

tions to assist in the control of potential health hazards and for no other use.”

Caution must be used in directly extending the ACGIH TLVs or other workplace guidelines to spaces covered by this standard and to population groups other than workers. Industrial health practice attempts to limit worker exposure to injurious substances at levels that do not interfere with the industrial work process and do not risk the workers’ health and safety. There is not an intention to eliminate all effects, such as unpleasant smells or mild irritation. Further, the health criteria are not uniformly derived for all contaminants. Irritation, narcosis, and nuisance or other forms of stress are not uniformly considered as the basis for the concentration limits. This is because different organizations use different end points and different contaminants have more or less information available on diverse end points of interest. The target population is also different from the occupants found in the spaces covered by this standard. Healthy industrial workers tend to change jobs or occupations if an exposure becomes intolerable. In contrast, workers in commercial environments such as offices often do not expect elevated concentrations of potentially harmful substances in their work environments. Also, monitoring programs are unlikely to be in place, as may be the case with industrial workplaces. In addition, the general population may have less choice about where they spend most of their time and includes those who may be more sensitive, such as children, asthmatics, allergic individuals, the sick, and the elderly.

C2. GUIDELINES FOR SUBSTANCES IN OUTDOOR AIR

Guidelines have been developed for outdoor air for a number of chemicals and metals, as shown in many of the references. These values, including some for metals, may be appropriate for some indoor environments, but they should be applied only after appropriate consultation. These guidelines also provide guidance concerning the quality of outdoor air if there is suspicion that outdoor air may be contaminated with specific substances or if there is a known source of contamination nearby^{C-3}.

C3. REGULATION OF OCCUPATIONAL EXPOSURE TO AIRBORNE CONTAMINANTS

Regulations of occupational exposure to workplace hazards are based on the results of accumulated experience with worker health and toxicological research and carefully evaluated by groups of experts. Effects are examined in relation to exposure to the injurious substance. Exposure is defined as the mathematical product of the concentration of the contaminant and the time during which a person is exposed to this concentration. Because concentration may vary with time, exposure is typically calculated across the appropriate averaging time, expressed as a TWA concentration, STEL, or ceiling limit. Regulations of the U.S. Occupational Safety and Health Administration (OSHA) are TWAs in most cases.

Industrial exposures are regulated on the basis of a 40-hour workweek with 8- to 10-hour days. During the remainder of the time, exposure is anticipated to be substantially lower for the contaminants of concern. Application of indus-

trial exposure limits would not necessarily be appropriate for other indoor settings, occupancies, and exposure scenarios. However, for certain contaminants that lack exposure limits for a specific nonindustrial target population, substantial downward adjustments to occupational limits have sometimes been used.

C4. SUBSTANCES LACKING GUIDELINES AND STANDARDS

For indoor contaminants for which an acceptable concentration and exposure value has not been established by a cognizant authority, one approach has been to assume that some fraction of TLV is applicable and would not lead to adverse health effects or complaints in general populations. This approach should not be used without first assessing its suitability for the contaminant of concern. In any event, if appropriate standards or guidelines do not exist, expertise must be sought or research needs to be conducted to determine contaminant concentrations and exposures that are acceptable.

C5. SUBJECTIVE EVALUATION

Indoor air often contains complex mixtures of contaminants of concern, such as environmental tobacco smoke^{C-30,C-31}, infectious and allergenic biological aerosols^{C-32}, and emissions of chemicals from commercial and consumer products. Precise quantitative treatment of these contaminants can be difficult or impossible in most cases. Chemical composition alone may not always be adequate to reliably predict the reaction of building occupants exposed to most common mixtures of substances found in indoor air. There are many toxicological endpoints used in assessing the effects from exposure to air contaminants.

Irritation of mucosal tissue, such as that found in the human nose, eyes, and the upper airways, is one of the endpoints often used in assessing short-term exposure to air contaminants. These irritation responses can occur after the irritant receptor is exposed to nonreactive compounds, to reactive compounds with a different pattern of dose-response relationships, and through allergic and other immunologic effects for which dose-response relationships have not been well defined. Susceptible populations—i.e., individuals with atopy (“allergies”)—may report irritation at lower levels of exposures than individuals without allergies. Other susceptible populations, such as the elderly and the young, may differ from healthy adults in their response to irritating and odorous substances.

To some degree, adequacy of control may rest upon subjective evaluation. Panels of observers have been used to perform subjective evaluation of IAQ in buildings. Many contaminants have odors or are irritants that may be detected by human occupants or visitors to a space. Generally, the air can be considered acceptably free of annoying contaminants if 80% of a panel consisting of a group of untrained subjects exposed to known concentrations of contaminants under representative controlled conditions of use and occupancy deems the air not to be objectionable.

When performing a subjective evaluation, an observer should enter the space in the manner of a normal visitor and should render a judgment of acceptability within 15 seconds.