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# SPECIAL FEATURE MECHANICAL & ELECTRICAL CONTRACTING

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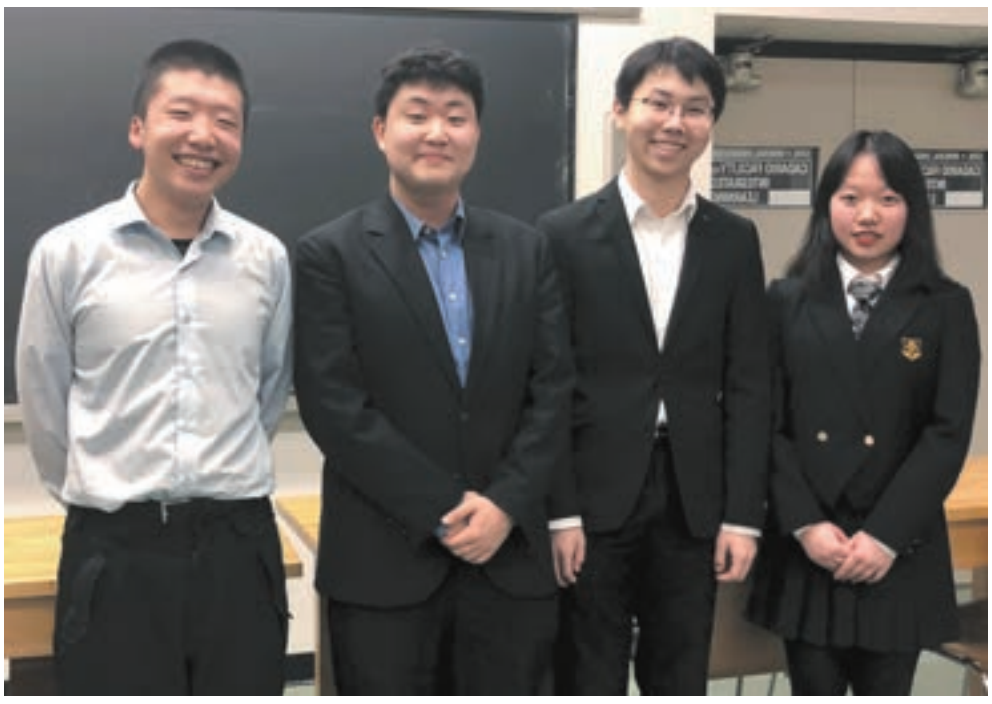
# Refugee welcome centre sees HVAC and electrical innovations



UNIVERSITY OF TORONTO

**Participants in the third annual Sustainable Building Design Case Competition sponsored by the University of Toronto student chapter of the Canadian Electrical Contractors Association were (from left): Bo Zhao, Paul Go, Ziyi (Jason) Wang and Jiating (Chelsa) Lou.**

**GRANT CAMERON**
CORRESPONDENT

Civil engineering students at the University of Toronto (U of T) have come up with some innovative HVAC and electrical ideas to cut energy use at the Christie Refugee Welcome Centre (CRWC) in downtown Toronto.

The suggestions were presented by teams during the third annual Sustainable Building Design Case Competition sponsored by the U of T student chapter of the Canadian Electrical Contractors Association (CECA). CECA represent the interests of more than 8,000 electrical contractors across Canada.

Students were asked to come up with ways to reduce energy use at the CRWC by 60 per cent. Ideas included everything from a heat recovery ventilator, to smart power strips with digital timers and electric furnaces. They also devised strategies to get the community engaged through social media platforms and interactive games.

"Some were better than others, but they came up with a great variety of solutions and ideas," says Brenda McCabe, one of the four judges and a professor in the civil and mineral engineering department at U of T. "Students came up with a lot of novel ideas. As we get experienced, we tend to go back to the same old solutions, but they aren't bound by that and might come up with something that no one else has really considered."

Two teams participated in the competition. The winning team consisted of second-year civil engineering students Ziyi (Jason) Wang and Jiating (Chelsa) Lou. Participants on the other team were Paul Go, a fourth-year civil engineering student, and Bo Zhao, a first-year student.

Students were given one week to work on the project and come up with energy-saving ideas. They had information on energy use, lighting, plug loads and HVAC from an energy audit project on the CRWC that was done by engineering students two years ago. Students were hard at work for a week, creating energy reduction solutions and strategies to spread energy efficiency awareness.

Noah Cassidy, a civil engineering student and organizer with the U of T CECA student chapter, says the competition is aimed at increasing interest in the construction industry and students on both teams came up with several interesting ways of saving energy at the shelter which helps homeless refugees.

Many of the solutions were focused on reducing the heating energy use of the building, he says, as heating is the largest use of energy at the centre and for many buildings in Canada.

The students suggested the use of heat recovery ventilators that transfer heat from old indoor air to fresh air coming in from outside. The process avoids dumping usable heat outside, reducing the work the furnace must do to heat up incoming air.

Smart power strips with digital timers were also recommended, says Cassidy, as they turn off equipment when it's not in use.

