CONSENSUS

Building Smarter Communities

Intelligent and Sustainable Buildings

On World Standards Day, October 14, 2008, the Standards Council of Canada joins the international community in celebrating the importance of standards-related activities and pays tribute to the collaborative efforts of the thousands of individuals that give of their time and expertise to this important work.

The October 2008 edition of CONSENSUS Magazine, *Building Smarter Communities*, is dedicated to the World Standards Day theme. Articles illustrate the many ways that standardization contributes to the construction of intelligent and sustainable buildings, as well as to the advancement of innovative technologies and smart systems that are shaping Canadian lives.

CONSENSUS

*Canada's
Standardization
Magazine*

Standards Council of Canada
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Canada

In this issue...

FOOD CHAINS and SAFETY linked through accreditation

Early last summer, major Canadian restaurant chains took tomatoes off their menus because of salmonella outbreaks in several U.S. states. Less than three months later, grocery stores withdrew 23 brands of packaged meats, and Maple Leaf Foods closed a Toronto plant after the products were linked to dozens of cases of potentially fatal listeriosis. These high-profile cases show that food safety issues can cost companies untold millions in lost revenue, and also how easily they can become international events involving parties at many levels of the food supply chain.

Kerry Ingredients and Flavors' Granby, Quebec facility is right in the middle of the food supply chain as part of a global operation that develops, manufactures, and delivers technology-based foods, flavours and ingredients for the food and beverage industry. The Granby plant, which employs 55 people, prides itself on quality management and food safety. For many years it has met the requirements of the internationally recognized Hazard Analysis Critical Control Points (HACCP) food safety system, and in 2000 it became certified to the International Organization for Standardization's quality management system standard (ISO 9001).

By 2006, when the ISO 9001 registration renewal came up, Kerry had another quality control option—ISO's Food Safety Management Systems standard (ISO 22000). The standard is specifically aimed at organizations in the food chain that need to demonstrate the ability to control food safety hazards and to ensure that food is safe at the time it is sold.

Published in 2005, ISO 22000 was prepared by an ISO working group of private- and public-sector members from 45 countries. Its approach was to marry the management systems approach of the ISO 9000 series with the food-industry specific HACCP, producing a truly international, auditable management system. To date more than 70 countries have adopted ISO 22000, and more than 1,100 companies worldwide have had their food management system certified. The beauty of the standard is that it is suitable for any business anywhere in the food chain, including equipment producers, packaging companies, cleaning and pest-control operations, and additives and ingredients companies like Kerry.

Kerry worked with the Bureau de normalisation du Québec (BNQ), one of the certification bodies accredited by the Standards Council of Canada (SCC), to certify companies' food management systems to ISO 22000.

"One of the most important advantages of ISO 22000 certification is that the standard is internationally recognized," says Christine Dupuis, manager of ISO 22000/HACCP certification for BNQ. "It is, to my knowledge, the most complete food safety management system and almost the only one with the continuous improvement requirement."

"When it came time to renew the ISO 9001 registration or go in a different direction, the company decided that ISO 22000 was more appropriate," says Kerry's Mélanie Tétreault, who, as the plant's Quality Assurance/Quality Control and regulatory supervisor, led an eight-member team to implement the process. "It met more needs in improving the quality and food safety of our products."

At the same time, the company also decided to meet the requirements of the Food Safety Enhancement Program (FSEP) of the Canadian Food Inspection Agency. They started the certification process in the summer of 2007.

As project leader, Tétreault received training at the BNQ offices, and then trained her quality control team. It was an intensive process, which required a great deal of time and effort by team members on top of their normal responsibilities.

"Management was very involved," says Tétreault. "We revised our quality and safety policies, and communicated often with employees to keep them updated on the project. We had employee training and a lot of internal audits to make sure we were prepared for the first audit."

The first BNQ audit took place in November 2007 and the final three-day certification audit was completed in March 2008. The company received certification in June 2008.

The project was not without challenges, according to Tétreault. There was a learning curve, since the whole process of validating control measures was new to the team. Production employees had to be trained to get them involved in the process. The revision of the HACCP analysis of ingredients and production processes was more detailed than anticipated. Each step of the way, employees had to make sure they met the requirements of both ISO 22000 and FSEP, and the audit itself was also very challenging.

But the rewards make it all worthwhile. "The customers' response has been very positive—they are happy to know we care enough about quality and food safety to achieve this certification," says Tétreault.

Internal benefits include an improved understanding of the production process, products and ingredients.

"Employees are much more aware and attentive to their work and the environment; and they are more proactive in resolving problems before they actually occur," Tétreault explains. "The process gets management involved, provides better controls, and [ultimately] provides our customers with a safe product."

Kerry is not the only Canadian company to certify their food management systems to ISO 22000. And while it is the first company to certify with BNQ, other organizations are working hard to complete the process, says BNQ's Dupuis. "We plan to have some more companies certified by the end of 2008 and/or beginning of 2009." ∎

Intelligent Communities Think Green

*W*hat started out as punishment for an environmental offence has become an opportunity for leadership.

In the late 1990s, Alberta's department of the environment took the City of Calgary to task over a large chlorine gas release from one of the city's water treatment plants. As a result, the city was required to achieve certification to the International Organization for Standardization's environmental management systems standard (ISO 14001) for the city's water treatment plants. It was the beginning of a whole new way of thinking by the city's council and staff.

"When the water treatment plants were directed to achieve certification to ISO 14001 to improve due diligence, it just made sense to do it on a broad scale to improve due diligence across the corporation", says

Shannon Abbott, the team leader for the Calgary's Environmental and Safety Management Business Unit Service.

In 2003, the City of Calgary became the first municipality in North America to become certified to ISO 14001.

"We've gained a much higher level of environmental awareness across the corporation," Abbott says. "Everyone, from the city manager to those who keep our roads clear in the winter, knows the environmental implications of their jobs. And everyone takes those implications very seriously."

Calgary is part of a wave of Canadian cities moving towards giving environmental development a place alongside economic and social development in order to become more intelligent and sustainable in its operations.

