

OCCUPATIONAL HAZARDS

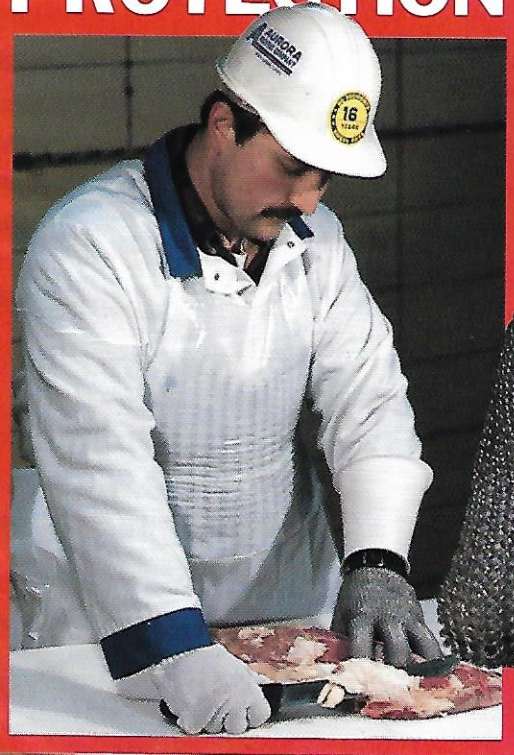
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Industrial Safety

Health/Hygiene

Plant Protection

**SPECIAL REPORT ON
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ARE YOUR WORKERS SAFE FROM SICK BUILDING SYNDROME?

By Sandy Moretz

Office buildings are safe places, right? After all, office workers don't have to wear clean room suits or respirators.

And they certainly don't have to worry about occupational illnesses or chemical exposures. Or do they?

"While office jobs have often been considered safe and clean compared to industrial work, recent research has found that they, too, have their risks," points out the Service Employees International Union (SEIU) in an indoor air pollution fact sheet.

If complaints such as headaches, dizziness, fatigue, and eye and throat irritations are heard frequently from your office workers, they may be suffering from "tight" or "sick" building syndrome, a condition often associated with poor indoor air quality.

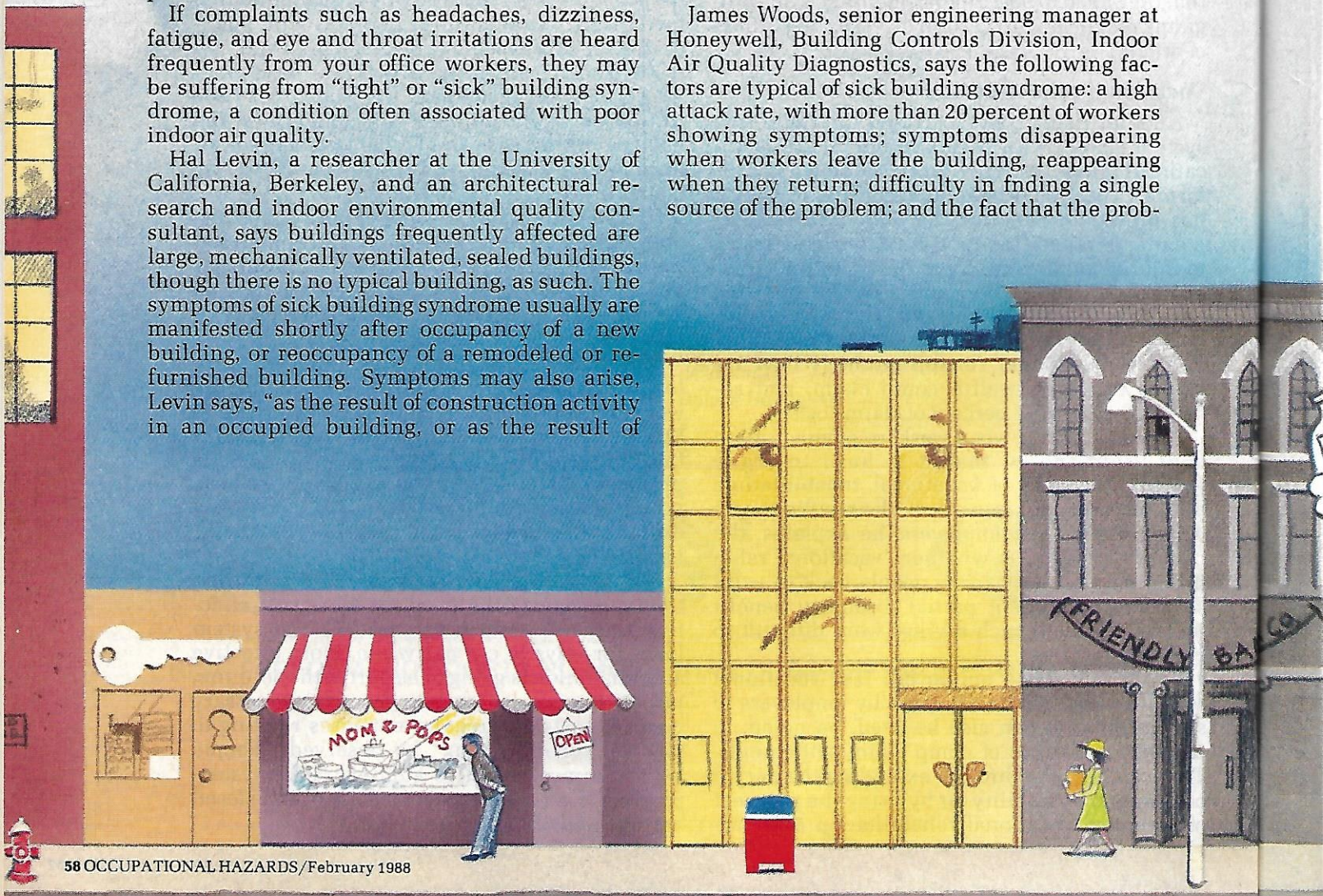
Hal Levin, a researcher at the University of California, Berkeley, and an architectural research and indoor environmental quality consultant, says buildings frequently affected are large, mechanically ventilated, sealed buildings, though there is no typical building, as such. The symptoms of sick building syndrome usually are manifested shortly after occupancy of a new building, or reoccupancy of a remodeled or refurbished building. Symptoms may also arise, Levin says, "as the result of construction activity in an occupied building, or as the result of

