



PROPERTY MANAGEMENT AND INDOOR AIR QUALITY

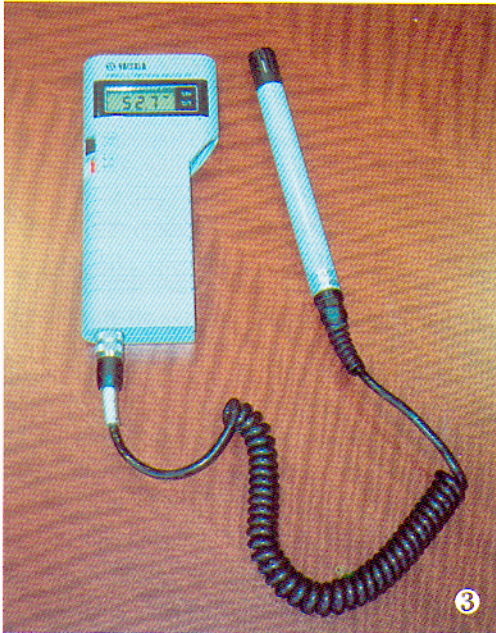
By Elia M. Sterling

Indoor air quality is rapidly becoming one of the leading issues facing Property Managers. Due largely to widespread media coverage over the past decade, both commercial and residential tenants are increasingly aware of potential indoor air quality problems and are reporting health and comfort complaints caused or aggravated by conditions in buildings in record numbers.

Photos: ❶ James Ross of Sterling Associates Ltd. testing carbon dioxide in Vancity Centre headquarters building. ❷ Carbon Dioxide Monitor. ❸ Temperature & humidity Monitor.

The concerns that building occupants have expressed, related to indoor air quality problems, have been primarily about comfort conditions - particularly stale and stuffy air, less than ideal temperature conditions and unpleasant odours. While occupants have reported symptoms such as headaches, fatigue, and eye, nose and throat irritation, there is no conclusive documentation of widespread serious health impairment that has been linked to indoor air quality. However, many indoor environments have been suspected to contribute to chronic health problems, such as allergies and chemical sensitivities, as well as acute health problems such as cancer and neuro system disorders. It

is therefore not surprising that indoor air quality is one of the fastest growing forms of litigation. Claims for "Sick Building Syndrome", "Building Related Illness" and "Multiple Chemical Sensitivity" have



entered the legal repertoire of personal injury lawyers throughout North America. Examples of recent litigation include claims of health impairment:

- in a medical clinic due to exposure to mold from a crawlspace
- in an office building due to total volatile organic compounds emitted from material used to construct the building
- in a strata residential townhouse unit due to emissions from flooring material

In addition to litigation issues, Workers Compensation authorities have begun to recognize damage due to exposure to low level or multiple contaminants resulting in "poor indoor air quality" as compensatory illness. For example, in 1991 the Workers Compensation Board in the state of Oregon awarded a computer programmer a damage claim of \$350,000 for health impairment, including acute irritant injury, balance disorder, organic brain syndrome and simple phobia, allegedly caused by exposure to poor quality indoor air in an office building. In British Columbia, landmark indoor air quality regulations are slated to be adopted by the Workers Compensation Board (WCB) on April 15, 1998. A unique and far reaching attribute of the regulations is that once in force, they will provide WCB

with enforcement authority over indoor air quality issues related to employee comfort in the workplace, in addition to WCB authority already in place covering employee health issues. The indoor air quality regulations require that ventilation rates, temperature and relative humidity levels established by the American National Standards Institute (ANSI) and the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) be maintained for all non-industrial workplaces. These regulations apply specifically to buildings housing such businesses as offices, retail stores, restaurants, bars, nightclubs and hotels. Additionally, the WCB indoor air quality regulations apply to government facilities and hospitals. The WCB will require that indoor air quality investigations be conducted:

- when indoor air quality complaints occur
- upon change in occupancy
- when renovations are made to the premises

Preventative maintenance practices are also specified by the WCB, which include such costly practices as regular duct cleaning.

Federal workplaces which are either owned or leased by the government are not covered by the WCB indoor air quality regulations. However, these buildings which include, for example, the Vancouver International Airport, Revenue Canada and other federal agencies, are covered by the Canada Occupational Safety and Health (COSH) regulations which are part of the Canada Labour Code. Proposed revisions to the COSH regulations incorporate similar indoor air quality provisions to those of the WCB regulations. The proposed COSH revisions are expected to be adopted by January 1999.