André Lambert, the deputy director responsible for the Federation of Canadian Municipalities (FCM)'s Green Municipal Fund, says there has been a definite movement towards implementing environmentally, socially and economically sustainable practices by municipal governments.

"There's lots of great work at the municipal level," he says. "Canadian municipal governments are showing real leadership when it comes to sustainable development."

FCM is providing some direct support to the movement through its Green Municipal Fund (GMF). The Fund provides low-interest loans and grants and information resources to assist municipal governments in developing communities that are more environmentally, socially and economically sustainable. Since the inception of FCM's Fund in 2000, it has committed more than $375 million in grants and low-interest loans to support nearly 700 leading sustainable community development projects. These GMF-supported initiatives are leveraging almost $2.2 billion of economic activity in nearly 350 communities across Canada.

Lambert points to one of the FCM's own programs as proof that the movement towards sustainable and intelligent communities is growing in Canada. The Federation hosts an annual study tour to various cities so that elected municipal officials and senior staff can see for themselves how those communities have implemented environmentally sustainable practices into their operations.

In 2008, the delegation visited sites in the city of Vancouver, Metro Vancouver, the resort municipality of Whistler, the city of Victoria and the Capital Regional District. The 2008 FCM Sustainable Communities Mission builds on last year's Mission to Alberta, which was the first year since the FCM started offering these tours that all the stops included were Canadian municipalities.

Lambert says the Federation believes a sustainable community integrates environmental, social and economic objectives in its operations. Eventually, he says, this blend of elements produces long-term benefits far greater than the costs of the changes.

In Calgary, Abbott says, certifying the environmental management system of a municipality that is better known for its rodeos and connection to the petroleum industry, to ISO 14001, was a challenge.

"It certainly hasn't been easy," she says. "We know why we're the first municipality in North America to have done this; it was a lot of work and there are still things to improve on."

However, she says, the city is starting to see the benefits of its commitment to the environmental management system.

Abbott says the City has become more effective in its day-to-day work since becoming registered to the standard.

"We're much more organized and more procedural in our documentation," she says. This has resulted in time savings, especially when it comes to training new staff in the high-turnover workplace.

"It used to be that when someone left the organization, so did a great deal of knowledge," adds Abbott. "By having things documented and the records managed properly it has helped reduce those problems when people leave for another job or retire. The information now stays with the organization."

The City of Fredericton has also reaped environmental benefits from its move to become an intelligent city. After about half-a-decade of transforming itself from a university and government town to a knowledge and information technology hub, the city became the first in Canada to achieve certification to the ISO standard for quality management systems (ISO 9001) in 2004.

...a wave of Canadian cities are moving towards giving the environment a place alongside economic and social development in order to become more intelligent and sustainable in their operations.

Don Fitzgerald is the executive director of the city's business development organization, Team Fredericton. He says becoming certified to ISO 9001 was a logical part of the city's focus on sustainable development.

"It's striving for quality and excellence, and it's evidence to our citizens and the world at large that this municipality is well-run, that it takes its challenges seriously," explains Fitzgerald.

One of the challenges the city is tackling is that of reducing its negative effect on the environment. The city has set a goal to reduce its corporate greenhouse gas emissions by 20 percent, and community greenhouse gas emissions by 6 per cent between 2000 and 2010. Fredericton is also focusing on becoming the first city in Canada to reach compliance with the Kyoto Protocol.

Fitzgerald says the certification goes hand-in-hand with this goal.

"It's a pillar of our development strategy: say what you're going to do, do what you said," he explains.

So far, the city has upgraded municipal buildings to improve their energy efficiency, reduced the size of its municipal fleet of vehicles and replaced some older

vehicles with hybrid models, and changed incandescent street lights to LED units.

Projects such as these have led to the city winning a number of environmental awards, such as the Canadian

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Council of Ministers of the Environment (CCME) *National Pollution Prevention Award for Greenhouse Gases Reduction* in 2006, and the 2006 *Environmental Leadership Award*, as well as commendations from Environment Canada, and the now environmentalist, former US Vice-President Al Gore.

In May of 2008, Fredericton's environmental efforts and its knowledge-friendly infrastructure of wireless computer networks helped gain the city recognition as one of the *Top Seven Intelligent Communities* in the world by the Intelligent Community Forum, a New York-based think tank.

Fredericton has several more projects in the works, including the set-up of marked bicycle lanes throughout the city, introducing an anti-idling policy for municipal vehicles in the winter and summer, and replacing ageing water and sewer pipes in an effort to conserve fresh water supplies.

Fitzgerald says these endeavours are all part of what Fredericton imagines for its future as a smart community.

"We are an economy driven by knowledge firms – in the ICT sector, in the engineering sector, in geomatics – that's who we are," he says.

"We're trying to set the conditions so the next breakout economy in Fredericton is the green economy. ∎

Energizing Canada's Wind Power Industry

Canada's wide open spaces are the perfect stage for the power of wind, that clean, green energy that the sky is giving out for free. But for all of its gifts, experts say Canada is lagging in the global push toward wind power.

"I think Canada was a bit late in realizing what an opportunity it presented," says Sean Whittaker, vice-president of policy for the not-for-profit Canadian Wind Energy Association (CanWEA).

CanWEA aims to encourage investment in 10,000 MW of wind capacity by 2010, providing five per cent of Canada's electricity—compare that to Denmark, which already gets 22 per cent of its energy from wind, and Germany and Spain, which each get eight per cent of their electricity from wind power.

Whittaker says 15 to 20 per cent of electricity can be generated by wind without having any adverse effects on the existing grid. Canada can become a leader in wind power, he says, but first the country needs a wind energy strategy. His agency advocates making wind an important part of Canada's electricity mix, recognizing that this country "is very gifted in terms of resource potential and ability to integrate wind."

Whittaker cites figures from the Global Wind Energy Council estimating that between now and 2020, anywhere from $800 billion to $1 trillion will be invested in the wind industry. Those investors are looking for a stable, long-term policy environment.

