ASHRAE®

ADDENDA

**ANSI/ASHRAE Addendum ab to**
**ANSI/ASHRAE Standard 62.1-2022**

# Ventilation and Acceptable Indoor Air Quality

Approved by ASHRAE and the American National Standards Institute on October 31, 2023.

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## FOREWORD

*Using $CO_2$ to control outdoor air ventilation rates—demand controlled ventilation (DCV)—has become increasingly popular to achieve energy savings in buildings that have varying occupancy rates. DCV is also a mandatory requirement for densely occupied spaces in ASHRAE Standard 90.1, but the standard provides no details for how to implement DCV, nor does it specifically mention $CO_2$. The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) uses $CO_2$ as an indicator of IAQ conditions, but it references Standard 62.1, Informative Appendix D, "Rationale for Minimum Physiological Requirements for Respiration Air Based on $CO_2$ Concentration," which was deleted in the 2019 edition of the standard because it contained outdated information that was widely misinterpreted. Specific requirements are therefore needed for how to use $CO_2$ concentration for DCV.*

*Addendum ab adds differential $CO_2$ concentration limits above ambient to Table 6-1 specifically for use with $CO_2$ DCV systems. The values were determined based on steady-state equations and*

a. *Outdoor air ventilation rates from Table 6-1 based on the default occupant density and default air temperature and pressure*
b. *Values of $CO_2$ generation rates based on activity level, gender, body mass, and age per ASTM D6245-2018[1] and Persily and de Jonge[2].*
c. *Assumptions regarding activity level and the mix of gender, body size, and age in each space based on SSPC judgment*
d. *Zone air distribution effectiveness ($E_z$) equal to 1.0, because the $CO_2$ in the space is what is being controlled, and the actual airflow delivery will automatically adjust for $E_z$ less than or more than 1.0*

*$CO_2$ limits shown in Table 6-1 are the differential concentration above ambient. In recognition of the uncertainty due to the range of assumptions, and for ease of use, the resulting differential $CO_2$ concentration limits were then rounded to the nearest multiple of 300 ppm.*

*Ambient concentration can be determined with ambient $CO_2$ sensors but is allowed to be assumed to be 400 ppm for the following reasons:*

a. *400 ppm is a common assumption, e.g., see California Title 24 Energy Standards[3] and Lawrence[4].*
b. *400 ppm is conservative from a ventilation standpoint, as few areas have consistently lower average ambient concentrations.*
c. *Using a fixed value avoids the first cost and recurring calibration costs of an ambient $CO_2$ sensor, which for hardwired room $CO_2$ sensors would have to be hardwired to each room $CO_2$ sensor.*
d. *Automatic Background Calibration (ABC) logic, which is commonly used with commercial $CO_2$ sensors to automatically maintain calibration, uses 400 ppm as the ambient concentration targeted by the logic, so ambient concentration is effectively indicated as 400 ppm regardless of actual ambient concentration. Therefore, when $CO_2$ sensors with ABC logic are used, ambient concentration should always be assumed to be 400 ppm.*

*With respect to using steady-state concentration limits for DCV, ASHRAE RP-1547[5] found that "$CO_2$ generation rate and odor generation rate are proportional, [so] the zone-to-discharge differential $CO_2$ concentration can be used as a signifier of human odors in a space". Taylor 2006[6] also explains why using steady-state $CO_2$ concentration limits makes sense even though zone conditions are not steady-state:*

