

is required to gain the necessary understanding. Problems can arise if bake-outs are improperly conducted. This reminds us a little of the rush during the 1970s to seal buildings in order to conserve energy. Now it is proposed that we use a whole lot of energy all at once to reduce the effects of minimal ventilation afterwards.

Furthermore, there may be a more effective and less costly solution: avoid installing strong indoor air pollution sources in a building rather than try to get rid of them by a building bake-out. On the other hand, for certain contaminants and material types, and under certain circumstances, the bake-out may be an effective remedy to reduce some of the excessive air pollution often found in newly constructed buildings.

Buildings vary greatly in their material composition and ventilation characteristics. Bake-outs must be designed to deal with the products or contaminants of concern for each individual building. More needs to be learned about how to conduct bake-outs effectively and economically. It is a sign of the times that the California Legislature considers authorizing regulations requiring building bake-outs rather than funding the necessary research to develop an adequate understanding of the bake-out process. ♦

ASHRAE Standard 62-1989 Implementation

Now that ASHRAE has adopted and published Standard 62-1989, "Ventilation for Acceptable Indoor Air Quality," several important questions are surfacing.

The standard is very important to indoor air quality; it merits considerable discussion. There are many

real barriers to its full implementation, and the present incentives and other motivating forces are inadequate to overcome profit motives and governmental parsimony regarding the buildings provided government office workers.

We don't believe that those who would like to implement the standard have adequate guidance available to them for some of the more important provisions. Surely, outside air supply quantities are important, and meeting the standard's minimum outside air requirements does not appear too difficult, at least in design (if there is no concern for the quality of the outdoor air). However, the standard clearly states that meeting the air quality requirements is essential to using the ventilation rate procedure.

More Than Outside Air Quantity

The truly important aspects of the standard go far beyond supplying the design outside air quantity minimum requirements of section 6.1 to the "occupied zone" of each space in the building. There are several requirements of the standard that must not be neglected.

They include the following:

- Quality of the air supplied from outside must meet National Ambient Air Quality Standards (NAAQS).
- Documentation of the design assumptions is required.

Section 5.2: "The design documentation shall state the assumptions that were made in the design with respect to ventilation rates and air distribution."

Section 6.1: "Design documentation shall clearly state which assumptions were used in the design so that the limits of the system in removing contaminants can be evaluated by

others before the system is operated in a different mode or before new sources are introduced into the space."

- Stationary or unusual sources must be addressed.

Section 5.7: "Contaminants from stationary local sources within the space shall be controlled by collection and removal as close to the sources as practicable."

- Control of gaseous contaminants by methods based on sorption or other "scientifically proven technology" is required where other elements of the standard are not sufficient to achieve adequate control.

Section 5.4: "When the supply of air is reduced during times the space is occupied (e.g., in variable-air-volume systems), provision shall be made to maintain acceptable indoor air quality throughout the occupied zone."

- HVAC systems and components must be accessible for maintenance and cleaning (Sec. 5.12).
- Delivery of the specified quantities of outside air must be to the breathing zone of the building occupants (Sec. 6.1.3.3).

Is It Being Followed?

So far architects and engineers have not rushed to implement the standard despite possible professional liability implications. A possible exception is the implementation of the provisions related to minimum outside air ventilation rates. This, in our opinion, is because the standard hasn't been adopted into the model codes and state and local building regulations. This lack of implementation reflects an oversimplified and inadequate understanding of

indoor air quality and the processes that determine it.

Eventually, all or parts of Standard 62 will be adopted into codes and regulations. However, the code development and adoption process takes years, and critics, already finding fault with the standard as written, are calling for its revision and possible expansion of scope. Various ASHRAE committee members have discussed integrating Standard 62-1989 with Standard 55. (Standard 55-1981R, "Thermal Environmental Conditions for Human Occupancy," the draft revision, is in the semifinal stages of adoption at ASHRAE.) Others think it should address contaminant sources more explicitly. Still others believe it should tackle the health effects and guidance for acceptable contaminant levels.

Is Ventilation Enough?

We recognize that the standard requires attention to "unusual contaminant sources." But, we still question whether the ventilation concept, even with requirements for considering ventilation efficiency, tackles the problem of indoor air quality directly enough.

The standard is basically a ventilation approach to maintaining indoor air quality; however, it is not adequate simply to provide for the supply of outside air. It is essential to consider the ability of ventilation to remove specific or theoretical contaminants from the air: its "air cleaning" or "pollutant removal effectiveness" capability. To the extent that the ventilation standard simply addresses air supply it is an indirect approach to controlling indoor air quality.

Area Versus Occupant Zone Ventilation

We believe that there are provisions in Standard 62-1989 that encourage considering overall or average *area* or *zone* ventilation rather than delivery to the *individual occupant's breathing zone*. We have argued with engineers about the correct interpretation of the standard on this point.

As long as ambiguity exists, those lacking a strong commitment to providing good indoor air quality will always look for the interpretation that imposes the minimal technical and economic requirements on the design and the building.

An article in the January 1990 *ASHRAE Journal* (see reference at the end of this article) quotes Andy Persily and Dick Grot from a 1985 publication:

"The minimum ventilation rates were compared to minimum outdoor air intake levels suggested by ASHRAE, and we found that most of the buildings were operated very close to or below the [1985] ASHRAE recommendation. Two of the buildings were operated well below this recommended ventilation rate. Local variations in air distribution and problems of ventilation efficiency can lead to effective ventilation rates in specific areas of the building that are significantly lower than the average rates for the building."

The foreword to Standard 62-1989 states: "It must be recognized...that the conditions specified in this Standard must be achieved during the operation of buildings as well as in the design of buildings if acceptable indoor air quality is to be achieved." This statement lends force to the need for verifying building ventilation performance upon completion of the structure;

however, the punch is pulled by the statement preceding the foreword: "This foreword is not part of this Standard but is included for information purposes only."

It may be argued that the standard is for design only, and, therefore, measuring building performance should not be mandated. However, it can be argued equally convincingly that a designer's responsibility is not fulfilled until the design has been demonstrated to be effective in accomplishing its intended purpose. Also, most designers remain responsible for execution of the construction contract until such performance is evaluated. Unfortunately, without implementation of the documentation requirements and an effective commissioning procedure, ventilation system performance will not be evaluated. The normal activities of air balance contractors are not adequate to assess system performance, only the performance of system components.

Some Pending Questions on Standard 62-1989

1. Will it make any difference?
2. Will it be adopted into codes or regulations?
3. Does it ensure good indoor air quality?
4. What is involved in implementing it?
5. What is next?

Reference

David W. Solberg, David S. Dougan, and Leonard A. Damiano, "Measurement for the control of fresh air intake." *ASHRAE Journal*, Volume 32, No. 1, January 1990. ♦