indoor location or an outdoor location.

Thus, the conditions under which sealants and caulks are installed and exposed to the atmosphere during the hours and days immediately after installation will have important effects on their long-term performance and emissions.

3. We are tremendously optimistic about the potential usefulness of emissions testing for evaluating the indoor air effects of building products. Information from such tests will soon be available to designers and builders, to assist them in careful selection of products to minimize indoor air pollution.

4. Studies of VOC from building materials are leading to a more complete understanding of the emissions process. With this knowledge and a market interest in cleaner, safer products, formulators will be able to develop products that will cause less harm to building occupants.

For More Information

Contact the office below or Dave Eyre, Energy Program Manager, Buildings & Energy Technology Program, Saskatchewan Research Council, 15 Innovation Blvd., Saskatoon, Saskatchewan, Canada S7N 2X8; (306)933-6925.

D. Jennings, D. Eyre and M. Small. "The Development of a knowledge base relating to indoor use of caulks, sealants and weatherstrip products; Volume 4, The safety categorization of sealants according to their volatile emissions." Ottawa: Energy, Mines and Resources, Government of Canada. August 1988. Available from Residential Energy Management Division Distribution; Energy, Mines and Resources Canada; Ottawa, Ontario K1A OE4. ♦

ASTM Standards for Emissions Studies

The increased interest in the use of test chambers to quantify emissions from building materials, furnishings, and products has spawned the need for some standardized test methods. Standards would allow comparing results from different laboratories.

ASTM Subcommittee D22.05 on Indoor Air is preparing a guide to chamber testing based on the chamber used by EPA at its Research Triangle Park laboratory. Bruce Tichenor at Research Triangle Park is preparing the document. If you are interested in commenting on it, call Tichenor at (919)541-2991. ♦

Practical Research Briefs

Indoor Air and a Whole Lot More

Indoor air quality problems are often blamed for building occupant's complaints or health problems, but IAQ may not always be the cause of the problems. *The human body integrates all of the environmental forces acting upon it, and its physiological and psychological responses may not be attributable to a* single causal factor. Lighting, acoustics, seating, computer equipment, and furnishings (among other things) also can cause many of the symptoms that lead to indoor air quality investigations. This complicates those investigations.

The following three articles look at office environments and occupant health, safety, and comfort in terms of a variety of environmental factors besides indoor air. Documented sick building syndrome investigations have revealed that mechanical vibration from HVAC systems, glare from lighting, or noise contributed to or caused the complaints. Therefore, we want you to appreciate the diversity of environmental factors that you must consider when investigating complaints (or designing buildings).

Quality of Work Environment: Factors in SBS?

In "Quality of Work Environment (QWE): Effects on Office Workers," Professor Franklin D. Becker of Cornell University reviews the literature on the quality of the work environment as a facet of what he calls the "Quality of Worklife (QWL)" movement. The purpose of the article is to characterize office quality to "help guide the search for design solutions that genuinely promote individual health and well-being as well as organizational effectiveness."

Becker says that reducing accidents and environmentally induced illness is necessary but insufficient for greatest productivity. Work environments can only contribute to individual and organizational welfare if they support different "workstyles" and respond to how employees want to be supervised and do their jobs.

QWE varies among different interest groups (developer, investor, manager, employee). In effect, Becker says, office quality is the result of a political process involving each interest group "to determine the allocation of the scarce resources of space, furniture, equipment, and location." While different interest groups might

define office quality differently, employee responses to different work environments provides clues to the essential building blocks.

Office Automation

Health and satisfaction among VDT (video display terminal) users appears related to the quality and type of support furniture and to work scheduling. Lighting problems of glare and contrast are common, especially when workers perform multiple tasks including non-VDT work. Some problems may be linked to the VDT, but the majority stem from seating, equipment and furniture adjustability, poor lighting, and other qualities of the surrounding environment. Becker suggests that the reported increased incidence of miscarriages among VDT users may be related to the stress of VDT use and perhaps to the increased use of drugs and alcohol to relieve that stress. (See the article below, "Miscarriages, Birth Defects, VDTs, and Indoor Air.")

Furniture

Backaches and circulatory problems have been associated with sitting for long periods, and over half the population experiences backaches at some point in their lives. Especially for VDT operators, adjustability has become a major consideration in furniture design.

Air Quality

Becker cites a number of effects familiar to most ***IAQU*** readers. He focuses on energy conservation as a source of increased indoor air quality problems. The negative effects of indoor air problems he mentions include decreased performance, memory problems, eye and respiratory irritation, cancer risk, depression of the central nervous system, irritation of tissues, and neurological damage.

Temperature

Most temperature effects in offices are discomfort or mild stress, although some research indicates that behavioral changes could be caused by temperature problems. Small temperature variations during the day may actually be beneficial by promoting increased awareness and improved performance.

Illumination

Lighting requirements depend on task difficulty and duration. Employees may prefer lighting levels several times higher than that required to do the job without eyestrain. Direct and reflected glare are major sources of office workers' health-related problems, including annoyance, discomfort, and temporary loss of good vision or visibility. Perceived color quality also affects workers' responses. However, there is little evidence that "full-spectrum" lighting helps performance.

Workers prefer natural lighting and views outside. Windows provide visual relief and relaxation, connect the worker to the outside world, and may reduce a sense of crowding.

Sound

Acoustic privacy is generally a greater concern to office workers than is visual privacy. "Meaningful noise" such as overheard telephone conversations are most bothersome.

Noise provokes more stress as it increases in intensity and unpredictability. Noise can also have a bad effect on social behavior, task performance, and evaluative judgments of other people.

Density and Enclosure

Open office plans cause problems due to lack of auditory and visual privacy and impaired inter-worker communication. Improved sound masking systems and acoustic separations have effectively reduced many of these problems. Some research suggests that higher "social density" (not necessarily less space per person) may improve performance among professional staff where interaction is valued.

Design

Workers tend to respond positively to any indication that the people responsible for their environment care about their needs and preferences. Thus, newness or cleanliness take on symbolic as well as physical significance in shaping workers' attitudes and responses. Office workers prefer muted color tones to bright colors or stark black and white decor.

Participation in Change

Office workers like to participate in the planning and design of their work environment, but they are rarely allowed to do so. Such participation increases job satisfaction, environmental satisfaction, and job performance.

For More Information

Contact Franklin D. Becker, Department of Design and Environmental Analysis, College of Human Ecology, Cornell University, Ithaca, NY 14853.

Franklin D. Becker, "Quality of Work Environment (QWE): Effects on Office Workers" in A. Wandersman and R. Hess, eds., ***Beyond the Individual: Environmental Approaches and Prevention.*** The Haworth Press, 1985. ♦