"Automatic timers mean the operators of the appliances connected to the strip don't have to turn it off themselves."

Students also suggested that electric furnaces be installed, as they are inherently more efficient than natural gas furnaces and reduce the amount of input energy required to heat the house, says Cassidy.

To involve the community, the two teams recommended children's programs be implemented that include interactive games to teach young children about limited natural resources and where they use energy. Meanwhile, Cassidy says, the students also suggested documentation be published and events held to help people understand how the retrofits helped the building and that social media be used to spread word further.

McCabe, senior vice president of the Canadian Society for Civil Engineering, says she was impressed with the ideas put forward, as students considered the short- and long-term impacts, amount of capital investment required, and what the return would be and how to make an impact with minimal cost.

"One of the great things is that our students are really engaged, and they drive this effort," says McCabe. "They don't depend on a faculty member to tell them what they ought to do and what the next step is. They figure it out and they do it. I think that is probably one of the greatest lessons out of this."

The four students have now joined forces with other civil engineering students and organizers of the U of T competition to work on a submission for the international Green Energy Challenge, an event in the U.S. sponsored by ELECTRI International and the National Electrical Contractors Association (NECA), in which they must simulate all the details of a proposal for a project in their community.

Teams are challenged to design an energy upgrade for a facility that provides community services to others and show how the facility can decrease its energy consumption by incorporating energy-saving measures. They must also create a volunteer plan of interaction with the facility and demonstrate in the proposal the activity and number of hours the team volunteered towards the mission of the organization.

The team is working with Orde Street Public School in central Toronto, just a few blocks south of the U of T campus. The school, built in 1914, has about 500 students. The engineering students have done an energy audit of the building to determine where the most energy is being used and are now brainstorming ways to retrofit the school, so it is more energy efficient. Last year, a U of T proposal finished second.

Deadline for their proposal is April 30. Three finalists will be selected by the end of July and invited to give presentations in October at the NECA Convention in Chicago. The winning team will receive $4,000.

## Economic Snapshot

# Political uncertainty and the coronavirus darken outlook for non-res construction

John Clinkard

In its recently released *Non-Residential Capital and Repair Expenditures (CAPEX) Survey*, Statistics Canada reported "capital spending (is) expected to increase in 2020 for the fourth consecutive year". Based on its survey of 25,000 private and public organizations, conducted between September 2019 and January 2020, the agency reported that capital spending on non-res construction and machinery and equipment was expected to increase by 2.8% in 2020 following gains of 9.8% and 1.7% in 2018 and 2019 respectively.

### Virus and project cancellations put private sector CAPEX at risk

Before analyzing the composition of this year's projected capital spending, it's worth noting that Stats Canada conducted the CAPEX Survey before four recent developments which have created a climate of extreme domestic and global economic uncertainty. In our view, this heightened level of uncertainty will weigh heavily on private sector non-res capital spending plans which account for the bulk (65% in 2019) of total capital spending and were projected to increase by only 0.9% this year following a modest gain of 2.2% in 2019.

First, on February 24, against a background of heightened political controversy about energy investment in Canada, Teck Resources announced that it was abandoning its plans to go forward with its Frontier Project. With a projected cost of $20 billion, it would have been the largest oil sands mine in Albertan history.

Second, the rapid onset of the novel coronavirus contagion across the globe is largely responsible for a very sharp drop in investor confidence reflected by the almost 29% drop in the Standard and Poor's/Toronto Stock Exchange Composite Index and the concomitant 26% drop in the Dow Jones Industrial Average.

Third, following the protracted unlawful interruption of cross-country rail transportation, Warren Buffet's Berkshire Hathaway announced on March 5 that it was not going forward with its plans to invest $4 billion in GNL's Energie Saguenay Project.

Finally, there is a significant risk that the precipitous drop in oil prices triggered by the coronavirus-induced oil price war between Saudi Arabia and Russia will significantly depress energy and energy-related investment in Alberta, Newfoundland and Saskatchewan.

To put these developments in perspective, the impact of the coronavirus crisis will likely cause an increased proportion of small- and medium-sized firms to shift their capital expenditures from the first into the second half of the year or, in a worst-case scenario, cause them to be shelved indefinitely.

While the Frontier project was not expected to impact CAPEX spending this year, its cancellation, together with Berkshire Hathaway's plans to pull back from participation in the Energie Saguenay Project, will cast a pall over energy investment in Canada in general and Alberta in particular for the next several years.

### Public sector will drive CAPEX this year and probably next

While the near-term prospects for private sector capital spending are severely impaired by the above-noted factors, the outlook for public sector spending is more sanguine since government projects are budgeted well in advance and are not contingent on future profitability. After posting a very slight 0.8% rise in 2019, the CAPEX survey reported that public sector organizations planned to boost their spending by 6.5% in 2020. This increase was driven primarily (50%) by a 25% y/y rise in spending on transportation and warehousing projects which, for the first time since 2001, exceeded the mining, quarrying, and oil and gas extraction sector.