Although WCB regulations for industrial workplaces generally apply specifically to employers, the special WCB indoor air quality regulations for non industrial workplaces are intended to apply also to the owner and operator of the building in which the employer is a tenant. Therefore, it is the combined responsibility of the employer and the property manager to maintain acceptable indoor air quality in the building. Because the individual tenant has little control over the building heating, ventila-

tion and air conditioning systems, and the property manager has little control over the furnishings and products used by a tenant in their premises, this combined responsibility for the health and comfort of the tenants' employees has the potential to create serious jurisdictional problems. If an indoor air quality complaint occurs and the WCB or COSH is called in to investigate, the result could be finger pointing between the tenant who is an employer and the building property manager. To safeguard against this situation will require property managers to assemble and retain extensive documentation demonstrating the indoor air quality performance of the existing base building, including the heating, ventilation and air conditioning systems and identifying indoor air quality issues resulting from specific tenancies, such as over crowding or use of specialized equipment that emits contaminants under improperly ventilated conditions.

Both the British Columbia WCB indoor air quality regulations and the COSH regulations reverence ANSI/ASHRAE Standard 62-1989 "Ventilation for Acceptable Indoor Air Quality" and ANSI/ASHRAE Standard 55-1989 "Thermal Environmental Conditions for Human Occupancy". These standards have become international benchmarks defining conditions providing acceptable indoor air quality. ANSI/ASHRAE Standard 62-1989 provides a list of ventilation rates required for specific types of occupancies, as well as some guidance regarding exposure levels to toxic substances. ANSI/ASHRAE Standard 55-1989 provides criteria defining acceptable ranges for temperature and humidity required to maintain conditions for human comfort. Although these standards were originally intended as design standards for mechanical engineers, both the courts and regulatory authorities in Canada and the U.S. have interpreted that the criteria apply to building operation as well as design. In fact, the outcome of recent regulatory actions and court cases on both sides of the border have hinged on the determination as to whether or not the building in question was designed, constructed and operated in compliance with these ANSI/ASHRAE Standards. Of most importance to property managers, however, is that the British Columbia WCB

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indoor air regulations apply the ANSI/ASHRAE standards to building operation.

To complicate matters further, both ASHRAE Standards are currently being revised. The proposed revision to ANSI/ASHRAE Standard 62-1989 was published in August 1996. Although the proposed revisions have little chance of being approved as written, some legal experts believe that the publication of the revisions may have set a precedent and that buildings must now be operated and maintained to meet this new benchmark indoor air quality standard. The proposed revisions change the goal posts defining acceptable indoor air quality and methods by which it should be achieved. For example, the proposed revisions:

- *are based on controlling or removing offending sources contributing to poor indoor air quality from a building rather than adding more ventilation air for dilution*
- *assume a zero tolerance level for offending substances rather than allowing exposure to a tolerable level, as is the case for outdoor*

air quality, as well as established industrial exposure standards

- *applies directly to existing buildings and can therefore be interpreted as retroactive once adopted*

With litigation and regulation looming and while the engineering and health community is in controversy over how best to define and control acceptable indoor air quality, can indoor air quality be managed effectively for residential and commercial properties?

To manage indoor air quality effectively requires an understanding of the underlying causes of indoor air quality problems. The following table (page 22) summarizes the specific causes identified as contributing to indoor air quality problems in investigations of over 40,000,000 square feet of office, commercial and residential buildings conducted since 1981. The identified causes of IAQ related problems can be broadly categorized into two types: design and operational inadequacies of HVAC systems and the presence of specific contaminants from a variety of sources. These two categories are not mutually exclusive. For example, the

presence of elevated formaldehyde concentrations resulting from off-gassing from interior furnishings may be diluted by adequate ventilation or intensified by a lack of outside air or poor air distribution. The single most frequent cause of occupant complaint is inadequate control of the indoor environment by the mechanical ventilation system (36 percent of all identified causes). Problems of an inadequate outside air supply and poor air distribution within a space can be related to both the design and operational characteristics of the HVAC system. Design problems may be a function of the design parameters of a building with low outside air ventilation rates desired for optimum energy efficiency or minimum code requirements. Operational deficiencies include building operators' closing of outside air dampers (again for energy efficiency), inappropriate minimum damper settings (particularly in variable-air-volume systems), unbalanced air distribution systems and the presence of barriers to effective air distribution, such as partitioning of a space or occupant blocking of diffusers.