$$V_{bz} = R_p P_z + R_a A_z \tag{1}$$

$$V'_{ot} = \frac{R_a A_z}{E_z - \dfrac{R_p (C_R - C_{OA})}{8400m}} \tag{11}$$

*Both Equation 11 and Equation 1, from which it was derived, are based on an assumption of steady-state conditions. In non-steady-state conditions, typical of most real-world applications, $CO_2$ concentration will generally lag behind changes in the actual number of occupants in the zone and changes in ventilation airflow rates. However, using Equation 11 to control outdoor air rates is still valid because the rate of generation of $CO_2$ by occupants should be nearly proportional to the rate of bioeffluent generation; both are* *generated at a rate proportional to the number of people and their activity level. It is bioeffluent (odor) concentration we are trying to control, and if the source strengths of* $CO_2$ *and bioeffluents are proportional,* $CO_2$ *concentration may be used as an indicator of bioeffluent concentration. Thus the steady-state assumption in Equation 11 is made not because the actual system is at steady-state but because the ventilation rate equation, Equation 1, is based on steady-state conditions. This steady-state relationship is simply being used to establish the relationship between* $CO_2$ *(odor) concentration and airflow set point in Equation 11. Therefore, while the rate of air supplied using Equation 11 will not exactly track the source strength of bioeffluents due to transient effects, it should maintain an acceptable bioeffluent concentration.*

*Note that the language of Sections 6.2.6.1.3.1 through 6.2.6.1.3.3 in this addendum was largely extracted from Title 24 Building Energy Efficiency Standards section 120.1(d)4.*

*Section 6.2.6.1.4 has been moved up to become Section 6.2.6.2 because it may be used with other dynamic controls (e.g., occupancy sensors) and not just DCV.*

*The exception to Section 6.2.6.1 is moved down to become an exception to Section 6.2.6.1.3, as it addresses use of* $CO_2$ *for DCV.*

*Some occupancies have* $CO_2$ *limits listed as "NA," meaning DCV is not applicable and may not be used, in cases the SSPC did not think* $CO_2$ *DCV was appropriate for one or more of the following:*

- *Animal occupancies where* $CO_2$ *may be generated by animals other than humans so* $CO_2$ *will not track human bioeffluents*
- *Occupancies, such a laboratories, where occupant activities may be generating significant contaminants other than bioeffluents*
- *Health care occupancies where an unknown number of infectious individuals may be present*

*"Corridors (age 5 plus)" from Addendum a to ASHRAE Standard 62.1-2022 has been added editorially for clarity. As a space with no default occupant density, DCV does not apply.*

**References:**


1. ASTM. 2018. ASTM D6245, *Standard Guide for using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation.*West Conshohocken, PA: ASTM International.
2. Persily, A., and L. de Jonge. 2017. Carbon dioxide generation rates for building occupants. *Indoor Air* 27(5):868–79.
3. California Building Energy Efficiency Standards, Title 24 Part 6 (https://codes.iccsafe.org/content/CAEC2022P1/preface)
4. Lawrence, T. 2008. Selecting $CO_2$ criteria for outdoor air monitoring. *ASHRAE Journal* 50(12).
5. ASHRAE. 2013. $CO_2$-based Demand Controlled Ventilation for Multiple Zone HVAC Systems. ASHRAE RP-1547 Final Report. Peachtree Corners, GA: ASHRAE.
6. Taylor, S. 2006. $CO_2$-based DCV using 62.1-2004. *ASHRAE Journal* (May).
7. ASHRAE. 2017. Implementation of RP-1547 CO=-based Demand Controlled Ventilation for Multiple Zone HVAC Systems in Direct Digital Control Systems. ASHRAE Research Project RP-1747 Final Report. Peachtree Corners, GA: ASHRAE.
8. Stanke, D. 2006. Standard 62.1-2004 system operation: Dynamic reset options. *ASHRAE Journal* 48(12):18–20.


***Informative 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 ab to Standard 62.1-2022

***Modify Section 6.2.6.1 as shown. The Exception to 6.2.6.1 was moved to Section 6.2.6.1.3. The strikethrough text in Section 6.2.6.1.3 was moved to Section 6.2.6.1.3.4 and modified as shown. Renumber existing sections accordingly.***

**6.2.6.1 Demand Controlled Ventilation (DCV).** DCV shall be permitted as an optional means of dynamic reset.

~~**Exception to 6.2.6.1:** $CO_2$-based DCV shall not be applied in zones with indoor sources of $CO_2$ other than occupants, or with $CO_2$ removal mechanisms, such as gaseous air cleaners.~~

**6.2.6.1.1** For DCV ventilation zones in the occupied mode, breathing zone outdoor airflow ($V_{bz}$) shall be reset in response to current population. Current population estimates or indicators used in DCV control calculations shall not result in ventilation rates that are less than those required by the actual population when averaged over ~~during any one-hour~~ the time period determined in accordance with Section 6.2.5.2, or one hour, whichever is less.

