Draft ASHRAE Standard 62-1981R

VENTILATION STANDARD DRAFT OUT FOR REVIEW

Five major revisions for acceptable indoor air quality are made and 15 cfm minimum per person is recommended

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THE DRAFT ASHRAE Standard 62-1981R, *Ventilation for Acceptable Indoor Air Quality*, is now undergoing public review. The purpose of the standard is to specify minimum ventilation rates and indoor air quality which will be acceptable to human occupants and are intented to avoid adverse health effects.

Five major revisions over the published 1981 standard are being proposed in this draft. It is instructive to consider the changes that have been made and the rationale for these changes.

To obtain a copy for review

Copies of Draft ASHRAE Standard 62-1981R may be purchased from Publication Sales at the Society for $15. Send a check with the order to: Publication Sales, ASHRAE, Inc., 1791 Tullie Circle NE, Atlanta GA 30329. Credit card orders are accepted by telephone. Call 404/636-8400 and ask for the Publication Sales Department. December 15, 1986 is the deadline for comments on the Draft Standard. Comments should be sent to: Manager of Standards, ASHRAE, 1791 Tullie Circle NE, Atlanta GA 30329. Instruction for commenting on proposed standards and a form for that purpose are included within each copy of the Draft Standard.

Minimum rate raised

The minimum ventilation rate has been raised from 5 cfm (cubic feet per minute) of outdoor air per person to 15 cfm per person. The distinction between *smoking permitted* and *smoking prohibited* has been abandoned. Most of the information on recommended contaminant limits has been moved to the appendix. Provision has been made for some averaging of ventilation flow rates when more than one room or zone is supplied from a common source when the individual space requirements differ. Also, the information on the use of filters has been expanded.

ANSI/ASHRAE Standard 62-73, even though superseded, is still the basis for most building codes. It allowed a minimum of 5 cfm of outdoor air per person for some applications. The recommended rates were in the range of 10 to 40 cfm per person for various applications.

When the building energy conservation standard, ANSI/ASHRAE/IES 90-75, was published in 1975, it recommended use of the minimum ventilating rates. Thus, one objective of the updating of Standard 62-73 that resulted in Standard 62-1981 was to justify lower possible ventilating rates in order to conserve energy. It was recognized that this would create a problem in rooms where smoking is permitted.

The result was separate outdoor air flow rates for smoking and non-smoking applications. It was recognized, also, that the technology was likely to advance rapidly and that designers should be allowed to use the new technology. The air quality procedure was then added to the 1981 standard as an alternate to the prescriptive ventilating rate procedure to permit innovative solutions to the problems.

This was a performance procedure that placed the responsibility for achieving an acceptable indoor environment on the designer if he chose not to use the ventilating rate procedure.

The provisions for smoking and non-smoking areas and the alternative air quality design procedure proved to be controversial. So, a review of the 1981 standard was begun in 1983 with the objective of rectifying these problems by

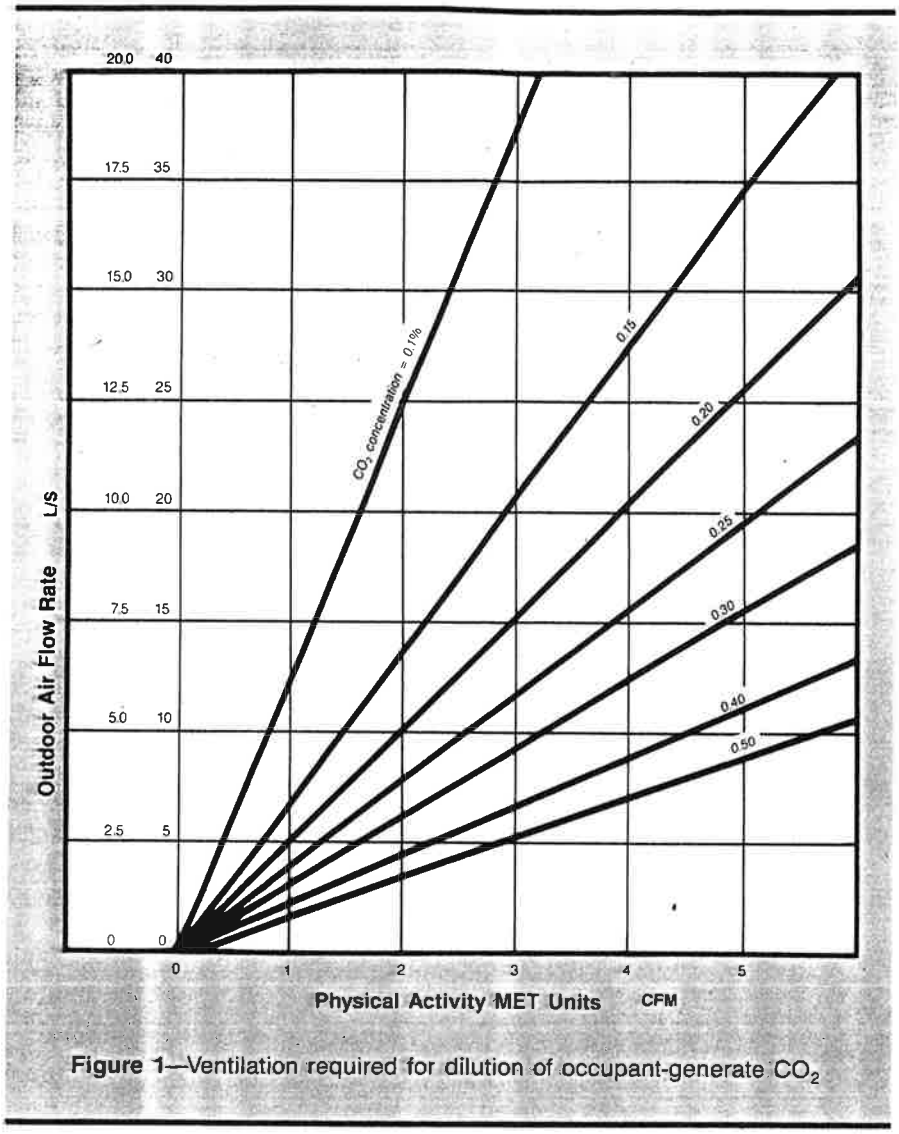

Figure 1—Ventilation required for dilution of occupant-generate CO_2

utilizing the resulting new research that was then underway.

