maintenance. The standard only requires that information on proper operation and maintenance of the system be provided to the owner or occupant. The occupant's use of that information is outside the scope of the standard.

e) On occasion, there might be releases of contaminants that are very odorous, extremely toxic, or released in large amounts. Such cases might overwhelm ventilation systems designed in accordance with this standard. For example, certain hobby activities, heavy spraying of pesticides, food burned while cooking, indoor barbequing, local forest fires, dust storms, or high pollutant counts are all considered "high-polluting events." Activities such as these can release air contaminants in such large quantities that systems designed to meet minimum ventilation standards are not able to keep contaminants at healthy levels.

Unvented space heaters are included in the scope of the standard for the first time in 2016, however there are no provisions specific to these devices in this edition of the standard. [2] Check existing codes and manufacturer's instructions for guidance on the use of these appliances.

Example 2-A—What Areas in a Multistory, Mixed-Use Building Fall within the Scope of Standard 62.2-2016 (§2)?

Q1

I must design the mechanical ventilation systems for a new eight-story multiuse building. The first floor of the building is business space, including a laundry, small pharmacy, and a hair salon. The other floors are dwelling units; hallways, stairs, and an elevator; a coin-operated laundry for tenants on the third floor, and a large meeting/recreation room on the fourth floor. For which of these areas should I use ASHRAE 62.2-2016 for my ventilation design?

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[2] The approved ASHRAE Position Document on Unvented Combustion Devices and Indoor Air Quality states in its recommendations "Ventilation standards, particularly those concerned with residential buildings, should consider addressing unvented combustion appliances and establishing appropriate technical requirements." The removal of §2.3 allows the 62.2 committee to consider unvented combustion devices in accordance with ASHRAE's position, and the committee intends to do so, with input from the stakeholders.

A2

Section 2 of the standard states “This standard applies to dwelling units in residential occupancies in which the occupants are nontransient.” The building in question does include dwelling units in residential occupancies. Because the occupants are nontransient (occupying for more than 30 days), the dwelling units in this multistory building fit within the scope of the standard. However, ASHRAE Standard 62.2-2016 should be used only for dwelling units in the buildings. All other spaces in this building, including the first floor, hallways, stairs, elevators, laundry rooms, and common areas fall under the scope of ASHRAE Standard 62.1-2016.

Example 2-B—What Residential Building Types Fall within the Scope of Standard 62.2-2016 (§2)?

Q1

A local family-owned hotel is having moisture problems in many of the guest rooms. In an effort to mitigate the moisture problems, the building manager has asked me to install mechanical ventilation in all the guest rooms. Should I follow the procedures of ASHRAE 62.1-2016 or ASHRAE 62.2-2016?

A1

Section 2 of the standard states “This standard applies to dwelling units in residential occupancies in which the occupants are nontransient.” The hotel building in question does include dwelling units in residential occupancies, but they are transient rather than nontransient occupancies. ASHRAE Standard 62.2-2016 defines *nontransient* as “occupancy of a dwelling unit or sleeping unit for more than 30 days.” Therefore, this hotel building does not fit within the scope of ASHRAE Standard 62.2-2016 but does fit within the scope of ASHRAE Standard 62.1-2016.

3. Definitions

Additions to the 2013 and 2016 edition of the 62.2 Standard are designated with a ❖ in the margin of this chapter. For the definitions to these and other terms, please refer to the standard.

The standard contains definitions for many terms that it uses. See the standard for definitions of the following:

acceptable indoor air quality

air cleaning

air, exhaust

air, indoor

air, outdoor

air, transfer

air, ventilation

air change rate

❖ annual exposure

balanced system

bathroom

climate, hot, humid

climate, very cold

conditioned space

contaminant

❖ dwelling unit

❖ dwelling unit, attached

❖ effective annual average infiltration rate

exhaust system

exhaust flow, net

❖ floor area

habitable space

heating degree-day

high-polluting events

infiltration

❖ intermittent ventilation

kitchen

❖ kitchen, enclosed
mechanical cooling
mechanical ventilation
❖ mixed-use building
natural ventilation
❖ nontransient
occupiable space
pressure boundary
readily accessible
❖ residential occupancies
❖ sleeping unit
source
supply system
system
❖ time average airflow rate
toilet
utility
ventilation

4. Dwelling-Unit Ventilation

Changes to §4, Dwelling-Unit Ventilation

❑ §4.1 Ventilation Rate.

- 2013 Standard:
  - Text changed to make clear that compliance depends not only on installation but also on operation.

❑ §4.1.1 Total Ventilation Rate.

- 2013 Standard:
  - Ventilation system must be "operated" in order to achieve stated purpose, rather than "installed."
  - Basic ventilation equation, 4.1a (4.1b), was altered from 1 cfm per 100 ft^2 (5 L/s per 100 m^2) to 3 cfm per 100 ft^2 (15 L/s per 100 m^2). This change resulted from the elimination of the 2 cfm per 100 ft^2 (10 L/s per 100 m^2) default infiltration credited for all dwellings. Note that the *target* overall air exchange rate remained the same. The method for calculating the infiltration credit also changed and partially neutralizes the effect of the elimination of default infiltration credit.
  - Variable for total ventilation rate altered from Q_{fan} to Q_{tot}.
  - Variable for infiltration credit designated as Q_{inf}.
  - Variable for required mechanical ventilation rate designated as Q_{fan}.
  - Tables 4.1a (I-P) and 4.1b (SI) altered to smaller floor-area segments, from 1500 ft^2 (140 m^2) difference from row-to-row to 500 ft^2 (46 m^2) from row-to-row.
- 2016 Standard:
  - Clarification of floor area by added reference to ANSI Standard Z765-2003[3], *Square Footage-Method for Calculation*.

❑ §4.1.2 Infiltration Credit.

- 2013 Standard:
  - Revised height adjustment exponent added with clarification on how to measure height.
  - Method for calculating infiltration changed in conjunction with the effort to expand the list of weather station locations.
  - Infiltration credit allowed for new residential dwellings, but limited to two-thirds of Q_{tot}.
  - All equations for the determination of the infiltration credit were incorporated into the 62.2 Standard. Previously these equations and weather data were in

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[3] ANSI/NAHB. 2003. *ANSI Z765-2003, Square Footage—Method for Calculating*. Upper Marlboro, MD: National Association of Home Builders Research Center, Inc..