changes in building systems, particularly in the ventilation system."

While the symptoms related to sick building syndrome may not seem like the kind that would jar a safety and health director into immediate action, research indicates that sick building syndrome should not be taken lightly. It makes some workers miserable — to the point that they seek medical attention. It can also lower productivity, increase absenteeism, trigger workers' compensation claims, and contribute to poor morale, especially if workers begin to feel that management doesn't take their complaints seriously.

Common characteristics

James Woods, senior engineering manager at Honeywell, Building Controls Division, Indoor Air Quality Diagnostics, says the following factors are typical of sick building syndrome: a high attack rate, with more than 20 percent of workers showing symptoms; symptoms disappearing when workers leave the building, reappearing when they return; difficulty in finding a single source of the problem; and the fact that the prob-



lem can almost always be mitigated by dealing with the physical systems of the building.

Symptoms associated with sick building syndrome have been linked to many sources, including thermal, lighting, acoustics, and air quality. "A big issue here is that sick building syndrome is more than an air quality issue," Woods says. "And I think we've learned to deal with it much more comprehensively in the last few years."

But even though air quality isn't the sole factor, it appears to be the most thoroughly studied in relation to sick building syndrome.

New England study

"Indoor air pollution is a significant health problem for the State governments in Maine and

New Hampshire," according to preliminary results of a survey conducted this past summer by the Maine State Employees Association and the State Employees Association of New Hampshire, in conjunction with the SEIU.

The survey, conducted to identify the range and extent of indoor air pollution, or sick building syndrome, found that many employees who complain of unusual fatigue or drowsiness, headaches, sinus congestion, and difficulty concentrating at work believe the problem is caused or aggravated by poor indoor air quality.

Forty-one percent of the respondents, all State workers, said they were bothered by stuffy air or lack of air movement most of the time, 16 percent said at specific times, and 27 percent said occasionally.

Fifty percent of the workers work in buildings where the windows don't open, and of those who work in buildings where the windows do open, only 40 percent are allowed to open them.