But first there are the challenges, says Morel Oprisan,

the deputy director of renewable energy technologies with Canada's department of Natural Resources (NRCan).

In the past few years, Oprisan says, Canada's installed wind energy has grown tremendously. Currently, Canada stands at close to 2,000 MW.

...the Global Wind Energy Council estimates that between now and 2020, anywhere from $800 billion to $1 trillion will be invested in the wind industry.

Oprisan cites the "not in my backyard" attitudes among communities, who stall developments with worries about noise and obstruction. Deeper, there is the fact that turbines are only as good as the wind in the area they're staged. Regulations are another key factor; energy remains a provincial matter and every province has its own set of regulations.

"This is where it's very important," Oprisan says. "The kind of work we've been doing together with the industry in getting national standards in place to make sure there's the same consistency in installing wind turbines across the country."

For the past three years, NRCan has been working with the Canadian Standards Association (CSA) as well as the Standards Council of Canada. Canada is now a full member of the International Electrotechnical Commission's committee (IEC TC 88), where the international standards for wind turbines are being created. The standards cover topics ranging from design requirements (IEC 61400-1) to noise measurement techniques (IEC 61400-11) to the measurement of power performance (IEC 61400-12-1).

Eventually adoptions of these standards are likely to be put forward for approval by the Standards Council of Canada as national standards.

The national standards will cover a range of issues, such as turbine performance, turbine safety, and grid connections to the power utility. Oprisan says most of these standards will be issued this year. As with all standards, they are voluntary at this stage. The marketplace is critical in making them work, he says, and the power utilities are active in the standards committee developing them.

Whittaker also looks toward industry standardization as a hopeful step in realizing wind's potential.

"Standards are often overlooked as being incredibly important for growth in any industry," he says. "And it's something that we take very seriously—from wind assessment, to developing standard municipal policies, component manufacturing and finally grid integration, standards play a vital role."

Standards already have a hand in shaping wind power. SaskPower's Cypress Wind Power Facility became the first electric utility in Canada to be certified to the International Organization for Standardization's environmental management standard, ISO 14001. It's meant a range of benefits: increased confidence that environmental risks are managed; better trained and more effective deployment of staff; improved efficiency of operations; and increased credibility with regulators and customers. Meanwhile, Turbowinds Canada Inc. complies with ISO 9001 quality standards for its enterprise that designs and manufactures wind and pumping turbines.

Beyond industry, standards also stand to empower communities with economic, social and environmental benefits. Whittaker says that potential is particularly great for transforming rural communities.

"We see 'wind', by its characterization as more of a rural facet for development—you need fairly open land areas to accommodate wind energy development," Whittaker says. "And what we find in a lot of cases is that

"Standards are often overlooked as being incredibly important for growth in any industry ... standards play a vital role."

Sean Whittaker, Canadian Wind Energy Association

in the end the development of wind farms is a real shot in the arm for rural communities. The municipal tax base goes up, so that kind of economic diversification is really important to rural communities, particularly when a lot of resource-based industries are in decline."

Whittaker is hopeful wind will usher in smarter, more sustainable communities.

"We've got a long way to go," he says, "But Canada's wind potential is one of the best in the world." ■

Making green labels *stick*

Energy efficient. Certified organic. 100% natural. Environmentally friendly. These and many other "green" claims now appear on the packaging of items from cleaning supplies to health and beauty products. But should consumers believe them?

TerraChoice Environmental Marketing believes people shouldn't necessarily put their faith in these green claims. Last year, the environmental marketing firm randomly surveyed six big-box stores about common consumer products ranging from toothpaste to printers. It discovered that many—99 per cent of 1,018 consumer products bearing 1,753 environmental claims—were guilty of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service, a practice TerraChoice calls 'greenwashing.'

With studies like the one conducted by TerraChoice revealing such high numbers of companies guilty of greenwashing, more had to be done. To that end, the Competition Bureau of Canada partnered with the Canadian Standards Association (CSA) to develop a best practices guide which makes the information easily accessible to businesses and consumers.

"The guidelines were developed to provide business with tools on how they can comply with the Competition Act when doing marketing and advertising their green products and services," says Pamela Wong, a spokesperson for the Competition Bureau of Canada. "In turn, we hope that will provide consumers with greater assurances on the claims about products out there."

The guidelines are based on CSA's 2000 adoption (CAN/CSA-ISO 14021) of the International Organization for Standardization (ISO)'s standard for environmental labelling (ISO 14021), a standard developed with the intention of providing an international harmonization of widely used self-declared environmental claims.

The *Environmental Claims: A Guide for Industry and Advertisers*, focuses primarily on self-declared environmental claims that are made by manufacturers, importers, distributors, or any person who promotes a product/service or business interest that is likely to benefit from the product's environmental claims.

"These claims are usually based on a single attribute,

such as a manufacturer's claim that a product is "biodegradable," without taking into account the environmental impact of a product's entire life cycle, and without independent verification or certification by a third party," says Ahmad Husseini, manager of Standards Development at CSA. "However, these claims must be verifiable, accurate, meaningful, and reliable if consumers are to understand the value of the environmental information they represent, such as their ability to protect the environment."

Based on stakeholder and public feedback, the guide has been updated from previous versions to include new and relevant examples as well as interpretive language that better reflects the Canadian marketplace. The guide does not address all environmental claims in use today, but does discuss a number of commonly used claims and practices, and sets the rules for such claims.

Mark Girvan, manager of the Arbour Environmental Shoppe in Ottawa, feels the guide is very thorough in scope though he does have one concern.

"Some of the elements may be difficult to implement," says Girvan, giving as an example a business' need to substantiate a claim on a label. "There may not be enough room, and to have a fallback to put a toll-free number might not work if a company isn't big enough to have a toll-free number. I just see some implementation problems."

Another question raised by Girvan is who will be enforcing the guide. "It doesn't discuss procedures, like what staff from whom would be handling it."