**6.2.6.1.2** For DCV ventilation zones in the occupied mode, breathing zone outdoor airflow ($V_{bz}$) shall be not less than the building component ($R_a \times A_z$) for the zone.

**6.2.6.1.3** ~~Where~~ $CO_2$ sensors shall be permitted to be ~~are~~ used for DCV in accordance with the following subsections.~~, the CO2 sensors shall be certified by the manufacturer to be accurate within ±75 ppm at concentrations of both 600 and 1000 ppm when measured at sea level at 77°F (25°C). Sensors shall be factory calibrated and certified by the manufacturer to require calibration not more frequently than once every five years. Upon detection of sensor failure, the system shall provide a signal that resets the ventilation system to supply the required minimum quantity of outdoor air ($V_{bz}$) to the breathing zone for the design zone population ($P_z$)~~.

**Exception to 6.2.6.1.3:** $CO_2$-based DCV shall not be applied in zones with indoor sources of $CO_2$ other than occupants, or with $CO_2$ removal mechanisms, such as gaseous air cleaners.

**6.2.6.1.3.1** $CO_2$ sensors shall be located in the space between 3 ft (0.9 m) and 6 ft (1.8 m) above the floor. There shall be at least one $CO_2$ sensor per ventilation zone and at least one per 5000 ft² (460 m²) of net occupiable floor area. Where DCV ventilation zones are comprised of more than one room, each room shall have a $CO_2$ sensor, and ventilation shall be controlled to the room requiring the most ventilation.

**Exception to 6.2.6.1.3.1:** Other locations for $CO_2$ sensors are permitted if the locations are demonstrated to be accurate in measuring average $CO_2$ concentrations in the space breathing zone.

**6.2.6.1.3.2** Demand ventilation controls shall maintain zone $CO_2$ concentration less than or equal to $C_{max}$ determined in accordance with Equation 6-12.

$$C_{max} = C_{amb} + \Delta C \qquad (6\text{-}12)$$

where

$C_{amb}$ = outdoor air $CO_2$ concentration determined in accordance with Section 6.2.6.1.3.3

$\Delta C$ = maximum $CO_2$ concentration above ambient concentration. It shall be equal to $\Delta C_{6.1}$ listed in Table 6-1 if the design occupancy used to calculate the zone design ventilation rate per Section 6.2 is equal to the default occupant density listed in Table 6-1.

Where the design occupancy used to calculate the zone design ventilation rate per Section 6.2 differs from the default occupant density listed in Table 6-1, $\Delta C$ in Equation 6-12 shall be the adjusted value determined in accordance with Equation 6-13:

$$\Delta C_{adj} = \Delta C_{6.1} \frac{R_p + \frac{R_a}{PD_{6.1}}}{R_p + \frac{R_a}{PD_{des}}} \qquad (6\text{-}13)$$

where

$\Delta C_{adj}$ = adjusted $CO_2$ maximum above ambient $CO_2$ concentration, ppm, rounded to the nearest 100 ppm

$\Delta C_{6.1}$ = maximum $CO_2$ above ambient $CO_2$ concentration from Table 6-1, ppm

$R_p$ = people outdoor air rate from Table 6-1, cfm/p (L/s/p)

$R_a$ = area outdoor air rate from Table 6-1, cfm/ft$^2$ (L/s/m$^2$)

$PD_{6.1}$ = default occupant density, number of people per unit area from Table 6-1, #/1000 ft$^2$/1000 (#/100 m$^2$/100)

$PD_{des}$ = design occupant density, number of people per unit area, equal to $P_z/A_z$ where $P_z$ and $A_z$ are determined in accordance with Section 6.2.1.1

Where “NA” is listed in Table 6-1, $CO_2$ DCV shall not be used.

