

# Building Managers' Knowledge of Indoor Air and Improvement Strategies

**Sponsored by the Canadian Committee on Indoor Air Quality and Buildings**

**Author: Alexandra Thompson, Ph.D., Research Officer, National Research Council Institute for Research in Construction (NRC-IRC).**

In fall 2010 members of International Facility Management Association (IFMA) in Canada were approached to participate in a survey on indoor air issues and improvement strategies in Canadian commercial buildings. The survey was commissioned by the Canadian Committee on Indoor Air Quality and Buildings (CCIAQB).

The CCIAQB was created in 2008 with the goal of improving indoor air quality in buildings and, ultimately, the health of occupants. Modeled on successful forums supported by National Research Council Canada (NRC), the CCIAQB has members representing government, industry and consumer groups from a wide geographical distribution across Canada.

The mandate of the CCIAQB is to: solicit and review relevant information; identify gaps and issues; provide discussion forum; recommend studies; develop "best-of-knowledge" positions and best practices; disseminate knowledge; promote adoption of uniform requirements, best practices and guidelines for the design and operation of buildings; and provide guidance for evaluation of solutions and technologies.

As a first step in fulfilling its mandate, the CCIAQB determined that it was imperative to gain an appreciation of the level of knowledge of indoor air issues and improvement strategies currently held by building professionals. The Committee therefore commissioned a survey that would at once establish a baseline measure of knowledge as well as identify gaps in information.

The nationwide survey consisted of 150 interviews with IFMA building and property managers, and facility managers, conducted by telephone between October 15 and December 3, 2010. Members were randomly selected and only one member of an organisation was interviewed. The survey was designed by the CCIAQB with technical support from National Research Council Institute for Research in Construction (NRC-IRC). Telephone interviews were conducted by an independent research agency.

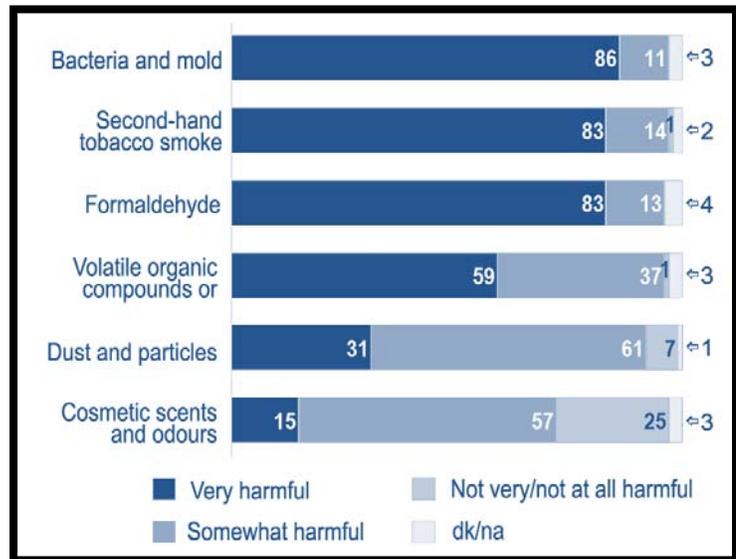
The survey lasted approximately 15 minutes and covered questions on the state of indoor air quality in their building; health risks associated with indoor air quality (IAQ), reporting of IAQ issues; strategies for reducing specific pollutants; design features that address IAQ; use of specific IAQ technologies and general details on the building being managed by the building professional being interviewed.

The results showed that the majority of buildings managed by the interviewed building professionals were built between 1981 and 2010 (57%). Fifty-three percent housed one

organisation, 25% housed 2 to 5 organisations. The number of occupants in the building ranged from 'less than 250' (19%), '250-500' occupants (24%), '500 to 1000' occupants (24%), '1,000-2,000' (16%) and '2,000 or more' (14%). The majority of buildings were 176,000 sq ft or more (50%), which, in part, reflects the request that if the building professional managed multiple buildings they should refer to their largest building. Seventy-three percent of buildings were office spaces. Twenty-two percent of buildings were green-rated.

In 2010 the impression of almost all building professionals concerning the indoor air quality in their building over a typical year is that it is 'good', as nearly half of the building professionals interviewed thought the air quality in their building was good (48%). One in three (35%) rate their building's indoor air quality as 'very good', and 11 percent say it is 'slightly good'. Only 3% say the air quality is poor and 2% describe the air quality as 'neither good nor poor'.

