ANSI/ASHRAE Addendum *aa* to
ANSI/ASHRAE Standard 62-2001

ASHRAE STANDARD

Ventilation for Acceptable Indoor Air Quality

Approved by the ASHRAE Standards Committee on June 26, 2004; by the ASHRAE Board of Directors on July 1, 2004; and by the American National Standards Institute on August 5, 2004.

This standard is under continuous maintenance 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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE web site, *http://www.ashrae.org*, or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard and printed copies of a public review draft may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: *orders@ashrae.org*. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in U.S. and Canada).

ISSN 1041-2336

Approved American National Standard
ANSI

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SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (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 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,
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.)

FOREWORD

This addendum converts requirements related to outdoor air intake location and intake protection into mandatory and enforceable language. Because outdoor contaminant sources can lead to unacceptable indoor air quality, this addendum adds requirements for minimum separation distances between common outdoor sources and outdoor air intakes. Also, because liquid water in the air distribution system can lead to microbial growth, this addendum includes requirements intended to limit the intrusion and entrainment of precipitation. To prevent contaminant related to bird nesting, this addendum requires bird screening and prohibits ledges at the outdoor air intake.

Note that the requirement on rain hoods in section 5.4.2 d would allow rain hoods such as that shown below in Figure A but not the one shown in Figure B.

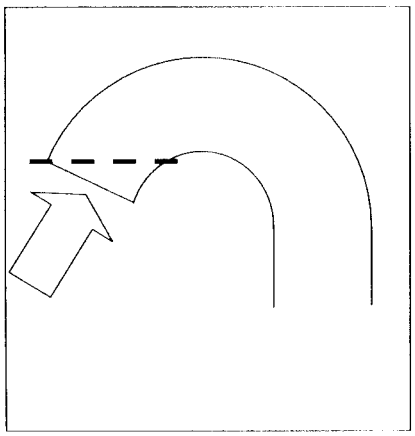

Figure A

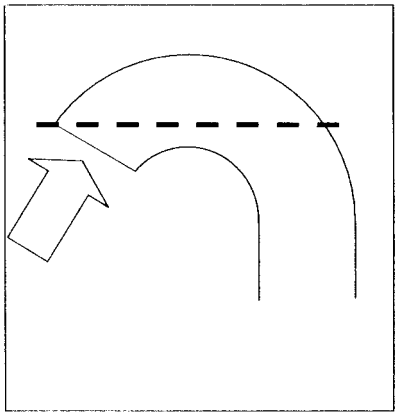

Figure B

Delete the current Section 5.4 completely and replace it with the following new Section 5.4. In addition, add new Table 5.2 as follows.

5.4 Outdoor Air Intakes. Ventilation system outdoor intakes shall be designed in accordance with the following.

5.4.1 Location. Outdoor air intakes, including doors and windows that are required as part of a natural ventilation system, shall be located such that the shortest distance from the intake to any specific potential outdoor contaminant source shall be equal to or greater than the separation distance listed in Table 5.2. **Exception**: Other minimum separation distances are acceptable if it can be shown that an equivalent or lesser rate of introduction of outdoor air contaminants will be attained. **Note**: Appendix X presents an acceptable alternative method of determining the minimum separation distance.

TABLE 5.2 Air Intake Minimum Separation Distance

Object	Minimum Distance, ft (m)
Significantly contaminated exhaust (Note 1)	15 (5)
Noxious or dangerous exhaust (Notes 2 and 3)	30 (10)
Vents, chimneys, and flues from combustion appliances and equipment (Note 4)	15 (5)
Garage entry, automobile loading area, or drive-in queue (Note 5)	15 (5)
Truck loading area or dock, bus parking/idling area (Note 5)	25 (7.5)
Driveway, street, or parking place (Note 5)	5 (1.5)
Thoroughfare with high traffic volume	25 (7.5)
Roof, landscaped grade, or other surface directly below intake (Notes 6 and 7)	1 (0.30)
Garbage storage/pick-up area, dumpsters	15 (5)
Cooling tower intake or basin	15 (5)
Cooling tower exhaust	25 (7.5)