***Informative Note:*** Steady-state $CO_2$ concentrations are not only dependent on occupancy density, but also on activity level, gender, body mass, and age. The $CO_2$ values in Table 6-1 are based on assumptions of these values that are typical of the occupancy type. The activity level (met) has the greatest impact on the steady state $CO_2$ values. It is therefore possible that the differential $CO_2$ values in the space may exceed the concentrations listed in Table 6-1, even if the occupancy density and the ventilation rate meet the values listed in Table 6-1.

DCV controls shall maintain the zone ventilation rate at no less than the building component ($Ra \times Az$) when zone $CO_2$ concentration is at $C_{amb}$. Upon a rise in measured CO2 levels above $C_{amb}$, ventilation shall be increased proportional to the difference between zone $CO_2$ concentration and $C_{amb}$. When the zone $CO_2$ concentration is equal to $C_{max}$, the minimum zone ventilation rate shall be equal to its design ventilation rate determined in accordance with Section 6.2 at design occupancy.

**Exceptions to 6.2.6.1.3.2:**

1. Zone and system ventilation rates are not required to be larger than the design ventilation rate required by Section 6.2 at design occupancy regardless of $CO_2$ concentration.
2. Other DCV control logic shall be permitted to be used where it can be demonstrated to comply with Section 6.2.6.1.1 under all expected operating conditions.

***Informative Note:*** The $CO_2$ values in Table 6-1 are only for the purposes of implementing $CO_2$ DCV. They are not intended to be and should not be used as indicators of IAQ.

**6.2.6.1.3.3** Outdoor air $CO_2$ concentration, $C_{amb}$, shall be determined by one of the following:

a. $CO_2$ concentration shall be assumed to be 400 ppm without any direct measurement.
b. $CO_2$ concentration shall be dynamically measured using a $CO_2$ sensor located within 4 ft (1.2 m) of the outdoor air intake.

**6.2.6.1.3.4** $CO_2$ sensors shall be certified by the manufacturer to be accurate within ±75 ppm at concentrations of 600, 1000, and 2500 ppm when measured at sea level at 77°F (25°C). Sensors shall be factory calibrated and certified by the manufacturer to require calibration not more frequently than once every five years. Upon detection of sensor failure, the system shall provide a signal that resets the ventilation system to supply the required minimum quantity of outdoor air ($V_{bz}$) to the breathing zone for the design zone population ($P_z$).

**6.2.6.1.3.5** $CO_2$ sensors that sequentially sample air from multiple spaces shall sample each space no less than once every five minutes.

~~**6.2.6.1.4** For DCV zones in the occupied standby mode, breathing zone outdoor airflow shall be permitted to be reduced to zero for the occupancy categories indicated "OS" in Table 6-1, provided that airflow is restored to $V_{bz}$ whenever occupancy is detected.~~

**6.2.6.1.~~5~~4 Documentation.** A written description of the equipment, methods, control sequences, set points, and the intended operational functions shall be provided. A table shall be provided that shows the minimum and maximum outdoor intake airflow for each system.

**6.2.6.2** For ventilation zones in occupied standby mode, breathing zone outdoor airflow shall be permitted to be reduced to zero for the occupancy categories indicated "OS" in Table 6-1, provided that airflow is restored to $V_{bz}$ whenever occupancy is detected. Where ventilation zones comprise more than one room, ventilation reduction shall be permitted only when occupancy is not detected in all rooms served by the ventilation zone and shall be restored when occupancy is detected in any room served by the ventilation zone.

