# The 'New' Ventilation Rates In Standard 62.1-2004

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In our relatively slow-moving industry, "new" probably means anything introduced within the last three years or so. With that in mind, the minimum ventilation rates prescribed by ANSI/ASHRAE Standard 62.1-2004 (published less than two years ago) qualify as new for most designers and code authorities. These rates had last changed with the publication of Standard 62-1989, when they increased significantly from those published in Standard 62-1981.

Compared with the 1989 version (*Table 1*), and most building codes,* the new 2004 rates increase outdoor airflow for a few building space types or occupancy categories (e.g., mall common areas, pharmacy prep areas and art classrooms), keep it about the same for some (e.g., supermarkets, primary classrooms, computer labs and media centers), and decrease it significantly for many others, especially those with high occupant density (e.g., multiuse assembly, dining rooms and bars, auditorium seating, lobbies and lecture classrooms).

I recently was asked a reasonable question by a code authority about the new rates prescribed for high occupant-density spaces. The question was simply, "Is there any actual test data indicating that these lower ventilation rates provide acceptable indoor air quality?"

In many jurisdictions, the rates adopted as part of state or local building regulations still reflect the rather high 1989 rates, so any variance to allow the new lower rates must be approached cautiously.

The quick answer is "no." However, that doesn't mean that Standing Standards Project Committee (SSPC) 62.1, the committee responsible for revising the standard, arrived at the new rates in an irrational or unjustified manner. On the contrary, even without specific studies to "prove" the acceptability of air quality resulting from ventilation at the newly prescribed rates, the committee approved these rates with a high degree of confidence.

Coupled with the existing body of research relating ventilation to comfort, health and well-being outcomes, these lower rates are the natural outcome of separating ventilation for people-related sources from ventilation for building-related sources—the concept of additivity of sources that forms the basis for the Ventilation Rate Procedure of Standard 62.1-2004.

## Adding Ventilation Rates

Former chair of SSPC 62.1 Andy Persily, Ph.D., Fellow ASHRAE, explained the justification for the additivity approach used.[1] Several studies[2–4] have demonstrated this concept as it relates to perceived indoor air quality. In summary, if two or more contaminants act on the same organ system (e.g., the odor sensory system), the source strengths, and, therefore, the ventilation required for each source, can be added for the purpose of determining the combined effect on that organ system.

Consider odor from two sources acting upon the odor sensory system. Assuming that all odors originate in the space, the odor concentration from one source at steady state is simply $C1 = S1/V1$, where $S1$ represents source strength and $V1$ represents outdoor airflow.

Historically, Standard 62 has assumed that perceived air quality should satisfy a certain percentage of occupants, so if an odor concentration of $C80$ satisfies 80% of the population in a space, it takes a ventilation rate of $V1 = S1/C80$ to dilute one contaminant, and $V2 = S2/C80$

* The term "building code" in this context includes building codes, mechanical codes, plumbing codes, fire codes and so on. Ventilation rates are typically addressed in the building code for natural ventilation and in the mechanical code for mechanical ventilation.

to dilute the other contaminant. Since source strengths impacting the same organ system can be added, the total source strength is $S = S1 + S2$, and the ventilation needed to satisfy 80% of occupants is $V = S/C80 = (S1 + S2)/C80$ or $V = V1 + V2$.

The new rates in Standard 62.1-2004 were developed while assuming that sensory system contaminants originate from two primary indoor sources: the occupants (and their activities) and the building (including building materials, floor/wall/ceiling coverings and furnishings). Based on the logic of additivity, total ventilation in an occupied zone simply is the sum of people-related ventilation and building-related ventilation.

## People-Related Ventilation Rates

The strength of sources associated with occupants is approximately proportional to the number of people present and is related to their activity level and type of activity.[5] Laboratory and field studies[6–10] have consistently shown that an outdoor airflow rate of 15 cfm/person satisfies at least 80% of unadapted occupants (those who have been in the space for 15 seconds or less) and that 5 cfm/person satisfies at least 80% of adapted occupants (those who have been in the space for at least six minutes).

Based on these studies, and considering the standard's prescribed minimum rates, the committee was comfortable using 5 cfm/person for high-density spaces with sedentary occupants (such as conference rooms). For spaces with higher activity levels (multiuse assembly, casinos, bars and so on), the rate was increased to 7.5 cfm/person. And, for spaces with high activity-related sources (e.g., art classrooms, beauty and nail salons) or very high activity levels (e.g., disco/dance floors), the committee used people-related rates between 10 and 20 cfm/person.

## Building-Related Ventilation Rates

Since people-related sources dominate high occupant-density spaces, a detailed explanation is not needed here. Suffice to say that the strength of sources associated with the building is approximately proportional to building floor area. It's not surprising, given the variations among buildings, that laboratory and field studies[11–14] related to building-related ventilation requirements vary. However, to satisfy 80% of adapted occupants in office buildings, outdoor airflow of 0.052 cfm/ft was identified as applicable to "low-polluting" buildings, so