According to Wong, enforcement of misleading advertising falls under the Competition Bureau's responsibilities. As part of its mandate, the Bureau enforces the false and misleading provisions of the *Competition Act* and the *Consumer Packaging and Labelling Act.* Environmental claims, like all other marketing claims, are subject to these laws, and must be verifiable with supporting data that is accurate and readily available to law enforcement agencies, such as the Bureau, upon request.

Wong points out the guidelines are just that— guidelines. "They are not law, but they will help businesses to avoid making misleading claims and comply with the laws enforced by the Bureau," she explains.

This education phase will see the Competition Bureau and the CSA set up information sessions over the next year for businesses, business groups and associations across Canada. Businesses will have one year to comply before enforcement begins.

"Those making claims of conformity with the standard are required to consider the impact of the product or service on the environment and be able to support the claim with verifiable data," says Husseini. "If the principles and specific requirements of CAN/CSA-ISO 14021 as recommended in this guide are complied with, it is unlikely that environmental claims used in the promotion of a product/service or business interest would raise concerns under the statutes administered by the Competition Bureau. The release of this guideline is an important milestone for Canada."

Overall, Girvan is optimistic about the guide and its impact on his business.

"The guide is very, very good," he says. "There will be a time impact as we will have to scan packages for consistency since almost everything we sell has a claim on it, but the ends will justify the means; it will not be an undue burden."

He adds that the guidelines will make stores more aware of their own signage as well. "It will certainly have an impact, but it will be positive." ∎

Building integration: Green and Smart!

Abiding by strict environmental rules can at times seem as much like a religion as a lifestyle. It's often difficult and even conflicting to balance the intention to live green with the attractions of modern convenience. Moving into igloos, or pit houses made of mud, is sustainable yes, but not realistic for most people.

Buildings are not only a symbol of modern convenience, they are often hubs of economic activity, and model comfortable living. They are also environmental enemy number one. From consuming natural resources, to polluting the air during their construction, to draining energy supplies during their life cycles, buildings (commercial and residential) top transportation in the total amount of carbon dioxide being emitted into the atmosphere. According to the U.S. Green Building Council, U.S. buildings are responsible for approximately 30 per cent of carbon dioxide emissions and 60 per cent of that nation's electricity use.

In Canada, buildings are responsible for 37 per cent of Canada's primary energy use and account for almost 30 per cent of greenhouse gas emissions, according to the Canada Green Building Council (CaGBC).

While building construction demand is not likely to subside anytime soon, in order to address environmental concerns, many engineers are opting to marry two concepts—buildings that are not only intelligent, but also green.

"There's so much energy being consumed by the building fleet in Canada that everything you can do to improve performance in buildings is important to Canada and its climate change goals," says Glenn Tubrett, Director of Built Environment at the Canadian Standards Association (CSA). "And I think constructing green buildings and incorporating automation systems is a natural evolution."

> *Though standards related to building codes and installation have existed for decades, green intelligent buildings have paved the way for new building-related standards.*

Industry Canada defines an intelligent building as, "equipped with the telecommunications infrastructure that enables it to continuously respond and adapt to changing conditions, allowing for a more efficient use of resources and increasing the comfort and security of its occupants."[1]

Smart buildings save energy by connecting once-separate features like heating, air ventilation, air-conditioning, fire safety, security, energy and lighting processes into one centralized system that monitors each process and reduce any counterproductive energy usage. In building-speak, this is known as 'building automation.'

Lighting is often a source of much wasted energy. Lighting systems typically generate more heat than light. During summer months, lighting may even cause air conditioning to turn on to cool down a room, wasting even more energy.

Automation systems in buildings contain smart features that are designed to reduce energy usage: occupancy sensors that detect whether people are present and turn the lights on accordingly; computer systems that automatically turn off when an employee has left the office building; and boardrooms that are configured to modify air flow.

Although including green features in an intelligent building is not mandatory, under the umbrella definition of intelligent buildings, and vice versa, often the concepts overlap because the energy efficiencies achieved are

beneficial on both ends. When heating, ventilation, and air-conditioning systems are linked to an integrated system, these can be managed in a way that not only cuts down on unnecessary energy use, but also reduces costs.

"Most often if you have a building that has been given a gold, silver or platinum rating through the Leadership in Energy and Environmental Design (LEED) program as a green building, most often you will find integrated systems in the building," says Ronald J. Zimmer, President and CEO of Continental Automated Buildings Association (CABA). "A green building doesn't have to include integrated systems, but to not include any is very rare."

CABA is a not-for-profit industry association that distributes knowledge on smart buildings among its members and industry, and promotes the implementation of intelligent technologies in homes and buildings across North America.

Zimmer estimates that the return on investment from energy reduction and the incorporation of an energy management system into a building can reduce lifetime energy costs by 35 to 45 per cent. CABA is currently undertaking a research study called *Convergence of Green and Intelligent Buildings* that will quantify the energy savings and outline the long-term benefits to commercial institutions and multi-residential facilities of using both intelligent and green building features.

"Energy costs have skyrocketed," says Zimmer. "And that today is the biggest driver for integrated systems. People are feeling the pain in their bottom line and operating costs due to the high cost of energy."

Though standards related to building codes and installation have existed for decades, green intelligent buildings have paved the way for new building-related standards.

"The latest trend is looking at total performance of the whole building as a system," says Tubrett.

Standards are also necessary in this area to facilitate partnerships between once separate occupations like IT personnel, architects, building designers and building contractors.

"This begins at the earliest stage of design using a method called Integrated Design Process (IDP). IDP is a standardized protocol that brings architects, building operators, and engineers together," says Tubrett.

By bringing the design team together, IDP can reduce or even eliminate systems in order to achieve energy efficiency. Given that industry uses IDP, CSA is proposing a development project that would result in the publication of a Canadian national standard on IDP.

"The process includes feedback loops so all of the players come to the table, and keep communicating to each

other to make sure they have the most integrated design possible," says Tubrett. "This ensures the most efficient and energy-wise practices are being integrated from the beginning. This also avoids confusion and expense from design changes later in the development process."

Green awareness has resulted in environmentally savvy consumers who demand and expect greener products and services; consumers however are not the only proponents of environmental building practices.

