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Fresh air in your home: what the government is doing to make it right Van De Ven, L.

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Fresh Air in Your Home

WHAT THE GOVERNMENT IS DOING TO MAKE IT RIGHT



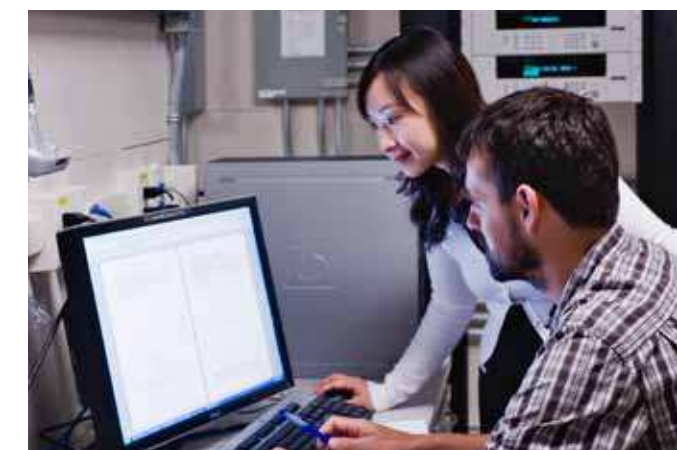
NRC researches Andrew Lowe, Daniel Booth, Liang (Grace) Zhou and Iain Macdonald.

Canadian researchers work diligently to close the gap between indoor air quality and tight home construction.

Energy efficiency is becoming a key component of modern-day construction as homeowners are searching for the most tightly-built, energy-efficient homes on the market.

It's a huge change from 60 years ago, when home construction was looser, with more opportunity for air and energy to escape. But with

homeowners know very little about indoor air quality, and probably know even less about the role that construction can play in ensuring the quality of the air inside their house. But there could be a reason for that — very little accessible scientific data exists on the subject. That's something the National Research Council Institute for Research in Construction (NRC-



these air-tight improvements, comes a hidden catch — one that many homeowners don't even know about.

The tighter a home, the less energy escapes. But tighter construction can affect airflow and indoor air quality as well, and not for the better.

Despite the importance of clean air inside the home, Canadian

IRC) is currently trying to remedy, with an ongoing study called the Indoor Air Initiative, led by the NRC's Indoor Environment Program.

"Canadians spend a lot of time indoors — up to 90 percent depending on your profession," says Dr. Hans Schleibinger, group leader for the project. "Indoor air quality is very important, and poor indoor air quality can also

Contributors to Poor Indoor Air Quality

What is it, exactly, in a home that can make someone sick?

It depends on many factors, including the individual and the house involved. At its most rudimentary, everyone needs enough air to breathe, which is why homes need ventilation. Like humans, houses need to replace the air you've breathed with fresh air from outside, and having enough oxygen available makes a difference to basic human functioning. According to the Lawrence Berkeley National Laboratory's database on scientific findings related to indoor air quality, multiple studies in office settings have reported that speed and accuracy among workers increases with better ventilation.

But ventilation doesn't just replace the carbon dioxide we exhale; it also serves to exhale a building's own waste.

For example, harmful VOCs, or volatile organic compounds, are gases that can emit from certain building materials, including paints, plywood, particleboard and glues. Beyond building materials, the materials used in some furniture, or even the office photocopier, can also emit the same toxic gases. VOCs contribute to the symptoms of Sick Building Syndrome.

Mould, dust mites and the nitrogen oxides released by cooking can also have an effect on indoor air quality, as can cigarette smoking inside. But some individuals will be more sensitive to those air quality issues, says Dr. Menn Biagtan, Program Manager for the British Columbia Lung Association. This includes not only asthmatics or others with allergies, but also the elderly and people with specific sensitivities to poor air quality.

"If you're concerned about outdoor air quality," Biagtan says, "indoor air quality should also be a concern."



The Honourable Gary Goodyear in the control room of the NRC Indoor Air Research Laboratory with Dr. Pierre Coulombe.

make people sick, especially those with asthma and allergies."

Which is why, two years ago, the NRC-IRC was awarded \$8 million in federal funding to start work on the Indoor Air Initiative, hoping to fill some of the knowledge gaps that exist between indoor air quality and home construction. The project is one part of the federal government's Clean Air Act, a \$1.9 billion strategy that is otherwise largely outdoor-air focused.

The aim of the Indoor Air Initiative is to increase scientific knowledge and to provide information to both the construction industry and to homeowners. The study will last for a total of four years. "The whole study will end by March 2011, and then the comprehensive results will be released," Schleibinger says.