When asked about how harmful different IAQ pollutants were to human health, pollutants considered 'very harmful' were bacteria and mold (by 86% of respondents), second-hand tobacco smoke (by 83%) and formaldehyde (by 83%), volatile organic compounds (VOCs) (by 59%), dust and particles (by 31%), cosmetic scents and odours (by 15%) (See Figure 1). Pollutants considered 'somewhat harmful' to human health were VOCs (by 37% of respondents) dust and particles (by 61%) and cosmetic scents and odours (by 57%). Only a small number of respondents believe that the pollutants listed are 'not harmful' (bacteria and mold (by 3%), second-hand tobacco smoke (by 2%), formaldehyde (by 4%), VOCs (by 3%), dust and particles (by 1%) and cosmetic scents (by 3%).



**Figure 1**

*Building professionals assessment of the harmfulness of indoor air pollutants on human health*

According to building professionals, it is common for tenants to report health issues related to indoor air quality as almost nine in ten (86%) say that the tenants in their buildings report such issues. The health issues related to IAQ most commonly reported are headaches (by 29% of respondents), allergic reactions (25%), dry eyes (21%) and stuffy nose (16%). When asked what source or sources of indoor air quality pollution has the greatest impact on health or complaints about health in your building 26% of respondents said dust and particles has the greatest impact on health or complaints about health, followed by cosmetic scents and odours (reported by 25% of respondents), VOCs (by 20%) and bacteria and mold (10%). Temperature or being

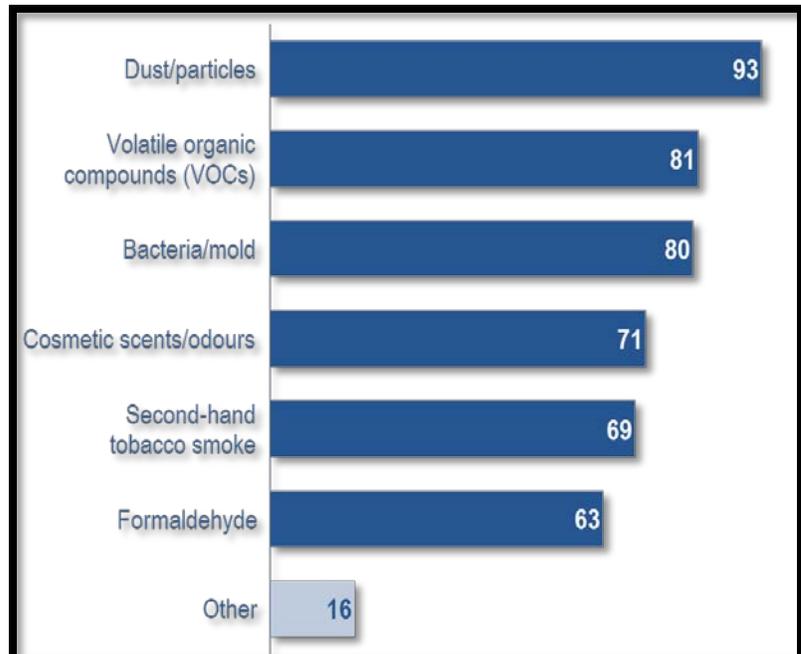
too hold or too cold was reported by only 6% of respondents and air circulation or flow was reported by 5%.

Most building professionals say they can reduce the concentrations of pollutants in their buildings, although this varies moderately by the type of pollutant (see Figure 2). Just over nine in ten building professionals say they can reduce the concentrations of dust and particles (93%), while eight in ten say the same of VOCs (81%), and bacteria and mold (80%). Seven in ten can reduce the concentrations of cosmetic scents and odours (71%), and second-hand tobacco smoke (69%), while just over six in ten can do so with formaldehyde (63%).

When asked very early in the survey which of three approaches – increased ventilation, pollutant source control or air cleaning – is the best way to improve indoor air quality in buildings, three in ten (30%) said that pollutant source control is most effective. The largest proportion believe increased ventilation (45%) is the best method, and one in four (25%) believe it is air cleaning.