"Green intelligent building is more mainstream than it was five years ago," says Tubrett. "Large architectural firms, building owners, government and consumers have helped push it along."

Smart standards for sustainable buildings

Several international standards published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) support the integration of greener, smarter features in buildings.

The committee *Building Environment Design* (ISO/TC 205) has developed standards on building automation control systems and numerous others specific to environmental design. Among them, ISO 16813 aims to assess a proposed design with criteria ranging from indoor air quality, to thermal comfort, and also energy efficiency; and ISO 16818 specifies terms and definitions used in the design of energy-efficient buildings.

Another committee—*Doors and Windows* (ISO/TC 162)—is developing standards to maximize the energy conservation of doors and windows. The standard ISO 15392 offers general principles on sustainability in building construction. And another committee—*Thermal Performance and Energy Use in the Built Environment* (ISO/TC 163)—is responsible for developing standards on the thermal performance of not only the whole building, but also the materials, products, components, elements and systems within.

ISO/TC 205 is also developing a standard that will provide guidelines to assess the energy efficiency of new buildings, and another that will provide methodology to assess the overall energy performance and environmental impact of buildings.

The IEC's Joint Technical Committee with ISO for information technology (ISO/IEC JTC 1) developed the ISO/IEC 14543 series of standards, which integrate information technology with a building's electronic system. With standards that cover management of an integrated system, wiring, frequency and control panels, these standards can help integrate the controls of a house's lighting; security system; heating, ventilation, and air conditioning systems; water control; and energy management, as well as household appliances.

A number of other IEC standards are being used to help conserve energy in the built environment. The technical committee for *Solar Photovoltaic Energy Systems* (IEC/TC 82) has published several standards around the use of solar energy in creating heat and electricity in structures; the technical committee for *Power Systems Management and Associated Information Exchange* (IEC/TC 57) has developed a number of standards for energy management system applications (IEC 61970-parts 1 to 501).

While no single ISO or IEC standard sets out all required criteria for green intelligent buildings, ISO's environmental management system series (ISO 14000) contains several standards that address the topic. For example, ISO 14001 provides requirements that an organization must adhere to in order to identify and control its environmental impact and improve its environmental performance.

Of course, there are numerous other technical committees in the process of developing new or related standards that can be used to increase the performance of buildings and lessen their impact on the planet. As technology advances and environmental concerns arise, members of ISO and IEC remain committed to finding standardization solutions that will improve environmental building performance. ■

ENVIRONMENTAL POLLUTANTS
decommissioned with standards

In December 2008, Paul Chénard, a certification specialist at the Canadian General Standards Board (CGSB), will be travelling to the Arkhangelsk region in northwest Russia to perform a surveillance audit at the Zvyozdochka shipyard.

Part of an international project to disarm and destroy nuclear-powered submarines in Russia so these doesn't harm the environment, CGSB is performing audits at the shipyard to ensure it meets the requirements of the ISO Environmental Management (14001) standard.

The audits are intended to determine whether the Russian shipyard continues to meet the requirements of its ISO 14001 registration.

"It's an interesting opportunity," says Chénard. "Most of our clients are within the private sector and this is definitely one of the most exotic locales where we've worked."

The audit is a small but vital part of Canada's contribution to a program that sees G8 countries working together to prevent terrorist groups from getting access to materials that can be used to create large-scale weapons.

One priority of this Global Partnership Program is the dismantlement of decommissioned nuclear powered submarines that were left in Russia following the collapse of the Soviet Union. Canada entered into a contribution

agreement with Russia to defuel and dismantle 12 of these submarines over a 43-month period which ended on March 31, 2008.

Before agreeing to contribute to this part of the project, Canada's Department of Foreign Affairs and International Trade (DFAIT) conducted an environmental assessment of the dismantlement project, and developed an environmental management plan with the Zvyozdochka shipyard.

The plan aimed to ensure that the Canadian-funded work would be performed in a way that didn't negatively affect the water, land and life around the shipyard, and would have only a positive impact on the environment.

In order to confirm that this aim was achieved, DFAIT asked CGSB to audit the plan against the ISO 14001 Environmental Management standard. This audit will take place over a series of three stages. The stage 1 audit was performed in July of 2007, and found the shipyard to be well-managed.

Chénard says the second audit will probably be similar to the first, even though the Canadian-contracted work has been completed.

"I'll likely have the chance to witness some of the activities going on at the time," explains Chénard. "The requirements of this audit are no different from the ones from the first one: I'll be looking at their emergency

plans, their training program, their environmental procedures, whether they've had an internal audit and management review—whatever is covered by the scope of the Environmental Management Systems standard."

There is a lot at stake in ensuring the shipyard is performing in an environmentally responsible way. DFAIT explains in a document outlining the steps involved in scrapping the submarines that each submarine produces a total of about 1,000 cubic metres of waste, some of which can be recycled or reused, and much of which is harmful.

According to DFAIT, crews pump the spent nuclear fuel from the submarines, and prepare it for shipping to a processing facility in the Ural Mountains. The dismantlement of the submarine produces a number of toxic substances, such as insulation (including asbestos); solid and liquid radioactive waste; and toxic waste such as lead and PCBs.

CGSB's involvement with the shipyard is scheduled to continue until the end of 2009, with one more audit in December of that year. However, DFAIT is reviewing the

There is a lot at stake in ensuring the shipyard is performing in an environmentally responsible way.

possibility of embarking on another submarine dismantling project under the Global Partnership Plan, and should the department finance another round of dismantlement, there could again be a role for CGSB.

Chénard says the audits are a great way for CGSB to help out in such an important global project.

"It's a very interesting program," he says of the Global Partnership Program. "It's helping to keep sensitive materials from getting into the wrong hands, and we're helping to make sure it's done in a responsible way."

"It also manages to show how universal the ISO 14000 series is, and that the standard (ISO 14001) is adaptable to any economic activity and any organization." ∎

Building integration, continued from page 15

The total number of green intelligent buildings is difficult to come by at this point. Zimmer says official data is not yet available, but adds, green intelligent buildings are not being constructed quickly enough.