***Revise Table 6-1 as shown.***

**Table 6-1 Minimum Ventilation Rates in Breathing Zone**

| Occupancy Category | People Outdoor Air Rate $R_p$ | | Area Outdoor Air Rate $R_a$ | | Default Values Occupant Density | Air Class | OS (6.2.6.1.4) | Maximum $CO_2$ above Ambient, $\Delta C_{6.1}$ |
|---|---|---|---|---|---|---|---|---|
| | cfm/person | L/s·person | cfm/ft$^2$ | L/s·m$^2$ | #/1000 ft$^2$ or #/100 m$^2$ | | | |
| **Animal Facilities** | | | | | | | | |
| Animal exam room (veterinary office) | 10 | 5 | 0.12 | 0.6 | 20 | 2 | | NA |
| Animal imaging (MRI/CT/PET) | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Animal operating rooms | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Animal postoperative recovery room | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Animal preparation rooms | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Animal procedure room | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Animal surgery scrub | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Large-animal holding room | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Necropsy | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Small-animal-cage room (static cages) | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| Small-animal-cage room (ventilated cages) | 10 | 5 | 0.18 | 0.9 | 20 | 3 | | NA |
| **Correctional Facilities** | | | | | | | | |
| Booking/waiting | 7.5 | 3.8 | 0.06 | 0.3 | 50 | 2 | | 1200 |
| Cell | 5 | 2.5 | 0.12 | 0.6 | 25 | 2 | | NA |
| Dayroom | 5 | 2.5 | 0.06 | 0.3 | 30 | 1 | | 1500 |
| Guard stations | 5 | 2.5 | 0.06 | 0.3 | 15 | 1 | | 1200 |
| **Educational Facilities** | | | | | | | | |
| Art classroom | 10 | 5 | 0.18 | 0.9 | 20 | 2 | | NA |
| Classrooms (ages 5 to 8) | 10 | 5 | 0.12 | 0.6 | 25 | 1 | | 600 |
| Classrooms (age 9 plus) | 10 | 5 | 0.12 | 0.6 | 35 | 1 | | 600 |
| Computer lab | 10 | 5 | 0.12 | 0.6 | 25 | 1 | | 600 |
| Corridors (age 5 plus) | — | — | 0.12 | 0.6 | — | 1 | | NA |
| Daycare sickroom | 10 | 5 | 0.18 | 0.9 | 25 | 3 | | NA |
| Daycare (through age 4) | 10 | 5 | 0.18 | 0.9 | 25 | 2 | | NA |
| Lecture classroom | 7.5 | 3.8 | 0.06 | 0.3 | 65 | 1 | ✓ | 1200 |
| Lecture hall (fixed seats) | 7.5 | 3.8 | 0.06 | 0.3 | 150 | 1 | ✓ | 1200 |
| Libraries | 5 | 2.5 | 0.12 | 0.6 | 10 | | | 600 |
| Media center | 10 | 5 | 0.12 | 0.6 | 25 | 1 | | 600 |
| Multiuse assembly | 7.5 | 3.8 | 0.06 | 0.3 | 100 | 1 | ✓ | 1200 |
| Music/theater/dance | 10 | 5 | 0.06 | 0.3 | 35 | 1 | ✓ | 2100 |
| Science laboratories | 10 | 5 | 0.18 | 0.9 | 25 | 2 | | NA |
| University/college laboratories | 10 | 5 | 0.18 | 0.9 | 25 | 2 | | NA |
| Wood/metal shop | 10 | 5 | 0.18 | 0.9 | 20 | 2 | | NA |
| **Food and Beverage Service** | | | | | | | | |
| Bars, cocktail lounges | 7.5 | 3.8 | 0.18 | 0.9 | 100 | 2 | | 1200 |