Later in the survey, when establishing how pollutants are reduced within their building, building professionals were asked to name the design features incorporated into the building that are most commonly used to address air quality. Using air filters was reported by 38% of respondents, air quality or CO<sub>2</sub> sensors were used by 33%. Other design features include humidifiers (11%), HVAC air filtration (10%), dehumidifiers (7%) and the location of air intake (5%). Very small proportions (2% or fewer each) mention having HVAC cycling/scheduling, HEPA filters, heat-recovery ventilators, air fresheners and entrance mats.

When asked whether, to the best of their knowledge, there are design features or devices to address indoor air quality that are *missing* from their buildings the majority of respondents (63%) said “no”. The next most common answer was “don’t know” (13%), then air quality or CO<sub>2</sub> sensors or monitoring systems (9%). The 25% of building professionals who stated that there were missing design features to address IAQ said, unprompted, that the reason was because the devices were too expensive to purchase, install or maintain (51%), or because of design issues (38%) or because of the building age (30%).



**Figure 2**

*Type of IAQ pollutants and percentage of building professionals who believe they can reduce their concentrations in their building*

A significant number of respondents (79%) reported that, according to them, changing air filters was the most effective maintenance procedure for improving indoor air quality. This was followed by increasing ventilation rates/fresh or outdoor air intake (29% of respondents) and duct cleaning (23% of respondents). Inspections and monitoring, or preventive maintenance programs were viewed as a maintenance technique for improving IAQ by 14% and 13% of respondents, respectively.

Air filters were viewed as ‘very effective’ in improving IAQ by 91% of respondents. Increasing ventilation rates/fresh or outdoor air intake was viewed as ‘very effective’ by 67% of respondents. Duct cleaning was viewed as ‘very effective’ by 46%, as ‘somewhat effective’ by 40%, ‘not very effective’ by 9% and ‘not at all effective’ by 2%. Cleaning with low-emission products was viewed as ‘very effective’ by 41%, ‘somewhat effective’ by 46% and ‘not very effective’ by 31% of respondents. Other maintenance techniques were viewed as primarily ‘somewhat effective’, ‘not very effective’ or ‘not at all effective’.

In depth questions covered the selection and use of four technologies designed to improve indoor air quality: 1) central heating, ventilation and air-conditioning (HVAC) air filtration systems, 2) heat recovery ventilators, 3) duct cleaning and 4) portable air cleaners. Questions covered the reasons for choosing a particular model or system, knowledge of rating systems for that technology, maintenance schedules, the impact of the system on IAQ, and how the impact was measured. The results can be found in the full report on the NRC-IRC website.



**Figure 3**  
*Building professionals' assessment of the effectiveness of maintenance techniques to improve indoor air quality*

Lastly, the most commonly identified person with responsibility for ensuring good indoor air quality in the building is the facility manager (63%). Other professionals or individuals who are mentioned as being responsible include property managers (18%), building owners or landlords (17%), operations departments (12%), building operators (10%), occupational health and safety personnel (9%), building supervisors (6%) and the occupants (6%). In relation to communicating with building organisations and occupants, 74% say they provide guidance on IAQ issues to the building organisations and occupants.

In conclusion, the results of the 2010 research reveal that building professionals are knowledgeable about traditional indoor air quality issues and solutions and the potential harm to human health. Most provide guidance to and field concerns from tenants about indoor air quality, which likely contributes to their sensitivity to the issue. There is also widespread confidence in the quality of the indoor air in their buildings, although many seem to recognize some room for improvement. Yet there is little sense of urgency for such improvement; most say they have the ability to reduce the concentration of specific pollutants, and few know of design features missing from their buildings that could make a difference.

For more information on the survey visit the NRC-IRC website: <http://www.nrc-cnrc.gc.ca/eng/projects/irc/air-initiative/cciaqb.html>. For more information on the CCIAQB contact the Secretary, Luc Saint-Martin at 613-993-7844, e-mail: [luc.saint-martin@nrc-cnrc.gc.ca](mailto:luc.saint-martin@nrc-cnrc.gc.ca).

#### *Acknowledgements*

The CCIAQB and NRC-IRC would like to thank IFMA and the Canadian IFMA members for their participation in the survey.

#### *References*

Thompson, A. Survey on Building Manager's Knowledge of Indoor Air and Improvement Strategies, Ottawa: Institute for Research in Construction, National Research Council Canada, February 11, 2011. (NRCC-53981)