According to the 2008 report *Green Building in North America*, published by the Montreal-based organization Commission for Environmental Cooperation (CEC), green building accounts for approximately two per cent of the new non-residential building market in the U.S. Though the number is small, it says green building has grown significantly in recent years and is expected to increase almost five-fold (between 5 and 10 per cent) by 2010. The report acknowledges that similar comprehensive surveys of Canada's green construction have not been conducted, but says it is generally accepted that Canada's green building trends are comparable to the U.S.

An increase in the number of building projects certified as 'green' (through various voluntary rating systems) provides some quantitative evidence. Adoption of the LEED program points to rapid growth of green buildings in Canada. In 2006, there were only 42 LEED-certified buildings in Canada[2]. That number has more than doubled in a span of two years. As of July 2008, 108

projects had been LEED certified and hundreds more are registered to be certified once they are completed.[3]

From 1997-2007, a voluntary program offered through Natural Resources Canada (NRCan) certified 1,132 buildings as highly energy-efficient buildings. Though the Commercial Building Incentive Program has since closed, by its end, the program was confident it had touched 15 per cent of the commercial building square footage in Canada.

Despite the environmental offenses historically committed by building construction, experts agree that building greener, smarter buildings by addressing and modifying their environmental impact is becoming reality.

"Whether 'green intelligent buildings' is a buzz word or a term that will have longevity, I'm not sure," says Tubrett. "But more responsible design and building operating practice are here to stay." ∎

[1] 2002. Industry Canada. *Technology Roadmaps: Intelligent Building Technology Highlights.* (www.ic.gc.ca)

[2] 2006. CaGBC Report, *Green Buildings in Canada: Overview and Summary of Case Studies.*

[3] 2008. CaGBC Report, List of all LEED Certified Projects in Canada.
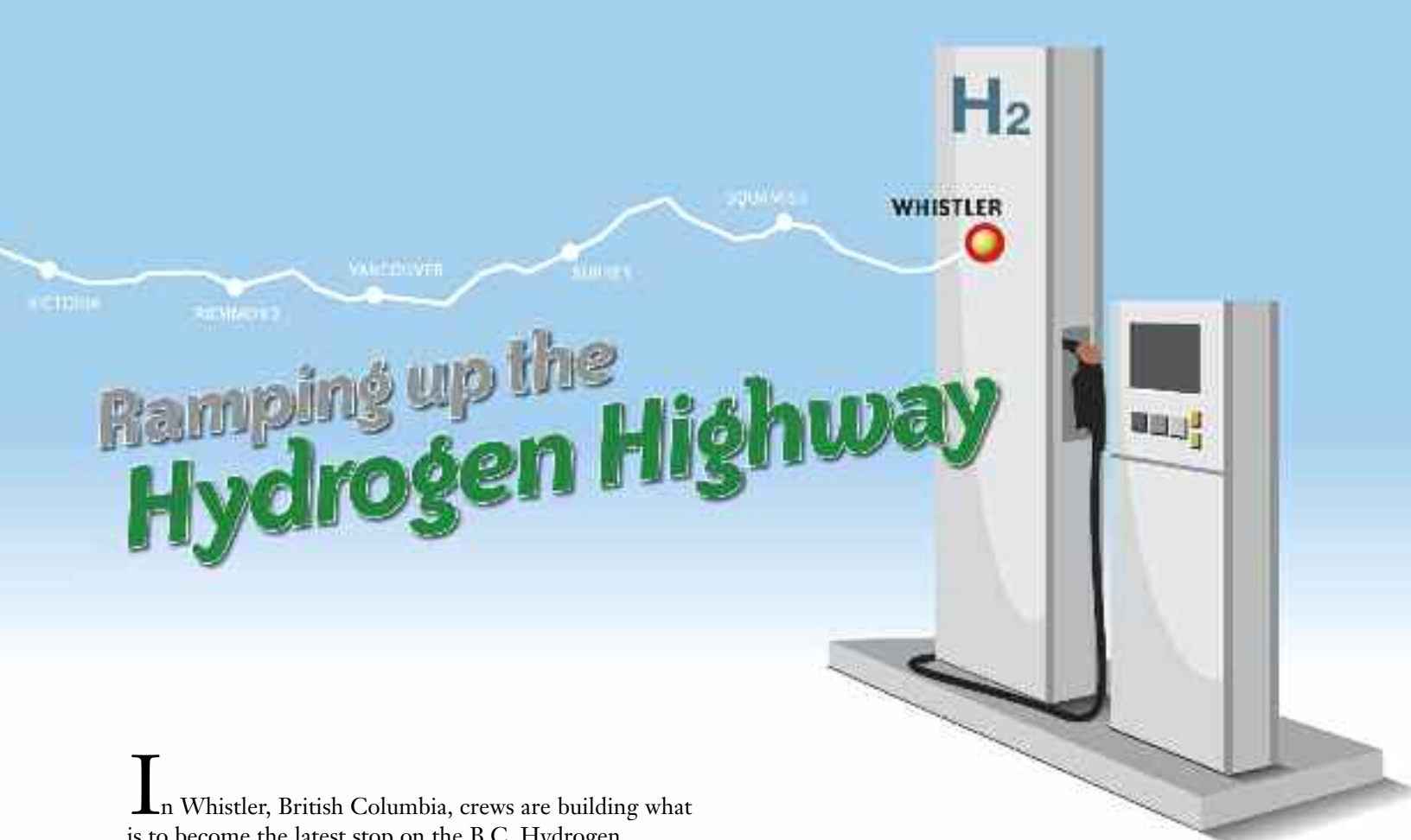
Ramping up the Hydrogen Highway

In Whistler, British Columbia, crews are building what is to become the latest stop on the B.C. Hydrogen Highway.

Work is taking place on building a hydrogen fuelling station in the resort municipality. When the station is completed in 2009, it will be the largest hydrogen fuelling station in the world.

"That's a huge part of what we're doing," says Gary Schubak, the manager of the Hydrogen Highway program.