**Table 6-1 Minimum Ventilation Rates in Breathing Zone *(Continued)***

| Occupancy Category | People Outdoor Air Rate $R_p$ | | Area Outdoor Air Rate $R_a$ | | Default Values Occupant Density | Air Class | OS (6.2.6.1.4) | Maximum $CO_2$ above Ambient, $\Delta C_{6.1}$ |
|---|---|---|---|---|---|---|---|---|
| | cfm/person | L/s·person | cfm/ft$^2$ | L/s·m$^2$ | #/1000 ft$^2$ or #/100 m$^2$ | | | |
| Cafeteria/fast-food dining | 7.5 | 3.8 | 0.18 | 0.9 | 100 | 2 | | 900 |
| Kitchen (cooking) | 7.5 | 3.8 | 0.12 | 0.6 | 20 | 2 | | NA |
| Restaurant dining rooms | 7.5 | 3.8 | 0.18 | 0.9 | 70 | 2 | | 1500 |
| **General** | | | | | | | | |
| Break rooms | 5 | 2.5 | 0.06 | 0.3 | 25 | 1 | ✓ | 1500 |
| Coffee stations | 5 | 2.5 | 0.06 | 0.3 | 20 | 1 | ✓ | 1200 |
| Conference/meeting | 5 | 2.5 | 0.06 | 0.3 | 50 | 1 | ✓ | 1500 |
| Corridors | — | — | 0.06 | 0.3 | — | 1 | ✓ | NA |
| Occupiable storage rooms for liquids or gels | 5 | 2.5 | 0.12 | 0.6 | 2 | 2 | | NA |
| **Hotels, Motels, Resorts, Dormitories** | | | | | | | | |
| Barracks sleeping areas | 5 | 2.5 | 0.06 | 0.3 | 20 | 1 | ✓ | 900 |
| Bedroom/living room | 5 | 2.5 | 0.06 | 0.3 | 10 | 1 | ✓ | 600 |
| Laundry rooms, central | 5 | 2.5 | 0.12 | 0.6 | 10 | 2 | | NA |
| Laundry rooms within dwelling units | 5 | 2.5 | 0.12 | 0.6 | 10 | 1 | | NA |
| Lobbies/prefunction | 7.5 | 3.8 | 0.06 | 0.3 | 30 | 1 | ✓ | 1500 |
| Multipurpose assembly | 5 | 2.5 | 0.06 | 0.3 | 120 | 1 | ✓ | 1800 |
| **Miscellaneous Spaces** | | | | | | | | |
| Banks or bank lobbies | 7.5 | 3.8 | 0.06 | 0.3 | 15 | 1 | ✓ | 900 |
| Bank vaults/safe deposit | 5 | 2.5 | 0.06 | 0.3 | 5 | 2 | ✓ | 600 |
| Computer (not printing) | 5 | 2.5 | 0.06 | 0.3 | 4 | 1 | ✓ | 600 |
| Freezer and refrigerated spaces (<50°F [10°C]) | 10 | 5 | 0 | 0 | 0 | 2 | | NA |
| Manufacturing where hazardous materials are not used | 10 | 5.0 | 0.18 | 0.9 | 7 | 2 | | 600 |
| Manufacturing where hazardous materials are used (excludes heavy industrial and chemical processes) | 10 | 5.0 | 0.18 | 0.9 | 7 | 3 | | NA |
| Pharmacy (prep. area) | 5 | 2.5 | 0.18 | 0.9 | 10 | 2 | | 900 |
| Photo studios | 5 | 2.5 | 0.12 | 0.6 | 10 | 1 | | NA |
| Shipping/receiving | 10 | 5 | 0.12 | 0.6 | 2 | 2 | | 700 |
| Sorting, packing, light assembly | 7.5 | 3.8 | 0.12 | 0.6 | 7 | 2 | | 900 |
| Telephone closets | — | — | 0.00 | 0.0 | — | 1 | | NA |
| Transportation waiting | 7.5 | 3.8 | 0.06 | 0.3 | 100 | 1 | ✓ | 1800 |
| Warehouses | 10 | 5 | 0.06 | 0.3 | — | 2 | | 700 |
| **Office Buildings** | | | | | | | | |
| Breakrooms | 5 | 2.5 | 0.12 | 0.6 | 50 | 1 | | 1500 |
| Main entry lobbies | 5 | 2.5 | 0.06 | 0.3 | 10 | 1 | ✓ | 1200 |