Carbon dioxide levels

A primary need for outdoor air in the indoor environment is to dilute the occupant-generated carbon dioxide. This is found to be more critical than replacement of the oxygen consumed.

The CO_2 generation rate depends on the occupant metabolic rate and to a small extent on diet. *Figure 1* shows the required outdoor air flow rate for various activity levels and room CO_2 concentrations. The usual activity level is about 1.2 MET (metabolic units). The 1981 standard permitted a CO_2 level of 0.25 percent. The level in the outdoor air is about 0.03 percent. This was satisfied with 5 cfm per person of outdoor air in the draft standard.

Research at the John B. Pierce Laboratory by W.S. Cain, et al, and at the Technical University of Denmark by B. Berg-Munch, et al, has shown that about 15 cfm (7.5 L/S) of outdoor air per person is needed to dilute occupant odors to a level acceptable to 80 percent of the visitors first entering the space. The 80 percent acceptance figure is consistent with the 80 percent acceptance level used by the ANSI/ASHRAE 55-1981 *Thermal Occupancy Environmental Conditions for Human Occupancy.*

Figure 1 shows that 15 cfm of outdoor air brings the room CO_2 down to 0.10 percent. This concentration of CO_2 is consistent with the current recommendations of the World Health Organization (WHO), most European countries and Japan.

A ventilating rate of 15 cfm of outdoor air has been found to control tobacco smoke odor in those applications where smoking is at a minimum. Leaderer and Cain[1] found that it takes about 1,800 cu. ft. of air to dilute the smoke from one cigarette to an odor level acceptable to about 70 percent of the population on first entering the space.

At today's reduced smoking rate (less than 30 percent of the population smoking at something less than two cigarettes an hour) 15 cfm of air is sufficient.

W.W. Thayer[2], using data from 10 different authors, found that one-third of the occupants smoking at a rate of 2.2 cigarettes per hour would produce a tobacco burning rate of 0.4 mg/s per smoker. He developed a dilution index that shows 15 cfm of outdoor air per person will satisfy more than 80 percent of the adapted occupants in the space.

The data of Cain, et al, apply to visitors whereas that of Thayer apply to occupants who have been in the space more than 15 minutes.

Expected incidence

Based on these factors, the proposed revisions in the standard consider the expected incidence of smoking and recommend ventilating rates that are expected to satisfy at least 80 percent of the occupants.

The recommended rate proposed for office spaces is 20 cfm. For bars and cocktail lounges, where the incidence of smoking is greater, 35 cfm per person is recommended. Outdoor air requirements for a number of applications have been reduced from the smoking allowed rates published in Standard 62-1981.

Several rooms or zones are often supplied from one air handling unit. If the occupant loads and heating or cooling requirements are different for different rooms, excess outdoor air is used if the fraction of outdoor air in the total supply is based on the needs of the critical zone. An approach has been borrowed from the Australian mechanical ventilation standard to avoid wasteful excess ventilation.

This approach states:

$$\text{Corrected \% OA in supply} = \frac{\text{Sum of OA for all rooms/Total Supply}}{1 + \frac{\text{Sum OA for all rooms}}{\text{Total Supply}}} - \frac{\text{OA for critical zone}}{\text{Supply for Critical Zone}}$$

This, in effect, provides credit for return air from zones, other than the critical zone, that are over-ventilated.

Filter applications

The explanation of the use of filters has been expanded to include the consideration of both constant flow and variable air volume systems, the effects of constant or variable supply air temperature, and the effect of a constant or proportional outdoor air supply. Equations are presented in the appendix for calculating the outdoor air required when using a filter, or the space contaminant concentration when the outdoor air flow rate and contaminant generation rates are specified.

Alternate retained

The alternate air quality procedure has been retained in the draft standard

and this permits the designer to use whatever outdoor air flow rate is desired if it can be shown that the contamination concentration levels will be kept within acceptable limits. Some data for contaminant limits have been included in the appendix to the draft. Certain contaminant limits have been adjusted based on new data.

The recommended limit for radon has been raised from 0.01 working level to 0.027 WL based on the current recommendation of WHO for new houses. Current data show that most homes in the U.S. exceed the 0.01 WL at least some of the time. The 0.027 WL number is more defensible.

The level of 0.1 ppm for formaldehyde has been proposed for removal because the document on which the limit was based has been withdrawn. The draft discusses the variability of human response to formaldehyde and suggests a limit of 0.4 ppm. Since urea formaldehyde foam insulation usage has diminished and wood products manufactured have reduced emission rates, the formaldehyde issue has decreased in importance.

These are the principal changes being offered in the revision to the standard. For more detailed information, copies of the draft standard may be purchased from ASHRAE. ■

1. Leaderer, B.P. and W.S. Cain, "Air Quality in Buildings During Smoking and Non-Smoking Occupancy," ASHRAE Trans. V89, Pt 2A&B, 1983.

2. W.W. Thayer, "Tobacco Smoke Dilution Recommendations for Comfortable Ventilation", ASHRAE Trans. V88, Pt 2, 1982.

About the authors

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