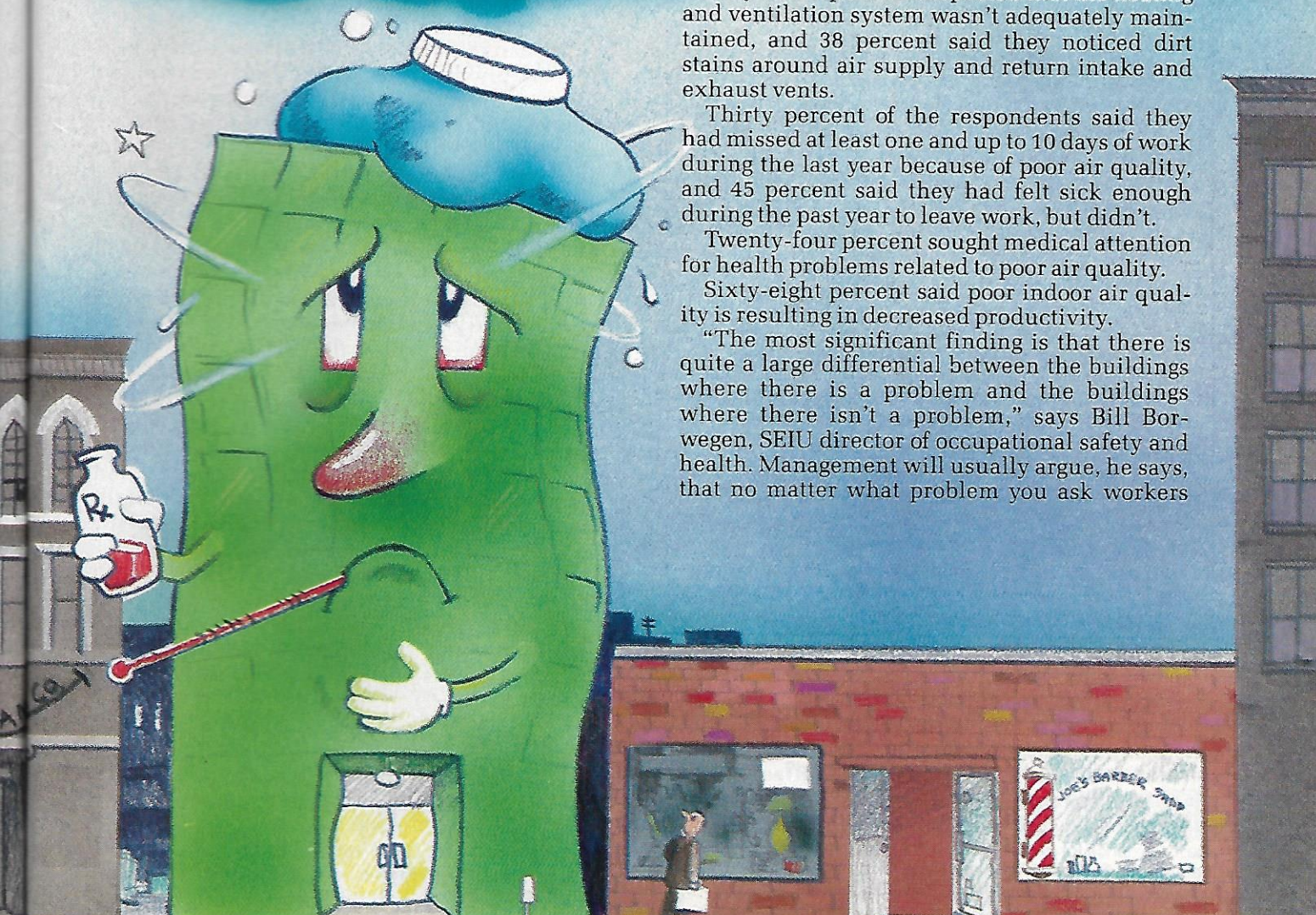
Fifty-seven percent suspected that the heating and ventilation system wasn't adequately maintained, and 38 percent said they noticed dirt stains around air supply and return intake and exhaust vents.

Thirty percent of the respondents said they had missed at least one and up to 10 days of work during the last year because of poor air quality, and 45 percent said they had felt sick enough during the past year to leave work, but didn't.

Twenty-four percent sought medical attention for health problems related to poor air quality.

Sixty-eight percent said poor indoor air quality is resulting in decreased productivity.