Note 1: Significantly contaminated exhaust is exhaust air with significant contaminant concentration, significant sensory-irritation intensity, or offensive odor.
Note 2: Laboratory fume hood exhaust air outlets shall be in compliance with NFPA 45-1991[AA-1] and ANSI/AIHA Z9.5-1992. [AA-2]
Note 3: Noxious or dangerous exhaust is exhaust air with highly objectionable fumes or gases and/or exhaust air with potentially dangerous particles, bioaerosols, or gases at concentrations high enough to be considered harmful. Information on separation criteria for industrial environments can be found in the ACGIH Industrial Ventilation Manual [AA-3] and in the ASHRAE Applications Handbook. [AA-4]
Note 4: Shorter separation distances are permitted when determined in accordance with (a) ANSI Z223.1/NFPA 54-2002 [AA-5] for fuel gas burning appliances and equipment; (b). NFPA 31-2001 [AA-6] for oil burning appliances and equipment, or (c) NFPA 211-2003 [AA-7] for other combustion appliances and equipment.
Note 5: Distance measured to closest place that vehicle exhaust is likely to be located.
Note 6: No minimum separation distance applies to surfaces that are sloped more than 45 degrees from horizontal or that are less than 1 in. (3 cm) wide.
Note 7: Where snow accumulation is expected, distance listed shall be increased by the expected average snow depth.

5.4.2 Rain Entrainment. Outdoor air intakes that are part of the mechanical ventilation system shall be designed to manage rain entrainment in accordance with any one of the following:

(a) Limit water penetration through the intake to 0.07 oz/ft^2•hr (21.5 g/m^2•hr) of inlet area when tested using the rain test apparatus described in UL 1995 Section 58.

(b) Select louvers that limit water penetration to a maximum of 0.01 oz/ft^2 (3 g/m^2) of louver free area at the maximum intake velocity. This water penetration rate shall be determined for a minimum 15-minute test duration when subjected to a water flow rate of 0.25 gal/min (16 mL/s) as described under the Water Penetration Test in AMCA Standard 500-L-99 or equivalent. Manage the water that penetrates the louver by providing a drainage area and/or moisture removal devices.

(c) Select louvers that restrict wind-driven rain penetration to less than 2.36 oz/ft2•hr (721 g/m2•hr) when subjected to a simulated rainfall of 3 in. (75 mm) per hour and a 29 mph (13 m/s) wind velocity at the design outdoor air intake rate with the air velocity calculated based on the louver face area. **Note:** This performance corresponds to Class A (99% effectiveness) when rated according to AMCA 511-99[AA-9] and tested per AMCA 500-L-99.[AA-8]

(d) Use rain hoods sized for no more than 500 fpm (2.5 m/s) face velocity with a downward-facing intake such that all intake air passes upward through a horizontal plane that intersects the solid surfaces of the hood before entering the system.

(e) Manage the water that penetrates the intake opening by providing a drainage area and/or moisture removal devices.

5.4.3 Rain Intrusion. Air handling and distribution equipment mounted outdoors shall be designed to prevent rain intrusion into the airstream when tested at design airflow and with no airflow, using the rain test apparatus described in UL 1995 Section 58. [AA-10]

5.4.4 Snow Entrainment. Where climate dictates, outdoor air intakes that are part of the mechanical ventilation system shall be designed to manage melted snow blown or drawn into the system as follows:

(a) Suitable access doors to permit cleaning shall be provided.

(b) Outdoor air ductwork or plenums shall pitch to drains designed in accordance with the requirements of Section 5.11.

5.4.5 Bird Screens. Outdoor air intakes shall include a screening device designed to prevent penetration by a 1/2 in. (13 mm) diameter probe. The screening device material shall be corrosion resistant. The screening device shall be located, or other measures shall be taken, to prevent bird nesting within the outdoor air intake. **Note:** Any horizontal surface may be subject to bird nesting.

Add the following references to Section 9: The alphanumeric designations refer to the citations in this addendum only. References to be renumbered when next edition of standard is published.

AA-1. *NFPA 45-1991, Standard on Fire Protection for Laboratories Using Chemicals*, 1991 edition. National Fire Protection Association.

AA-2. *ANSI/AIHA Z9.5-1992, Standard for Laboratory Ventilation*, American Industrial Hygiene Association.