| Occupancy Category | Required Ventilation, cfm/1,000 ft² | | % Change[1] |
|---|---|---|---|
| | 62-1989 through 2001 | 62.1-2004 | (2004–1989)/1989 |
| **Correctional Facilities** | | | |
| Cell | 500 | 245 | –51% |
| Day Room | — | 210 | No Comparison |
| Guard Stations | 225 | 135 | –40% |
| Booking/Waiting | — | 435 | No Comparison |
| **Educational Facilities** | | | |
| Daycare (Through Age 4) | — | 430 | No Comparison |
| Classrooms (Ages 5–8) | 375 | 370 | –1% |
| Classrooms (Ages 9 and Up) | 525 | 470 | –10% |
| Lecture Classroom | 975 | 548 | –44% |
| Lecture Hall (Fixed Seats) | 2,250 | 1,185 | –47% |
| Art Classroom | 300 | 380 | 27% |
| Science Laboratories | 500 | 430 | –14% |
| Wood/Metal Shop | 400 | 380 | –5% |
| Computer Lab | 375 | 370 | –1% |
| Media Center | 375 | 370 | –1% |
| Music/Theater/Dance | 525 | 410 | –22% |
| Multiuse Assembly | 1,500 | 810 | –46% |
| **Food And Beverage Service** | | | |
| Restaurant Dining Rooms | 1,400 | 705 | –50% |
| Cafeteria/Fast Food Dining | 2,000 | 930 | –54% |
| Bars, Cocktail Lounges | 3,000 | 930 | –69% |
| **General** | | | |
| Conference/Meeting | 1,000 | 310 | –69% |
| Corridors | 50 | 60 | 20% |
| Storage Rooms | 150 | 120 | –20% |
| **Hotels, Motels, Resorts, Dormitories** | | | |
| Bedroom/Living Room | 30[2] | 22 | –27% |
| Barracks Sleeping Areas | 300 | 160 | –47% |
| Lobbies/Prefunction | 450 | 285 | –37% |
| Multipurpose Assembly | 1,800 | 660 | –63% |
| **Office Buildings** | | | |
| Office Space | 100 | 85 | –15% |
| Reception Areas | 450 | 210 | –53% |
| Telephone/Data Entry | 1,200 | 360 | –70% |
| Main Entry Lobbies | 150 | 110 | –27% |

1. Standard 62.1-2004 vs. 62-1989 (through 62-2001), using the default occupant densities in the 2004 version. 2. Assumed 200 ft² and two people (rather than 1,000 ft² and 10 people).

*Table 1: Standard 62.1-2004 vs. Standard 62-1989 through 62-2001.*

## How Governments Adopt Codes

Federal, state and local agencies that implement building regulations typically adopt a model code or standard as a basis for those regulations.

In the case of ventilation-related regulations, the ICC International Mechanical Code, the IAPMO Uniform Mechanical Code or ASHRAE Standard 62.1—either directly or through application in the model codes—typically forms the basis for the adopted criteria.

Federal agencies adopt and implement building regulations to address their own buildings, as do state and local agencies. Some states adopt a statewide mandatory code and apply it throughout the state. Other states authorize local governments to adopt building regulations.

More information on code adoption can be found at www.iccsafe.org or www.iapmo.org.

the committee was comfortable using 0.06 cfm/ft$^2$ as the lowest building-related ventilation rate. As above, higher rates (ranging from 0.12 to 0.48 cfm/ft$^2$) were used for occupancy categories with higher anticipated building-related odor sources (such as classrooms, storage rooms, retail sales, casinos and swimming pools).

### Codes Adopting Standard 62.1-2004 Rates

After thinking about the question posed by this local code authority, I wondered how many jurisdictions in this country have already adopted the new rates. This is not an easy question to answer.

The 2006 Uniform Mechanical Code, published in Jan. 2006, uses the Standard 62.1-2004 rates and calculation procedures, according to Carl Marbery, the International Association of Plumbing and Mechanical Officals member on SSPC 62.1.

And, ASHRAE submitted code-change proposals to the International Code Council, which would change the International Mechanical Code® to include the new rates. (These proposals will be considered in late September.)

A quick internet search shows that building codes for the states of Iowa, Virginia, Washington and Minnesota and the City of Tucson (to name a few), already incorporate the new rates.

I'm sure that more jurisdictions have also adopted the new rates in some manner, but this information is not easy to find due to the number of local jurisdictions involved.

### Summary

The new rates are based on both laboratory and field studies and the good judgment of SSPC 62.1 and designers and other users of the standard, via public review. Combined with the concept of additivity of sources, these new rates result in significantly less outdoor airflow for some high occupant-density spaces, as expected.

Will the new rates produce indoor air quality that 80% of adapted occupants find acceptable? Time will tell. New studies and more experience are needed to be sure. However, based on previous studies and actual experience in buildings, it seems likely that these new minimum rates are "right" for all occupancy categories, including high-occupant density spaces.

### References


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## Standard 62.1-2004 Addenda Status

ANSI/ASHRAE Standard 62.1 is on continuous maintenance. This list recaps the status of addenda in process.

**62.1*e*—** (Formerly DA-2) Adds documentation requirements, incorporating existing requirements with new requirements to provide single point reference for users. Publication approved and expected in 2007.

**62.1*f*—** (Formerly DA-8) Revises title, purpose and scope, removing information covered by Standard 62.2 and updating to reflect TPS changes previously approved by the BOD Publication approved and expected in 2007.

**62.1*h*—** (Formerly DA-9) Attempts to reconcile differences in ventilation for residential occupancies between Table E-2 and Standard 62.2. Expected to be approved for Publication by BOD in January 2007.

**62.1*i*—** (Introduced as DA-12) Removes requirement for increased ventilation in smoking areas (Section 6.2.9). Expected to be available for Public Review in Fall 2006.

**DA-4—** General cleanup of Standard 62.1-2004, adding clarity and removing errors and inconsistencies, with no significant new requirements. Expected to be approved for Publication Public Review in January 2007.

**DA-10—** Minor changes to correct errors in Appendix C, D and F. Expected to be approved for Publication Public Review in January 2007.

**DA-11—** Expected to "clean up" Section 6 with minor changes to correct errors and improve clarity and consistency. Expected to be approved for Publication Public Review in January 2007.