"The most significant finding is that there is quite a large differential between the buildings where there is a problem and the buildings where there isn't a problem," says Bill Borwegan, SEIU director of occupational safety and health. Management will usually argue, he says, that no matter what problem you ask workers



about, a certain percentage will say they're afflicted even if they aren't.

"The study shows that conditions are quite different in buildings where there have been reported problems and buildings where things seem to be O.K.," Borwegen says. "It's not just a bunch of employees complaining; there are real legitimate differences in health between good buildings and bad buildings. Clearly the bad buildings need to be investigated to determine what factors are causing the symptomatology."

At presstime, final results of the study were being tabulated and publication was imminent.

Other research

Spurred by workers' health complaints — typical of sick building syndrome — at its seven-year-old James Madison Building, the Library of Congress has announced plans to study the building and survey its 3,400 occupants. The proposed \$750,000, two-year study will look at many facets of the building, ranging from air quality to lighting to ergonomics, says Gerald Garvey, library support services officer. The study will be conducted by NIOSH, the Department of Energy, the National Bureau of Standards, and the Environmental Protection Agency.

How common is sick building syndrome? Researchers don't have a definitive answer yet, but based on a telephone survey of 600 office workers across the United States, Woods and his associates, Geraldine M. Drewry and Philip R. Morey, proposed this preliminary hypothesis: "It is possible that 20 percent of the office workers in the U.S. are exposed to environmental conditions that are manifested as the sick building syndrome."

WHAT TO ASK WORKERS

NIOSH recommends that the following questions be included in an occupant questionnaire or interview:

- What health complaints have been experienced?
- When is the first time they were noticed?
- Is there any specific incident or event that is linked with the initial onset of the complaints? (building renovations, new carpeting, new equipment, etc.)
- How often do they occur? (several times per day/week, etc.)
- How often do they last? (minutes/hours, all day)
- Are there particular times of the day they occur? (morning vs. afternoon, etc.)
- Do they occur in particular areas of the building vs. others?
- Are there any specific activities, tasks or unusual circumstances that accompany the problem?
- When do the health complaints go away? (soon after leaving the building, at home, on weekends)

Source: "Guidance for Indoor Air Quality Investigations," Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies, NIOSH.

During the past several years, through December 1986, NIOSH has examined close to 450 buildings for indoor air quality health hazards. They investigated typical sick building syndrome complaints, such as headaches, varying degrees of itching or burning eyes, irritations of the skin, sinus problems, dry and irritated throats, and other respiratory irritations.

Although the symptoms may have been caused by many factors, NIOSH classified their evaluations by primary type of problem found: inadequate ventilation, 52 percent; contamination from inside the building, 17 percent; contamination from outside the building, 11 percent; microbiological contamination, 5 percent; contamination from the building fabric, 3 percent; and unknown, 12 percent.

According to NIOSH's "Guidance for Indoor Air Quality Investigations," the most common ventilation problems it finds are: "not enough fresh outdoor air supplied to the office space; poor air distribution and mixing which causes stratification, draftiness, and pressure differences between office spaces; temperature and humidity extremes or fluctuations (sometimes caused by poor air distribution or faulty thermostats); and air filtration problems caused by improper or no maintenance to the building ventilation system."

In many instances, NIOSH says, the ventilation problems are created or compounded because of energy conservation measures, including reducing or eliminating fresh outdoor air; lowering thermostats or economizer cycles in winter, raising them in summer; and eliminating humidification or dehumidification systems.

"Although varied," NIOSH says, "these ventilation problems commonly can allow a build-up of any contaminants present in the occupied space to the point that adverse health effects are experienced or allow the environment to become annoyingly uncomfortable to the office workers."

Sources of inside contaminants, says NIOSH, include copying machines, pesticides, boiler additives, cleansers, tobacco smoke, and combustion gases from sources common to cafeterias and laboratories. A common source of outside contamination, NIOSH says, is motor vehicle exhaust fumes drawn into a building's ventilation system from parking garages. Other outside contaminants that can affect indoor air quality include those from construction or renovation projects, such as asphalt, solvents, and dusts.

Ventilation problem

What should you do if you think your ventilation system is causing your workers to suffer from symptoms associated with sick building syndrome? We put that question to researcher and consultant Hal Levin. He replied, first check the building to see that it's functioning the way it

should. If no apparent problems can be found, a qualified consultant may need to be called to conduct an investigation.