AA-3. ACGIH. 1998. *Industrial Ventilation – A Manual of Recommended Practice* – 23d ed. American Conference of Governmental Industrial Hygienists.

AA-4. *2003 ASHRAE Handbook—Heating, Ventilating, and Air-Conditioning Applications*. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

AA-5. *ANSI Z223.1/ NFPA54-2002: National Fuel Gas Code, 2002 Edition,* Chapter 10. American Gas Association/National Fire Protection Association.

AA-6. *NFPA31: Standard for the Installation of Oil-Burning Equipment, 2001 Edition,* Chapter 6. National Fire Protection Association.

AA-7. *NFPA211: Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances, 2003 Edition.* Chapter 7. National Fire Protection Association.

AA-8. AMCA 500-L-99. *Laboratory Methods of Testing Louvers for Rating.* Air Movement and Control Association International, Inc.

AA-9. AMCA 511-1999. Certified Ratings Programs for Air Control Devices. Air Movement and Control Association International, Inc.

AA-10. UL. 1995. *UL Standard for Safety for Heating and Cooling Equipment*, UL 1995. Underwriters Laboratories, Inc.

Add new Appendix X to present the separation distance equation as a function of airflow, velocity and dilution factor (by air classification).

(This appendix 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.)

APPENDIX X. SEPARATION OF EXHAUST OUTLETS AND OUTDOOR AIR INTAKES

X.1 General. Exhaust air and vent outlets as defined in Table 5.2 shall be located no closer to outdoor air intakes, and operable windows, skylights, and doors, both those on the subject property and those on adjacent properties, than the minimum separation distance L specified in this section. The distance L is defined as the shortest "stretched string" distance measured from the closest point of the outlet opening to the closest point of the outdoor air intake opening or operable window, sky-

light, or door opening, along a trajectory as if a string were stretched between them.

X.2 Application. Exhaust outlets and outdoor air intakes or other openings shall be separated in accordance with the following. **Exception:** Laboratory fume hood exhaust air outlets shall be in compliance with NFPA 45-1991 and ANSI/AIHA Z9.5-1992.

X.2.1 Outdoor Air Intakes. Minimum separation distance between exhaust air/vent outlets as defined in Table 5.2 and outdoor air intakes to mechanical ventilation systems or operable windows, skylights, and doors that are required as part of natural ventilation systems shall be equal to distance L determined in accordance with section X.3. **Exception:** Separation distances do not apply when exhaust and outdoor air intake systems do not operate simultaneously.

X.2.2 Other Building Openings. Minimum separation distance between building exhaust air/vent outlets as defined in Table 5.2 and operable openings to occupiable spaces shall be half of the distance L determined in accordance with section X.3. Minimum separation distance between high odor intensity or noxious or dangerous exhaust air/vent outlets and operable openings to occupiable spaces shall be equal to the distance L determined in accordance with section X.3.

X.2.3 Additional Limitations for Noxious or Dangerous Air. Minimum separation distance between exhausts located less than 65 ft (20 m) vertically below outdoor air intakes or operable windows and doors shall be equal to a horizontal separation only as determined in accordance with section X.3; no credit may be taken for any vertical separation.

X.2.4 Equipment Wells. Exhaust air outlets that terminate in an equipment well that also encloses an outdoor air intake shall meet the separation requirements of this section and, in addition, shall either

(a) terminate at or above the highest enclosing wall and discharge air upward at a velocity exceeding 1000 fpm (5 m/s)

or

(b) terminate 1 m (3 ft) above the highest enclosing wall (with no minimum velocity).

Exception: Low contaminant or intensity air.

For the purpose of this section, an equipment well is an area (typically on the roof) enclosed on three or four sides by walls that are less than 75% free area, and the lesser of the length and width of the enclosure is less than three times the average height of the walls. The free area of the wall is the ratio of area of the openings through the wall, such as openings between louver blades and undercuts, divided by the gross area (length times height) of the wall.

X.2.5 Property Lines. Minimum separation distance between exhaust air/vent outlets and property lines shall be half of the distance L determined in accordance with section X.3. For significant contaminant or odor intensity exhaust air, where the property line abuts a street or other public way, no minimum separation is required if exhaust termination is 10 ft (3 m) above grade.

X.3 Determining Distance L. Separation distance L shall be determined using any of the following approaches:

(a) Use the values of L in Table X.1.

