The Division of Standard 62: What a Difference a Decade Makes

By

Andrew Persily

Building and Fire Research Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899 USA

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THE REVISION OF STANDARD 62: WHAT A DIFFERENCE A DECADE MAKES

A Persily*

National Institute of Standards and Technology, Gaithersburg, MD, USA

ABSTRACT
The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has been revising Standard 62, Ventilation for Acceptable Indoor Air Quality since 1991. The two primary motivations for this revision have been 1) to convert the document into minimum requirements in mandatory and enforceable language for adoption into building codes and 2) to incorporate the increased knowledge from research and practical experience since the bulk of the standard was last approved in 1989. A number of changes have been approved since the revision process began ten years ago, but many difficult issues remain. This paper provides a summary of the progress that has been made to date and the issues that remain to be resolved before a complete code-language version of the standard can be issued.

INDEX TERMS
Indoor air quality, Standards, Ventilation

INTRODUCTION
ASHRAE approved the first version of Standard 62, titled Standards for Mechanical and Natural Ventilation, in 1973 (ASHRAE, 1977). It was republished as Ventilation for Acceptable Indoor Air Quality in 1981(ASHRAE, 1981), with another revision in 1989 (ASHRAE, 1989). The approval of Standard 62-1989 was not without controversy, and it was felt that its revision should begin right away in anticipation of the time that might be required. A committee was formed in 1991 to develop the revised standard and met for the first time in January of 1992. It has been ten years since that first meeting; this paper summarizes what has been accomplished to date and what remains to be done.

At the time of the first meeting in 1992, the new committee was tasked with converting the standard to mandatory, enforceable language to facilitate adoption into building codes. The 1989 standard was a mix of requirements, recommendations and other discourse that was often difficult to interpret, making it inappropriate for code reference or adoption. In addition, the committee was charged with updating the standard to reflect new information from research and practice. At that time, Standard 62 was under periodic maintenance, an ANSI (American National Standards Institute) procedure by which a standard must be revised or reaffirmed every 10 years.

During the first few years of the revision process, the committee defined the goals of the new standard and prepared drafts of various sections. A complete draft revision was issued for public review in August of 1996. It received about 8000 public review comments, most of which were duplicates generated by organized efforts to express displeasure with various aspects of the draft. Despite the controversy, this draft did achieve the goal of a standard written in code-intended language that incorporated new research results and experience.

* Contact author email: andyp@nist.gov

Based on concerns about how the committee would be able to deal with the large number of public comments, questions about the ANSI status given the 1989 approval date and other factors, the ASHRAE Board of Directors converted the revision of Standard 62-1989 to continuous maintenance in June 1997. This action put the 1996 draft aside, and redirected the efforts of the committee to the new revision procedure. Under continuous maintenance, a standard is revised via discrete changes or addenda that modify a section of the standard, a subsection or even a single word or numerical value. The committee's charge was the same, to update the 1989 standard and to do so in code-intended language.

THE DEVELOPMENT OF STANDARD 62-1999 AND STANDARD 62-2001

Since the creation of the committee ten years ago, two new versions of the standard have been published by ASHRAE. This section describes the changes implemented in these documents.

ASHRAE Standard 62-1999

After the change to continuous maintenance, the committee started to develop addenda to convert the standard into code-intended language. The first set of five addenda went out for public review in March 1998. These addenda focused on the scope of the standard (addenda 62c and 62d), the ability of the ventilation rates in the standard to accommodate smoking (62e), and the significance of indoor carbon dioxide concentrations (62f). Addendum 62c clarified that the standard does not address thermal comfort, but does consider "chemical, physical, and biological contaminants that can affect air quality." Further changes to the scope were contained in addendum 62d, which noted that compliance with the requirements of the standard could not guarantee acceptable indoor air quality due to the range of contaminant sources in buildings, the many factors that affect human perception of indoor environments and the variability among people in their susceptibility to indoor contaminants.

Addendum 62e removed a note to the table of minimum outdoor air requirements stating that these rates accommodated "a moderate amount of smoking." Since the 1989 publication of the standard, numerous public health and governmental authorities declared environmental tobacco smoke (ETS) to be a significant health risk. The committee removed this note based on the inconsistency between the stated purpose of the standard to "minimize the potential for adverse health effects" and the presence of ETS. Addendum 62f attempted to clarify the significance of indoor carbon dioxide levels relative to indoor air quality and outdoor air ventilation rates. The most important change was the removal of the 1800 mg/m^3 (1000 ppm(v)) CO_2 guideline value, which had been the subject of much abuse and confusion, and clarification that the actual contaminant of interest was the odor associated with human bioeffluents and that CO_2 was simply a surrogate for those odors. The 1800 mg/m^3 (1000 ppm(v)) value was removed or replaced, as appropriate, by roughly 1300 mg/m^3 (700 ppm(v)) above the outdoor concentration.