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* Specific Causes Identified As Contributing To Indoor Air Quality-Related Problems

Cause Of Problem	% Of Times Cause Was Identified
Ventilation Control	36
• lack of outside air	
• poor air distribution	
Thermal Control	19
• inadequate capacity	
• operational deficiencies	
Ventilation Infiltration	10
• outside air intake location	
Cross-contamination	11
• parking garage	
• print shop	
• smoking lounge	
Indoor Sources	9
• interior furnishings	
• fibrous insulation	
Microbial Contamination	7
• poor maintenance	
• water leakage	
Site Infiltration	2
• adjacent industry	
• underlying soil	
Undetermined Cause	6

* Source: Sterling Associates Ltd.
Indoor Air Quality investigations conducted since 1981.

Fortunately, with an understanding of the underlying causes of tenant complaints by taking prudent action in anticipation of indoor air quality concerns, the prudent property manager is in a position to manage indoor air quality successfully. The most effective approach is for the property manager to develop a proactive program with respect to indoor air quality. This can be accomplished by defining the benchmarks for assessing conditions and implementing a management plan. Because no single authority has yet established a definitive indoor air quality standard that can be applied to all buildings across the board, the property manager is in a position to set benchmarks for each property in their portfolio. These benchmarks, for example, would include target ventilation rates and levels for common indoor substances, such as carbon dioxide, and total volatile organic substances. The indoor air

quality benchmarks established by the property manager would also identify the standard of preventative maintenance to be expected by contractors who service the heating, ventilation and air conditioning systems and clean the building. In addition, the benchmarks would provide criterion to identify tenant activities that could contribute to indoor air quality problems. Once the benchmarks have been established, a proactive indoor air quality management program can be tailored to meet the special requirements of each building in the portfolio. Although the property manager is in a position to establish the benchmarks and the indoor air quality management program for specific buildings, the specific benchmarks must also be acceptable to the regulatory authority. Therefore, prior to implementation of the indoor air quality management program in any building, the regulatory authority, for example the WCB, should be consulted for comments and approval. The regulatory authority may request specific changes, but in general should be agreeable to the strategy as it will assist in improving indoor air quality conditions.

The indoor air quality management program should also be discussed with tenants prior to implementation. Tenant feedback could assist the property manager in identifying and correcting existing concerns before the program is implemented. Once implemented, the indoor air quality management program will provide a record documenting the ongoing performance of the building in comparison to the benchmarks that the property manager has established and have been approved by the WCB or (other authority).

The program should be tailored to each building. However, an example of an indoor air quality management program which is currently implemented for the Vancouver City Savings Credit Union on all branch locations and Headquarters building consists of initial walkthrough inspections of all locations to review of existing facilities and systems (individual plans and specifications if available), a preliminary series of on-site air quality measurements to establish benchmarks for comparison followed by semi annual indoor air quality management inspections. The semi annual inspections are incorporated as part of the ongoing building operations and maintenance schedule and include:

- * *walkthrough inspections*
- * *air measurements for total volatile organic compounds, formaldehyde, carbon dioxide, carbon monoxide, dust levels, temperature, humidity, ozone, mold and bacteria*
- * *archival documentation of results: comparison with property benchmarks, regulatory standards, and recommended guidelines*

The indoor air quality management program is intended to identify potential problems before they result in health or comfort complaints. In addition to avoiding potential problems, with the program in place if a complaint occurs the property manager will have the documentation required to determine whether or not indoor air quality conditions are acceptable. If conditions are found to be unacceptable, the indoor air quality management program will provide the information necessary to determine whether the building or the tenant activities are responsible. With measured indoor air quality performance information at his or her fingertips, if a complaint results in a WCB inspectors visit the property manager will be in a position to offer valuable assistance to all parties that are effected by such a challenging situation. Simply having the information available will often resolve the concerns immediately. In addition to providing a useful record for the property manager, the indoor air quality performance documentation is often of assistance to tenants when responding to indoor air quality concerns expressed by their employees, or in the case of a strata residential building, the strata council responding to concerns of the strata owners. ■

Elia M. Sterling, MRAIC, MASHRAE, is President of Sterling Associates Ltd. With over 20 years of experience providing environmental services to the building industry in B.C., he has conducted indoor air quality assessments encompassing over 40 million square feet of space. He was also a member of the ASHRAE committee that wrote the current ventilation standard and has published over 100 research and technical articles on the subject of indoor air quality. Mr. Sterling contributed to a study conducted by the Building Owners and Managers Association of British Columbia of the capital and operating cost implications of the new Workers Compensation Board of British Columbia indoor air quality regulations.