(b) Calculate L in accordance with Equation X-1 (a or b).

(c) Determine L using any calculation or test procedure approved by the authority having jurisdiction that shows that the proposed design will result in equivalent or greater dilution factors than those specified in Table X.2.

TABLE X.1 Minimum Separation Distance, L, in ft (m)

Significant contaminant or odor intensity	Noxious or dangerous particles
15 (5)	30 (10)

$$L = 0.09\sqrt{Q}(\sqrt{DF} - U/400) \text{ in feet (IP)} \qquad \text{(X-1a)}$$

$$L = 0.04\sqrt{Q}(\sqrt{DF} - U/2) \text{ in meters (SI)} \qquad \text{(X-1b)}$$

where

Q = exhaust air volume, cfm (L/s). For gravity vents, such as plumbing vents, use an exhaust rate of 150 cfm (75 L/s). For flue vents from fuel-burning appliances, assume a value of 250 cfm per million Btu/h (0.43 L/s per Kw) of combustion input (or obtain actual rates from the combustion appliance manufacturer.

DF = dilution factor, which is the ratio of outside air to entrained exhaust air in the outside air intake. The minimum dilution factor shall be determined as a function of exhaust air class in Table X.2:

TABLE X.2 Minimum Dilution Factors

Exhaust Air Class	Dilution Factor, *DF*
Significant contaminant or odor intensity	15
Noxious or dangerous particles	50*
*Does not apply to fume hood exhaust. See section X.2	

For exhaust air composed of more than one class of air, the dilution factor shall be determined by averaging the dilution factors by the volume fraction of each class:

$$DF = \frac{\sum DF_i * Q_i}{\sum Q_i}$$

where

DF_i = dilution factor from Table X.2 for class *i* air and Q_i is the volumetric flow rate of class *i* air in the exhaust airstream.

U = exhaust air discharge velocity, fpm (m/s). As shown in Figure X.1, *U* shall have a positive value when the exhaust is directed away from the outside air intake at an angle that is greater than 45° from the direction of a line drawn from the closest exhaust point the edge of the intake; *U* shall have a negative value when the exhaust is directed toward the intake bounded by lines drawn from the closest exhaust point the edge of the intake; and *U* shall be set to zero

for other exhaust air directions regardless of actual velocity. *U* shall be set to 0 in Equation X-1 for vents from gravity (atmospheric) fuel-fired appliances, plumbing vents, and other nonpowered exhausts, or if the exhaust discharge is covered by a cap or other device that dissipates the exhaust airstream. For hot gas exhausts such as combustion products, an effective additional 500 fpm (2.5 m/s) upward velocity shall be added to the actual discharge velocity if the exhaust stream is aimed directly upward and unimpeded by devices such as flue caps or louvers.

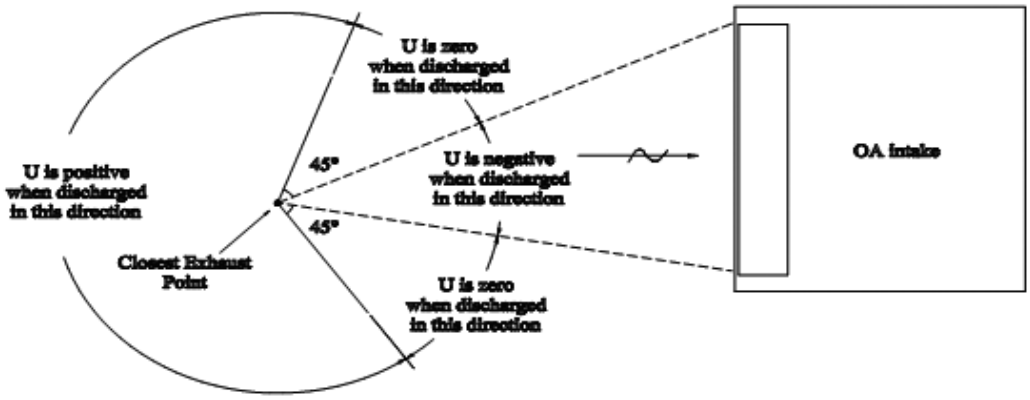

Figure X.1

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.