Any investigation should start with a review of the overall building, Levin says. For example, what activities are taking place in the various spaces and is there any variation in time of the activities? Pinpointing the various activities will help indicate some sources of pollution, and how they are related to the distribution of people in the building.

Get some idea of when the problem started, Levin advises, and try to find out if there were any changes in building activities, or changes in the building that occurred around that time. Check out the operation of the ventilation system, including its layout, where air is being brought in, and how well it's maintained. Are there obvious build-ups of contaminants on filters, coils, drip pans? Are those all easily accessible and easily maintained?

If the workings of the ventilation system appear to be in order, Levin says the next step is to determine the adequacy of flows: Is an adequate amount of outside air being brought in, and is the distribution in the building adequate? Is the air reaching the occupants and not short-circuiting through some defect in the layout, design, or operation?

If that appears in order, the investigation should include medical or epidemiological studies to try to determine if there is an elevated level of complaints. Points to look for, Levin says, are whether complaints are localized on a certain floor or side of the building, or if they only occur at certain times of the day, week, or year. "Try to narrow down and define what the problem is," he says.

Further investigation, which may or may not include air sampling, should seek to determine if there are some sources of indoor air contaminants that may be related to the symptoms demonstrated by the study.

"The occupants of a building are a very reliable and important source of information as to how a building is working," Levin stresses. By talking with building occupants through systematic surveys, interviews, or questionnaires, along with epidemiological studies, and by doing a systematic evaluation of building activities and its ventilating system, "one can often do a better job of improving the environmental quality of the building than by using a lot of sophisticated and expensive measurement instruments," Levin says.

"The body is sensitive to all forces and factors in a building," Levin continues. "Also, social and psychological factors may play a very significant role. Stress or other forces that affect [workers'] health, outside of building environment, may predispose them to a more noticeable reaction to defects in the building environment.

"Instruments cannot tell you what people are experiencing, but people can tell you what

GET THE FACTS ABOUT YOUR BUILDING

The following questions will help you gather information about your building and its ventilation system:

What is the building's age? What is the basic construction? Number of floors? Number of square feet/floor? Type of windows? Do they open?

Who is responsible for the functioning of the building systems? (i.e., ventilation)

Who is responsible for cleaning the interior of the building? How often is cleaning done?

Have there been any major renovations or operating changes? What were they? When did they occur?

Does the building have sprayed or foamed insulation? When was it applied?

What type of heating system is used?

What type of cooling system is used?

What type of humidification system is used?

How is the total ventilation system operated?

What floors and rooms are served by each system?

What type of filtration system is used? How often is it changed/maintained?

How much fresh air is being introduced into the ventilation system? Does this amount meet system specifications?

Where are the fresh air inlets and are they functioning properly?

Are there any possible sources of contamination located in the general vicinity of the air inlets?

How likely are contaminants to be drawn into the air inlets due to prevailing winds and inversions?

How does exhaust air leave the building?

Is the building being used for the same purpose(s) for which it was designed?

What type of activities are building occupants engaged in?

What processes or activities are present in the building that may serve as contaminant sources? How are they vented?

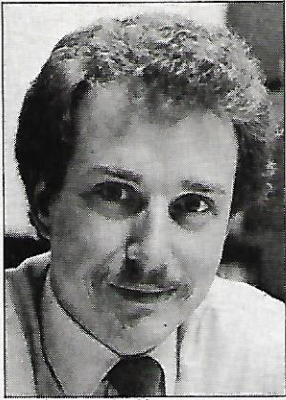
Source: "Guidance for Indoor Air Quality Investigations," Hazard Evaluations and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations and Field Studies, NIOSH.

they're experiencing," Levin adds. "They may not understand the causes and they may not know how to accurately describe it, but that's the challenge for the investigators."

