Annual Convention

PNWIS '96

ENVIRONMENTAL MANAGEMENT

DECEMBER 11, 12 & 13, 1996

SEATTLE, WASHINGTON

PROCEEDINGS

IMPLICATIONS OF THE PROPOSED REVISED ASHRAE INDOOR AIR QUALITY STANDARD

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ABSTRACT

Ventilation problems have been demonstrated to be the major cause of poor indoor air quality. The ventilation industry has historically been governed by self-imposed regulations. The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) is the organization responsible for setting industry standards. The first ASHRAE ventilation standard was published in 1973 and has been revised twice. The latest standard, published in 1989, responded to a growing concern about indoor air quality problems. ASHRAE has proposed revisions to the 1989 Standard. The revisions are concluding a three month public review process announced in August of 1996. The revisions are significant and will have a dramatic impact on the building industry through building code requirements and on the State and Federal regulatory environment with respect to indoor air quality. This paper will review the underlying principles and application mechanics of the proposed standard in comparison with the existing standard.

INTRODUCTION

The American Society of Heating, Refrigeration and Air-Conditioning Engineers, have released a proposed revision to the current ASHRAE Standard 62-1989 Ventilation for Acceptable Indoor Air Quality (referred here as 62-1989). The scope of this proposed standard (referred here as 62R) differs significantly from the existing one, and encompasses the design, construction, maintenance and renovation of a ventilated space.

There are many substantial differences between the existing Standard 62-1989 and the proposed revisions 62R:

- One fundamental change is in the scope and the intention of the standard. 62-1989 is a design standard, whereas 62R is both a design standard and an operating standard.
- 62R purports to address health issues, whereas 62-1989 addresses perceived air quality.
- The Prescriptive method of 62R considers both the people and building component.
- The existing standard, 62-1989, does not directly consider the latter.

- The existing standard, 62-1989, bases the ventilation rates on the perceived air quality as seen by the visitor or unadapted person. The proposed standard, 62R on the other hand, addresses the perceived air quality of the occupant.

- While 62-1989 establishes indoor air quality through dilution ventilation. 62R emphasizes source control as the preferred method.

- 62-1989 assumes some tobacco smoke in the air. The proposed standard, 62R does not allow for this. If smoking is suspected, the designer will have to refer to an informative appendix.

- The current standard, 62-1989, requires outside air to be filtered if it does not meet the requirements set by the U.S. Environmental Protection Agency National Ambient Air Quality Standards. In 62R the engineer is required to test the ambient air, but does not seem to be required to clean it, if it is found to be unacceptable.

- With some exceptions, the outside air requirements for typical spaces have been reduced. This is in part, due to lower assumed occupancy densities.

In addition to the aforementioned changes, the definitions of acceptable indoor air quality are different. In 62-1989, acceptable indoor air quality is defined as "*air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people exposed do not express dissatisfaction*". In 62R it is defined as "*air in an occupied space toward which a substantial majority of occupants express no dissatisfaction and in which there are not likely to be known contaminants at concentrations leading to exposures that pose a significant health risk*". Without further explanation, it would be up to the engineer to assume what is it meant by a 'substantial majority', and a 'significant health risk'. It is unclear as to whether we are to be designing for the extremely hypersensitive individual. Equally, in 62R, an 'unusual source' is defined as "*sources that release contaminants at rates that are higher than those typically found in spaces of the same occupancy category*". It is again, left up to the engineer to decide what is a contaminant and what is a high rate. Furthermore, this definition would imply that a substance like formaldehyde would not be a contaminant when found in a lab area or in a morgue.

DISCUSSION OF THE APPLICATION OF THE PROPOSED STANDARD

The proposed standard provides three procedures for determining compliance: simple systems procedure, prescriptive procedure and analytical procedure. The simple systems and prescriptive procedures are to be used only where there are no "unusual sources of odors, sensory irritants, or harmful contaminants present or, if present, such

sources are eliminated or controlled. Also, whereas the simple systems procedure may be applied only to either single zone systems or. once-through systems, the prescriptive procedure may be applied to any ventilation system type. The analytical procedure and may also be used for any ventilation system type. It is intended to be applied to spaces where strong sources cannot be eliminated or controlled, air cleaning occurs, especially low concentrations of contaminants are required or other levels of acceptance apply.

The mechanics of performing the simple systems and prescriptive procedures are relatively straight forward as they follow tables of minimum ventilation requirements. However it is unclear how these tabulated values were derived. The simple systems procedure is wholly dependent on the area of the building, and varies depending on the building type. The prescriptive procedure is similar in that it varies according to the building type, but it also involves a 'people' component and a 'building' component. Effectiveness of the ventilation system is taken into account as well.

As mentioned above, the mechanics of performing the simple systems and prescriptive procedures are relatively straight forward, but there is uncertainty regarding the selection of a procedure The uncertainty lies within the definition of "unusual sources" and the level of confidence with which an engineer can determine the rate that contaminants are released from sources. It should be recognized that despite a source being typical for a space (e.g. furniture), its rate of release of contaminants may vary greatly depending on its age and material(s). Also, it is often difficult for an engineer to determine the construction materials at the early design stage.

The analytical procedure involves identifying the various contaminants of concern and determining the emission rate of each source in each space. For guidance, the proposed standard refers to Appendix C which includes tabulated 'levels of interest' for various contaminants. Appendix C is worded very cautiously and does not offer clear suggestions regarding which contaminants are of concern and their acceptable concentration levels. And, although a number of international guidelines and standards are listed, the proposed standard acknowledges that "*meeting one, some, or all of the listed values does not assure that acceptable indoor air quality will be achieved*".

In addition, even if a comprehensive list is available, the engineer is still faced with obtaining the emission rates of each contaminant for all sources present. Emission rates of contaminants for construction materials and furniture are not readily available, and may only be available through testing. At present, the proposed standard is unclear as to whether there are any existing standardized testing procedures.

Another concern is the sources that are brought in by the building users. In some situations, the engineer will be provided with furniture and equipment lists by the users that will assist him or, her In determining possible unusual sources. In other cases, such as 'shelled' buildings where the spaces tenants and uses are unknown, it is impossible for the engineer to predict the existence of unusual sources. Regardless, it would be difficult for

the engineer to accurately ascertain the various everyday items brought in by the users such as felt-tipped markers, cleaning solutions (or residues of), etc,. which may give off contaminants.

SUMMARY

The definitions and guidelines in the proposed standard are ambiguous, Though the mechanics are workable, the underlying principles are questionable. The engineer is provided with very minimal guidance and, therefore, it is doubtful that the designer could apply the standard with an acceptable level of certainty. Fundamental decisions, such as what is a contaminant and what is an acceptable level, are left up to the engineer. Realistically, these are not decisions that a mechanical engineer is qualified to make. Furthermore, the designer is responsible for foreseeing all the contaminants which will enter the space at any point in time. This could only be achieved by placing restrictions on the spaces and holding the tenants and owners responsible for complying. Such restrictions would need to include: amount and type of cleaners, carpets, furniture, felt pens etc. This would appear to be a difficult task.

To fully appreciate this standard, we must also consider the implications that it will have, not only on the design industry, but on the end-users of the system. Designing to the analytical procedure of this standard would considerably increase the amount of time and funds required. The Industry may also see a dramatic rise on the operating and maintenance costs of a facility.