The results will draw from the three overall components that make up the NRC-IRC initiative. The first, and most extensive, is a study with field and lab components, looking at ventilation's effects on indoor air quality in the home, and examining how it impacts health. The second part will analyse commercially available products and services that claim to improve indoor air quality, gauge their merit, and create a labelling system to help homeowners make smarter, healthier choices in the future. The third and final goal is to form the Canadian Committee on Indoor Air and Buildings, which serves to monitor the direction of the research itself and to offer feedback along the way.

"This investment will help the Canadian construction industry to design, produce and implement better ventilation systems," says Canada's Minister of State, Science and Technology, Gary Goodyear. "It will also help consumers choose energy-efficient and affordable ventilation systems that help improve air quality at home."

Goal 1: Examine the Links Between Home Ventilation and Indoor Air Quality

Exactly how important is ventilation when it comes to indoor air quality? While the NRC-IRC's research results won't be available for another year and a half, related research on the subject reveals some of the connections that exist between proper ventilation and the quality of indoor air.

The Lawrence Berkeley National Laboratory, a United States Department of Energy lab managed by the University of California, has compiled a database of information on indoor air quality, including information on the effects of ventilation specific to commercial and school environments. Their data shows strong evidence that buildings with increased ventilation rates lead to, on average, better work and school performance, and fewer absences. Office buildings with increased ventilation have been shown to have anywhere from 10 to 80 percent fewer cases of Sick Building Syndrome (SBS).

Symptoms of SBS are thought to be caused by poor indoor air quality, including the irritation of eyes, nose, and throat; headaches; fatigue; coughing; and tight chest. With SBS, these symptoms will occur at work, then improve once away from the office.

Despite this information, very little research has been done on ventilation as it pertains to the home environment. That's about to change, as the NRC-IRC hopes to investigate ventilation as part of the first component of its Indoor Air Initiative. This first part of the project includes a field study taking place in the Greater Québec City Area, involving approximately 100 families, all with asthmatic children. For one year, researchers will

Public awareness on indoor air quality is an important next step for the construction industry and it won't be long before this issue becomes just as relevant as energy efficiency.

monitor both the existing indoor air quality — and home ventilation measures — as well as the child's health. Later, changes to the ventilation will be introduced, and the indoor air quality and health components will continue to be monitored, as well as any changes compared against a control group. An Indoor Air Research Laboratory was constructed on the NRC's Ottawa campus to assist the research team in recreating the conditions within each family's home, and to test ventilation options. [SEE THE QUÉBEC CITY STUDY PG. 94]

"This kind of study design has never been followed through worldwide," says Schleibinger. "Of course there are many studies on indoor air quality, but this type of study design is very unique."

Even though the National Building Code has addressed the need for mechanical ventilation in new homes since 1990, Schleibinger says, Canada currently has no hard scientific standards for ventilation. "There are some recommendations as to the minimum air supply, but there are no hard regulations," he adds.

This can be particularly dangerous in today's climate, which emphasizes energy efficiency over everything else. What makes it particularly dangerous, he says, is that energy efficiency is easily quantified through science, which means proof for its effectiveness is easily obtained; this isn't the case with indoor air quality.

"On one hand, the drive towards energy efficiency is very strong, and we as engineers can calculate the potential energy conservation very well," Schleibinger states. "But on the other hand, if we reduce the ventilation rate we don't know exactly what that means in terms of air quality."

"We assume the main focus of Canadians is energy conservation, because spending money on energy consumption hurts," Schleibinger says. "Obviously a deterioration of your health hurts as well, but that's [something that would happen] down the road, and not everybody gets sick."

Air quality, then, isn't as front-and-centre with homeowners as energy efficiency is, but part of the NRC's goal is to make it a priority. Schleibinger expects that the council will release some of the group's preliminary information on ventilation sometime this year, followed up by the final release of information in 2011. But it won't just be reported in scientific journals or distributed to the construction industry. The idea is to also provide pamphlets and web-accessible information to homeowners themselves, so that they can learn about indoor air quality.

Goal 2: Create a Scientific Analysis of Solutions and Services

What do portable room air cleaners, heat/energy recovery ventilators and professional cleaning have in common? All of them make certain claims as to the benefits they provide in improving a home's indoor air quality. What doesn't exist in Canada right now are scientific standards to quantify those claims, which would allow homeowners to compare solutions and services effectively in order to choose the right technology for their needs.

That's where the second component of the NRC-IRC's Indoor Air Initiative comes into play, studying the products and services available to help consumers make well-informed decisions on solutions to poor indoor air quality — including non-ventilation solutions, stand-alone systems or in-duct systems that claim to reduce air pollutants.

Right now, adds Dr. Zuraimi M. Sultan, an NRC-IRC research officer working on this component of the Indoor Air Initiative, manufacturers often advertise their products as solutions to poor indoor air quality, and consumers are turning to those products for their perceived benefits, especially for benefits related to health. Some of these claims, though, aren't entirely substantiated, says Sultan.