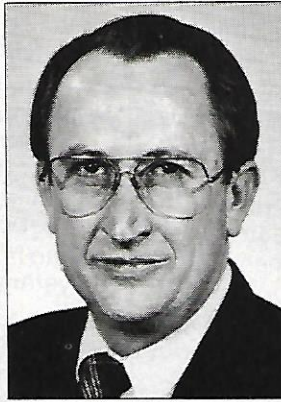
Assessment guidelines

In its "Guidance for Indoor Air Quality Investigations," NIOSH outlines steps for a self-evaluation of indoor air quality problems. The initial assessment includes a documentation of complaints, by surveying occupants to estimate the magnitude and distribution of the problem; a building characterization, to learn about the building composition and its ventilation system; and a walk-through survey, to ensure the survey information is accurate and to check the building's overall condition. (Questions to include in

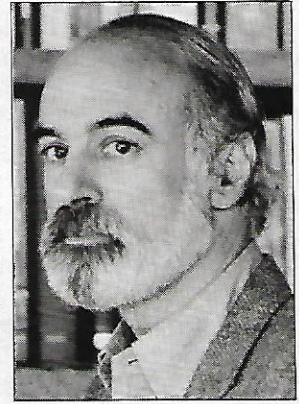
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Borwegen:
Costs
associated with
sick building
syndrome are
higher than
making sure
the ventilation
system works
properly.



**Honeywell's
Woods expects
productivity to
become a major
issue in the sick
building
syndrome
phenomenon.**



**Levin: Health
factors such as
stress may
predispose
workers to a
more
noticeable
reaction to
building
environment
defects.**

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any occupant survey and in a building characterization are shown in accompanying tables.)

How can you improve indoor air quality in your office building and avoid sick building syndrome? Make sure areas that house sources of known contaminants, such as copy machines, carbonless copy paper, printing processes, and cigarette smoking are exhausted directly to the outside, without the air being recirculated in the building, Levin says. Reduce sources of contaminants, if possible. "The problem most of the time is that the activities that occur in a building weren't known when the building was designed and built," Levin adds. "For example, copy machines are frequently stuck in a space that's undesirable for anything else."

Make sure your ventilation schedules aren't causing a problem, Levin says. Often, to conserve energy or save money, ventilation systems are turned on shortly before people arrive at work in the mornings — at a time when auto traffic is filling the air with exhaust contaminants. Also, building systems are often turned off on weekends, which can cause filters and ducts lined with porous material to accumulate dust or organic matter, providing a matrix for development of microorganisms, Levin says. The organisms breed over the weekend, and when the system is turned on Monday morning, they are blown all over the building.

Office maintenance schedules should also be considered, Levin says. Floors should be waxed and furniture polished on Friday evenings or before a long weekend so that toxicity from solvents and vapors are at miniscule levels when employees return to work, he suggests. The same can be said for pesticides. Also, Levin adds, replace toxic substances with less harmful substances, where possible.

Experts agree that more attention should be given to the maintenance of buildings' ventilation systems. "Very often the people who actually operate the building will tell you that a ventilation system is operating a certain way, but upon investigation, you find that it's not," Levin says. Systems need periodic review by qualified people, and those personnel operating

buildings often need supervision because they haven't been adequately trained or lack experience, Levin adds.

Incentives

Our respondents emphasize the cost benefits of indoor air quality programs. Says the SEIU's Borwegen: "If every State employee in the States of Maine and New Hampshire just missed one day of work because of a respiratory disease that they may have contracted because of an indoor air quality problem, that's a tremendous amount of money that can more than offset the prudent approach by management to make sure that the ventilation was properly designed and maintained."

Honeywell's Woods told *Occupational Hazards*: "I think what's going to happen is that as people begin to realize that they don't have to feel the way they do in the office space, and as management begins to recognize what the nature of the problem is, that productivity will become a major issue." By improving the workplace environment, Woods says, management will begin to find out that workers feel better, their attitudes and performance improve, system costs go down, and, therefore, productivity increases.

"From a strict cost-benefit sense," Borwegen says, "the number of lost workdays and the loss of productivity because the people are so miserable is a much higher cost than making sure the ventilation system works properly."

It seems certain that sick building syndrome, a relatively new issue in the occupational safety and health arena, will become more talked about in 1988, as the results of the New England study are analyzed and the more extensive U.S. Library of Congress study gets underway. Meanwhile, Senator George Mitchell (D-Maine) has introduced a bill to examine the indoor air quality issue. The bill, which assigns EPA a central role, would initiate public health advisories, a national response plan, a specific attack on air quality problems in Federal buildings, and some \$6 million a year for research.

Senate hearings are expected sometime this year. They will fuel further discussion and debate on sick building syndrome. □