...standards development activities are recognized as being very important to move hydrogen and related technologies forward.

The construction of the Whistler fuelling station is the latest step in establishing the program that was launched in 2004.

The BC Hydrogen Highway, a collaboration of technology providers from Canada's hydrogen and fuel cell industry sector, and various levels of government, demonstrates the commercial applications of hydrogen technology.

The Hydrogen Highway deploys a variety of hydrogen technologies and products, from fuelling stations, to production facilities, to hydrogen-fuelled vehicles, to stationary power products that use hydrogen to generate heat and electricity for buildings and industry.

The Whistler station is one of seven stations slated to be built and operating by 2010, when the Hydrogen Highway program will be showcased during the Olympic and Paralympic Winter Games.

The program has already seen the installation of a basic infrastructure of five hydrogen fuelling stations in Southwestern BC, which are fully operational.

In addition to the fuelling stations, a number of hydrogen-fuelled vehicles are now operating in southwestern B.C. There are five Ford Focus fuel-cell vehicles operating in the area. Also, there are four hydrogen and compressed natural gas-powered buses in Vancouver; as well as nine hydrogen internal-combustion-engine pickup trucks; and two internal-combustion-engine shuttle buses operating in North Vancouver.

Those involved with the program also expect to deploy a fleet of 20 fuel-cell buses—the largest such fleet in the world—in Whistler within the same time frame.

Schubak says safety fears have been among the challenges the hydrogen fuel industry has had to overcome to gain wider acceptance.

"There's always been a safety perception with hydrogen. I've been in the industry for over 15 years and I've seen that and been confronted by it," he says. "I think there's a need for a lot more public information about hydrogen as a fuel.

There's a lot of education yet to be done."

The development of international standards relating to various hydrogen technologies has helped ease some of these fears.

The International Organization for Standardization (ISO) has a technical committee (ISO/TC 197) made up of industry professionals and various government workers that is developing standards, which should lead to hydrogen becoming a more accepted type of fuel. The Standards Council of Canada (SCC) holds the technical committee's secretariat, which is operated by the Bureau de normalisation du Québec (BNQ). Canadian Randy Dey serves as the committee's chairman. As well, Canada's federal department of Natural Resources (NRCan) provides financial support to the country's standards-development efforts.

To date, the committee has developed 12 published international standards, covering topics ranging from basic considerations for the safety of hydrogen systems, to the industrial and commercial applications of generators that use a water electrolysis process to create hydrogen.

In 2007, the Canadian Hydrogen Installation Code (CHIC) was published by the BNQ and approved by the Standards Council of Canada as a national standard (CAN/BNQ 1784-000). The code defines the requirements applicable to the installation of hydrogen equipment in a variety of environments. Its publication is expected to remove any safety concerns that have acted as roadblocks in the adoption of hydrogen technology.

Dey, who also chairs the CHIC technical committee, says these standards have proven vital in advancing the hydrogen fuel industry.

"Everybody has their own idea of what safety is," he says. "What the committee does is bring together a number of different voices and reach acceptance from all sides. For hydrogen and related technologies, the standards development activities are recognized as being very important to move these new technologies forward. The committee has been working hard with those in industry and other stakeholders towards this goal."

Schubak says that as the 2010 deadline approaches, he expects the Hydrogen Highway will showcase a balanced portfolio of hydrogen-based products and applications during the Olympic and Paralympic Winter Games.

"Beyond that," he says, "it's up to all of us to define where we want this road to go." ■

A tiny technology with a big medical impact

It will kill 1,419 Canadians every week in 2008. Estimates suggest another 166,400 Canadians will be diagnosed this year alone; 39 per cent of Canadian women, and 45 per cent of men will acquire it over their lifetimes.[1]

Cancer, which remains an incurable disease, is the leading cause of early death in Canada according to the Canadian Cancer Society.

Traditionally, treatments such as chemotherapy and radiation cause various adverse side-effects. During treatment, along with the destruction of cancer tissue, damage is also done to surrounding healthy tissue. New advances in science, in the domain of nanotechnology, have the potential to make a significant impact on the treatment and diagnosis of cancer while reducing some of the traditional obstacles to treatment.

Nanotechnology is a collective term that refers to the science of manipulating particles between 1-100 nanometres (nm). Measurements are so microscopic, that one single double-helix strand of DNA is approximately 2.5 nm wide and one red blood cell is approximately 8,000 nm long.

Even in the early stages of research and development, cancer researchers see nanotechnology as key to improving the way doctors and specialists diagnose and treat cancer and other diseases. Since the body's biological processes that play factors in disease often occur at the nanoscale, scientists believe integrating nanotechnology in medicine is not only a natural progression, but possibly an effective one.

One major medical advantage to integrating nanoparticles into cancer treatment is the improvement in drug delivery. The cancer research community has long established that nanosize particles can collect in tumors. In the past, certain drug particles have been prevented from reaching the cell because the particles were too large to fit through the small channels and pumps within the membrane of human cells. Nanoparticle-based drug treatments, which coat a nanoparticle with a hydrophilic layer, allow a once insoluble drug to bypass the cell's filters, thereby reaching the cell body to dispense treatment.

Nano-engineered drug strategies are able to actively target cancerous tissue, without destroying any surrounding healthy tissue. Because cancerous cells often display behaviour which is distinguishable from that of surrounding healthy tissue, such as in the form of mutated cellular proteins, antibodies can be attached to nanoparticles and tailored to actively target only those cells displaying characteristics that signal cancer. The ability to focus the drug at the site of the tumor is also expected to decrease negative side effects including nausea, and weight and hair loss.

On the diagnostic side, machinery used to diagnose cancer is also becoming more efficient and effective as a result of nanotechnology.

"Every piece of hardware used for cancer diagnosis, especially MRIs and CAT scans, will change dramatically," says Dr. Roland Hosein, chair of Canada's advisory committee to the International Organization for Standardization (ISO) committee that is developing standards on nanotechnology (ISO/TC 229).

"They [diagnostic machinery] are becoming faster, smarter, and invariably cheaper with the introduction of nanotechnology."