These addenda went out for public comment, as noted, in March 1998. A number of comments were received on each of them, and the committee attempted to resolve the issues raised by the commenters. Four of these five addenda were approved for publication in 1999. The publication of one, Addendum 62e, was appealed to the ASHRAE Board of Directors and ultimately to ANSI. These appeals were denied, and these four addenda became part of the standard when it was republished as ASHRAE Standard 62-1999.

ASHRAE Standard 62-2001

At the time that Standard 62-1999 was published, the committee was working on a number of other addenda. Seven of these were approved for publication between the release of 62-1999

and the end of 2001 and were incorporated into the standard with the publication of Standard 62-2001 (ASHRAE, 2001). These seven addenda include the following:

62j: Clarifies design requirements related to natural ventilation systems and removes language inconsistent with code application.

62l: Adds a new section to the standard on Commissioning and System Startup, addressing issues such as contaminant control during renovation, balancing of ventilation systems and documentation requirements.

62m: Adds a new section on Operations and Maintenance, addressing issues such as the need to reevaluate system design when space use or occupancy changes and maintenance requirements such as filter replacement and inspection of air intakes.

62p: Clarifies requirements related to the provision of combustion air for fuel-burning appliances.

62q: Clarifies a number of definitions in the standard, removing terms that are not used in the standard or that do not require definition.

62s: Clarifies requirements for control of particulate matter, adding a requirement for MERV 6 (ASHRAE, 1997) filters upstream of coiling coils and other wetted surfaces.

62w: Clarifies requirements for materials in contact with ventilation airstreams in order to reduce the potential for microbial growth in ventilation systems.

Table 1. Addenda under Development

Addenda	*Description*
62g	Separation of smoking and nonsmoking spaces.
62h	When the Indoor Air Quality Procedure can and must be used.
62i	Requirements of the Indoor Air Quality Procedure.
62k	Guidance on application of the standard in new and existing buildings.
62n	Revision of Ventilation Rate Procedure for calculating design ventilation rates.
62o	Design guidance on determining ventilation rates for smoking spaces.
62r	Assessment of outdoor air quality and outdoor air cleaning of particles.
62t	Management of condensate and moisture in HVAC systems.
62u	HVAC control systems.
62v	Air distribution in HVAC systems.
62x	Building envelope construction to limit condensation and microbial growth and to limit entry of exhaust from parking garages.
62y	Classification of air in various spaces and limits on recirculation.
62z	Outdoor air cleaning of ozone.
62aa	Location of air intakes relative to exhausts and outdoor contaminant sources.
62ab	Exhaust of local contaminant sources.
62ad	Update of Appendix with contaminant limits issued by other bodies.
62ae	Further clarification of definitions, update of references and other items.
62af	Change in scope to clarify coverage of new and existing buildings.

Other Revisions Under Development

In addition to the eleven addenda that have been approved and published, the committee is working on eighteen other addenda. These proposed revisions are summarized in Table 1. It is anticipated that two or three more addenda may be developed in the near future, but the

eventual approval of the changes listed in the table will complete the conversion of ASHRAE Standard 62-1989 into code-intended language.

KEY ISSUES RELATED TO THE REVISION OF STANDARD 62

A range of issues has impacted the approval of the addenda in the 1999 and 2001 revisions and continues to impact the development of the addenda listed in Table 1. Overlaid on these technical issues, there has been a layer of controversy, procedural changes and politics that has distracted the committee and ASHRAE during the revision process. Since the revision was converted to continuous maintenance in 1997, there have been seven committees created by the ASHRAE Board of Directors to examine the revision of Standard 62 and the procedures used to develop ASHRAE standards. The recommendations of these bodies have led to a number of changes in the procedures under which ASHRAE Standards, in particular multidisciplinary or high profile standards such as Standard 62, are developed. In 2000, one of these committees addressed the issue of health concerns in ASHRAE standards and concluded that "ASHRAE standards should and do consider health impacts when setting the criteria for an acceptable indoor air environment." This conclusion is consistent with the long history of ASHRAE Standards development. While many of these procedural changes have been helpful, the result of these various committees has been a constantly changing set of procedures, a sense on the part of some committee members that they were not trusted to carry out their duties, and a continuing atmosphere of controversy.

Outdoor Air Quality

The impacts of poor outdoor air quality and how it should be addressed in the standard has been the subject of much discussion. It is generally acknowledged that outdoor air in some locales, as well as in the vicinity of specific buildings, can be quite poor. In such cases, dilution ventilation with outdoor air can introduce significant outdoor contaminants including particles, ozone, and carbon monoxide. The challenge facing the committee has been to develop reasonable requirements to address this critical issue. Some have argued that the standard's goal of acceptable indoor air quality cannot be achieved without the use of particulate filtration and gaseous air cleaning when outdoor air quality is unacceptable. Others counter that poor outdoor air quality is a societal problem and it is unfair to "penalize" designers and building owners with the additional expense associated with air cleaning. In addition, while particulate removal technology is fairly well developed and a test method exists for rating these devices, this is not the case for gases. There is far less experience with commercial application of gaseous air cleaning, some contaminants are hard to clean with existing technology, and there are no standard methods in place for rating the equipment. The committee's approach, as currently proposed, is to require an assessment of the regional and local air quality and documentation of the results and conclusions of that assessment. In addition, if the PM10 levels exceed the national level, then particulate filters rated at MERV 6 (ASHRAE, 1997) or higher must be installed. In addition, if the second highest daily maximum one-hour average concentration of ozone exceeds 313 $\mu g/m^3$ (0.160 ppm), filters capable of removing ozone at an efficiency of 40 % must be installed and operated whenever the outdoor ozone exceeds this concentration. There are a number of exceptions to the ozone requirement that limit this requirement to spaces with high outdoor air change rates. These proposals are still under development and may change before approval.