**Table 6-1 Minimum Ventilation Rates in Breathing Zone *(Continued)***

| Occupancy Category | People Outdoor Air Rate $R_p$ | | Area Outdoor Air Rate $R_a$ | | Default Values: Occupant Density | Air Class | OS (6.2.6.1.4) | Maximum $CO_2$ above Ambient, $\Delta C_{6.1}$ |
|---|---|---|---|---|---|---|---|---|
| | cfm/person | L/s·person | cfm/ft$^2$ | L/s·m$^2$ | #/1000 ft$^2$ or #/100 m$^2$ | | | |
| Occupiable storage rooms for dry materials | 5 | 2.5 | 0.06 | 0.3 | 2 | 1 | | 700 |
| Office space | 5 | 2.5 | 0.06 | 0.3 | 5 | 1 | ✓ | 600 |
| Reception areas | 5 | 2.5 | 0.06 | 0.3 | 30 | 1 | ✓ | 2100 |
| Telephone/data entry | 5 | 2.5 | 0.06 | 0.3 | 60 | 1 | ✓ | 1800 |
| **Public Assembly Spaces** | | | | | | | | |
| Auditorium seating area | 5 | 2.5 | 0.06 | 0.3 | 150 | 1 | ✓ | 1800 |
| Courtrooms | 5 | 2.5 | 0.06 | 0.3 | 70 | 1 | ✓ | 1500 |
| Legislative chambers | 5 | 2.5 | 0.06 | 0.3 | 50 | 1 | ✓ | 1800 |
| Libraries | 5 | 2.5 | 0.12 | 0.6 | 10 | 1 | | 600 |
| Lobbies | 5 | 2.5 | 0.06 | 0.3 | 150 | 1 | ✓ | 1800 |
| Museums (children's) | 7.5 | 3.8 | 0.12 | 0.6 | 40 | 1 | | 1800 |
| Museums/galleries | 7.5 | 3.8 | 0.06 | 0.3 | 40 | 1 | ✓ | 1500 |
| Places of religious worship | 5 | 2.5 | 0.06 | 0.3 | 120 | 1 | ✓ | 1800 |
| **Residential** | | | | | | | | |
| Common corridors | — | — | 0.06 | 0.3 | | 1 | ✓ | NA |
| **Retail** | | | | | | | | |
| Sales (except as below) | 7.5 | 3.8 | 0.12 | 0.6 | 15 | 2 | | 900 |
| Barbershop | 7.5 | 3.8 | 0.06 | 0.3 | 25 | 2 | ✓ | NA |
| Beauty and nail salons | 20 | 10 | 0.12 | 0.6 | 25 | 2 | | NA |
| Coin-operated laundries | 7.5 | 3.8 | 0.12 | 0.6 | 20 | 2 | | 900 |
| Mall common areas | 7.5 | 3.8 | 0.06 | 0.3 | 40 | 1 | ✓ | 2100 |
| Pet shops (animal areas) | 7.5 | 3.8 | 0.18 | 0.9 | 10 | 2 | | NA |
| Supermarket | 7.5 | 3.8 | 0.06 | 0.3 | 8 | 1 | ✓ | 1500 |
| **Sports and Entertainment** | | | | | | | | |
| Bowling alley (seating) | 10 | 5 | 0.12 | 0.6 | 40 | 1 | | 900 |
| Disco/dance floors | 20 | 10 | 0.06 | 0.3 | 100 | 2 | ✓ | 1500 |
| Gambling casinos | 7.5 | 3.8 | 0.18 | 0.9 | 120 | 1 | | 1200 |
| Game arcades | 7.5 | 3.8 | 0.18 | 0.9 | 20 | 1 | | 900 |
| Gym, sports arena (play area) | 20 | 10 | 0.18 | 0.9 | 7 | 2 | | 900 |
| Health club/aerobics room | 20 | 10 | 0.06 | 0.3 | 40 | 2 | | 1500 |
| Health club/weight rooms | 20 | 10 | 0.06 | 0.3 | 10 | 2 | | 1500 |
| Spectator areas | 7.5 | 3.8 | 0.06 | 0.3 | 150 | 1 | ✓ | 1500 |
| Stages, studios | 10 | 5 | 0.06 | 0.3 | 70 | 1 | ✓ | 1500 |
| Swimming (pool and deck) | — | — | 0.48 | 2.4 | — | 2 | | NA |

# 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 · 180 Technology Parkway · Peachtree Corners, GA 30092 · www.ashrae.org**

**About ASHRAE**

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

**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.**

10/23