With all of the potentially effective strategies to treat cancer, Dr. Clive Willis, vice-chair of the Canadian advisory committee to ISO/TC 229, who also helped found NanoQuébec, stops short of saying nanotechnology could deliver a cure for cancer.

"There probably won't be a silver bullet cure for cancer, just because of the nature of the disease," says Willis. "But nanotechnology is one of the areas for delivering new treatments very specifically and effectively. It will certainly be one of the technologies involved in the treatment of cancer."

The effectiveness of manipulating matter at the nanoscale is derived from the idea that when it comes to nanoparticles, strength is in small numbers. When matter is broken down at the nanoscale, different characteristics are evident. At this size, performance is more enhanced than in its larger form. In addition, certain functionality (chemical, physical or biological) can be added to make the nanoparticle behave in a pre-determined way.

"In a number of potential applications, the key is the uniformity of small size. Smaller particles form a more uniform pattern. Each particle will have a greater surface area and involve a different strength in its bonding," says Willis. "It's the collective effect of the whole that makes the particles better."

With all of the possible advances in medicine that nanotechnology could deliver, the technology's potential good also comes with potential risk.

A report released by the Council of Canadian Academies, an organization which provides independent assessments of science in the public interest, suggests more research is needed. The report says the risk is related to the uncertainty of the change in properties that take place when existing compounds are reduced to such a small scale. Chemical reactions involving nano-sized particles take place more quickly, which could possibly mean a more reactive and higher toxicity than in the compound's original form.

Canadian experts and researchers are actively working alongside their global counterparts to develop standards in nanotechnology... systems to protect employee and public health, and the environment.

Though Willis agrees that the research in this field is relatively limited, he says the research being conducted globally is helping to define the hazards and therefore to manage the risk.

"Many of the materials we are engineering at the nanoscale, we have used before. If they were toxic, we would know about it by now, unless there is a specific change of toxicity because of the size," says Willis. "With such new materials, sure the potential is there for risk and we must be vigilant in ensuring responsible use."

Canadian experts and researchers are actively working alongside their global counterparts to develop standards in nanotechnology in order to provide guidance for regulators, researchers, developers, manufacturers and users.

ISO chose four working areas to be established before any industry-specific standards could begin development. The four areas are: terminology and nomenclature; measurement and characterization; health, safety and environmental aspects of nanotechnologies; and lastly material specifications.

"This area needs language," says Hosein. "It needs terminology and definitions in order to create the foundation for language. Measurement methods must be developed for the user community to characterize the materials. Plus you also have to develop systems to protect employee and public health and the environment."

Developing standards in nanotechnology can be complicated since nanotechnology is not considered a sector in itself. Because its impact spans various sectors, ranging from cosmetics to forestry, consensus among industry, stakeholders and researchers is that

standards should be developed before nanotechnology is made available commercially across multiple industries.

"We saw that it was important to take early action with standards, in order to create a scientific-based standard description covering the whole field," says Willis.

In the field of biotechnology, he recalls that standards were developed afterwards, which caused problems later-on in the commercialization of that technology.

"We didn't want the same thing to happen in nanotechnology, simply because we haven't taken early steps," says Willis.

From incorporating nanoparticles into cosmetics (which is already happening), to manufacturing lighter-weight and stronger composites to create more durable and sustainable materials, this small science is en-route to make a large impact on just about every sector of the market.

"Nanotechnology will allow us to be more efficient across the board in a way we haven't been before," says Willis. "When we see it applied across the traditional industrial sectors, we are going to see a lot of differences—niche products tailored to optimally respond to their specific applications. It's going to be very different, but incrementally different. I don't see that in 10 to 15 years we're going to have a world we had not envisaged before because of nanotechnology."

Willis is confident that nanotechnology's benefits outweigh any risk, provided the industry understands and manages the risks.

"Even in its early stages, we are seeing so much promise and we haven't really engineered the field yet," he says. "It's exciting and really going to change our lives for the better." ∎

[1] 2008. Canadian Cancer Society. *General Cancer Stats for 2008.* (www.cancer.ca)

Establishing nanotech standards

Despite being a relatively new field of science, through the application of standards, nanotechnology has the potential to affect the physical and social well-being of Canadians and people all over the world.

Within the health sector alone, there are countless applications of nanotechnology: from new and improved cancer and central nervous system therapies; to diagnostic tests based on nanoarrays and quantum dots; to enhanced imaging capabilities enabling detection of disease states; to diverse medical implants, such as bone replacement materials; to antibody labels and DNA probes that speed testing and research.

Establishing a series of agreed-upon standards is vital to nanotechnology—in the collection of research data, in providing evidence of emerging health issues, and in order to give governments a starting point when creating regulations and legislation.

Both the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) are developing numerous standards that will help ensure the safe and responsible use of nanotechnologies. The technical committees working on these standards include participants from more than 30 countries, Canada among them.

Members of the Canadian advisory committee contribute and effectively participate directly in the development of international standards for use in Canada.

The Canadian Standards Association (CSA) facilitates this work through the involvement of its experts from industry, government, research, consumer, and other interests across Canada.

As of mid-2008, nanotechnology-related standards development work spanned some 50 individual projects. These diverse projects are expected to establish the foundation for the international standards that will be used in the commercialization of products and applied by the Canadian regulatory system. ∎
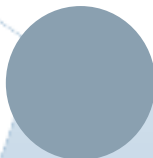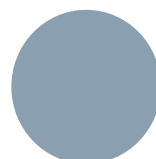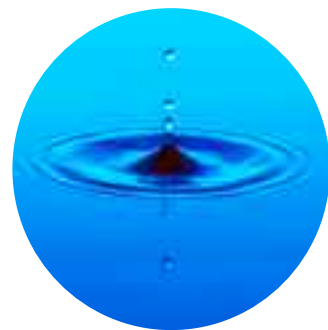
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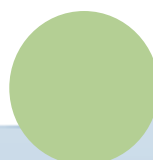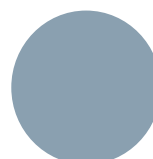
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