Outdoor Air Ventilation Requirements

One of the more challenging issues in the revision has been the minimum outdoor air ventilation requirements. In the 1989 through 2001 versions of the standard, these requirements are presented as a table of minimum ventilation rates for about eighty different

space types. In addition, the standard speaks to adjusting these requirements based on imperfect mixing in the space and the effects of recirculation from multiple spaces. However, these adjustments are not very clear to the designer or to the party tasked with enforcing the standard. Other concerns exist that these ventilation requirements result in outdoor air intake rates that are higher than necessary, particularly in densely occupied spaces such as theaters. At the same time, there are others who feel that the rates should not be changed without strong technical justification and perhaps may even need to be increased.

The committee's current approach to revising the outdoor air ventilation requirements in the standard, being proposed in addendum 62n, tends to result in slightly lower ventilation rates in many spaces. The biggest changes are seen in densely occupied spaces. The proposed addendum deals with the issue of occupant density by having two ventilation requirements for each space type, one in the form of a volumetric flow rate per person and the other as a flow rate per unit floor area. For a given space, one multiplies the first value by the number of people expected in the space and the second by the floor area; these two products are then added together to determine the outdoor air requirement for the space. Addendum 62n also contains specific direction on how to determine the outdoor air intake rate of the ventilation system serving any number of spaces, providing default values to account for air mixing in the space and in the system. Some view this addendum as overly complex, but the point can be made that it appears to be more complex because it contains explicit requirements needed to make compliance and enforcement clearer where the current standard is vague and even incomplete.

Controlling ETS Exposure

As might be expected, a great deal of controversy has arisen as the committee has dealt with the issue of environmental tobacco smoke (ETS). The first step, described earlier, was the deletion of the note stating that the minimum ventilation rate requirements in the standard accommodate a moderate amount of smoking. Two other proposed changes to the standard have been developed by the committee and are working their way through the approval process. The first, addendum 62g, contains requirements for separating smoking and non-smoking spaces such that the non-smoking spaces are sufficiently free of ETS that they can meet both the comfort and health requirements of the standard. This addendum would require depressurization of spaces where smoking is occurring and separation of ETS-exposed and "ETS free" spaces. The objective of these requirements is to prevent significant ETS transport into ETS free spaces, but they are not expected to prevent absolute separation such as what one is trying to achieve in some infectious disease wards in hospitals using airlocks.

While the standard's purpose of providing health and comfort is inconsistent with the presence of ETS, designers still need to design spaces where smoking is allowed. The committee is attempting to develop guidance for determining ventilation rates in these spaces through addendum 62o, which provides a method for determining outdoor air ventilation rates in smoking-permitted spaces for odor control only. This guidance is proposed for inclusion in an informative appendix to the standard, which is not officially part of the standard and therefore need not be consistent with the health goals of the standard.

Moisture in Buildings

Moisture in buildings, particularly the issues associated with air-conditioned buildings in hot and humid climates, has been the focus of much committee discussion. Several addenda address the management of condensate from cooling coils and reducing the potential for mold growth on airstream surfaces. The more difficult aspects of the issue still facing the committee

have to do with managing moisture brought into the building with outdoor ventilation air. The committee has listened to many individuals express the concern that the ventilation rates in the standard are currently too high, and that they can create problems (specifically mold) in hot/humid climates. As noted earlier, others believe the rates in the standard are too low or that there is insufficient justification for lowering them. In these discussions, the committee has often noted how outdoor air intake and moisture control are in some sense separate issues. How much outdoor air a space needs is a function of contaminant sources, occupant perception, etc., independent of where the building is located and outdoor humidity levels. At the same time, indoor moisture (driven in part by outdoor humidity) must be controlled, regardless of climate. The means (primarily equipment and controls) to achieve such control exist, and the types of equipment required to dehumidify are a function of climate. Many people feel that part of the problem in hot/humid climates is the use of inexpensive equipment that is less able to handle the moisture load. In addition, some blame poor design and a lack of consideration of part load performance.

CONCLUSION AND IMPLICATIONS

In the ten years since its first meeting, the committee revising ASHRAE Standard 62 has made significant progress. While there has been controversy, the committee has tried to focus on technical issues and develop minimum requirements for achieving acceptable indoor air quality in a practical and cost-effective manner. While it is difficult to predict, it seems reasonable to expect that a full revision of the standard, written in code-enforceable minimum language, will be published by 2004.

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