"There is a need to develop performance evaluation protocols to test and assess the effectiveness of indoor air quality solutions," Sultan continues. "This will provide a solid foundation for a system that could eventually be used to label and rate products and technologies that claim to improve indoor air quality."

Currently, no such rating systems exist in Canada to evaluate the performance of indoor air quality solution technologies, which is why, according to Sultan, this research is "critically important." Consumers have no way of knowing whether a specific technology is right for them, or if it will even prove effective.

Worldwide, some countries do have indoor air quality standards and do rate certain aspects of product performance. "But," Sultan says, "these are not comprehensive and not up-to-date because new technologies are always emerging and scientific data on these products and technologies are new. The protocols to be developed through this project will be state-of-the-art." The NRC



NRC researchers take pride in their attention to detail in this study that is so significant to Canada's growing awareness of indoor air quality.



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itself hopes to keep from falling into that trap of quickly becoming outdated as new technologies are introduced once the study is done, by continuing to work with stake holders and standards organizations to evaluate protocols even after the study is complete.

Test protocols for this component of the project will in part be created with help from a Technical Advisory Committee, which will assist in selecting the technologies to be tested and help create the evaluation protocols. Those protocols will also be informed by a technical expert workshop scheduled to take place this winter, where industry stakeholders will gather to discuss indoor air quality solutions and technologies.

Goal 3:

A National Committee Dedicated to Indoor Air Quality

The final component of the NRC's Indoor Air Initiative was one of the first completed: the creation of The Canadian Committee on Indoor Air Quality and Buildings. The CCIAQB was formed

to steer the NRC's research and to get feedback from interested parties across the country.

Currently the committee has 16 cross-disciplinarian members from all over Canada, including one member from the Canada Mortgage and Housing Corporation, and another from the Manitoba Lung Association.

"We want to seek input from different types of stakeholders all across Canada, to find out what kinds of indoor air quality problems exist in the different provinces and territories," Schleibinger says. "And it's basically also for us a way to steer or support our research focus."

Forward Thinking

What will the NRC-IRC's research mean for homeowners across the country? By providing scientific standards and information, the hope is that it will build awareness on the important issue of indoor air quality in the home.

Schleibinger anticipates that the information provided by the NRC will help create a more informed public, one that knows exactly what to ask for when it comes time to buy a new home. □

The Québec City Study

INDOOR AIR INITIATIVE

The results from these studies could be life-changing, both for the construction industry and anyone suffering from respiratory problems, including — but not limited to — asthmatics. This study will add to the research on home ventilation, and examine the effects that ventilation and airflow can have on indoor air quality, and on health in general.

THE STUDY: 1ST STAGE

The quality of the final research, of course, depends on the quality of the study itself, which is why many of the details of this Indoor Air Initiative project were laid out beforehand by the research team. Research itself began more than a year ago, when families were approached at the Centre Hospitalier Universitaire de Québec (CHUQ), a research hospital in Québec City. All of the families had asthmatic children, and upon further examination all had homes that fit the criteria of the NRC-IRC. Once the final group was selected, the field study could begin. The first step was designed to monitor existing conditions. The air quality of each family's home was measured, and ventilation techniques and home layout components assessed, while medical examinations and questionnaires helped to establish the ongoing health of the children involved. Three separate visits over a year established the analytical base at each house, providing researchers with the information they needed to mimic conditions at their Indoor Air Research Laboratory in Ottawa.

THE STUDY: 2ND STAGE

After a year, the next part of the study begins, the home interventions. At this time, new ventilation and airflow technology will be added, all changes informed by the research conducted in Ottawa. A new round of measuring will take place as well. As is standard in scientific studies, a control group will be maintained throughout to allow for comparison.

Schleibinger hopes the study will achieve its ultimate goal, which is not just to improve public awareness, but also to improve the overall health of Canadians. "Investigating the link between indoor air quality and human health is indeed the primary goal of this initiative," adds Gary Goodyear, Canada's Minister of State, Science and Technology.

A GIANT STEP FOR ASTHMA

Christine Hampson is excited to see any kind of science-based research on this subject, especially as it relates to asthmatic children. As President and CEO of the Asthma Society of Canada, she agrees with Schleibinger, saying that not a lot of information currently exists in regards to indoor air quality and ventilation, and how our interior environment might affect sufferers of respiratory diseases like asthma.

The NRC-IRC hopes to change that, by adding greater insight to the information already available, with the goal of improving everyone's health, not just asthma sufferers. The Québec City field study and the Indoor Air Research Laboratory are a large part of that goal.