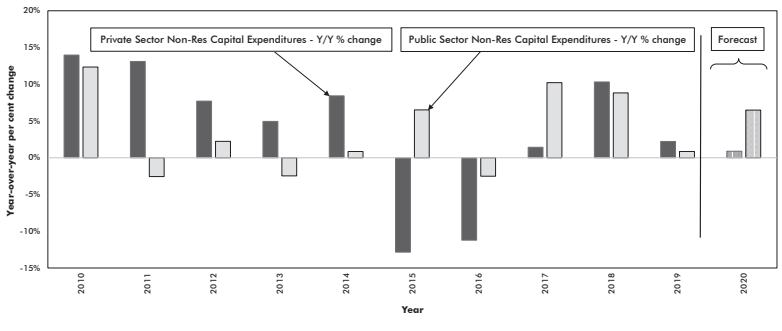
According to Statistics Canada, two-thirds of the increase in transportation and warehousing investment was due to increases in spending on transit and ground transportation projects in Quebec (+$1.9 billion), Ontario (+$738 million) and British Columbia (+$187 million). After transportation and warehousing, projected spending in the utilities sector accelerated by 9.1% to $32.9 billion in 2020 after posting growth of 4.4% in 2019. The largest contributor to this gain was a 30%y/y rise in spending on water and sewage systems, the bulk of which are in British Columbia and Ontario.

Across the country, Stats Canada reports non-res capital spending will exhibit the fastest growth in British Columbia (+7.8% to $41.8 billion), followed by Quebec (+7.8% to $46.4 billion) and Ontario (+4.4% to $86.1 billion). Smaller gains were reported for Nova Scotia (+1.4%), Saskatchewan (+0.4%) and Alberta (+0.1%).

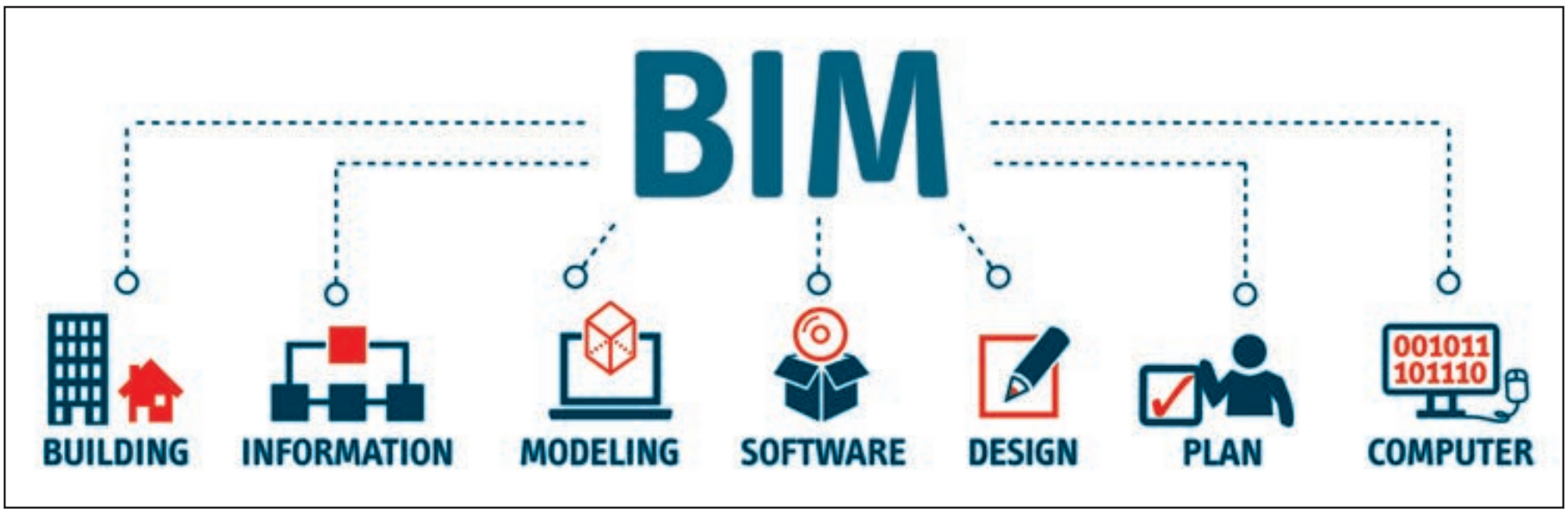
Capital spending is projected to contract by 11.8% in Newfoundland and Labrador during 2020, largely due to the scaling back of spending on the Muskrat Falls project. Also, the CAPEX survey reported a slowdown in non-res investment in Manitoba (-7.3%), New Brunswick (-2.2%) and Prince Edward Island (-2.3%). As noted above, these survey responses were all pre-coronavirus and we expect them to be revised lower.

John Clinkard has over 35 years' experience as an economist in international, national and regional research and analysis with leading financial institutions and media outlets in Canada.

**Private Sector and Public Sector Non-Residential Capital Expenditures – Y/Y % change – Pre-Coronavirus**




*Data Source: Statistics Canada / Chart: ConstructConnect — CanaData.*




SHUTTERSTOCK

# Mechanical, HVAC contractors discovering the benefits of BIM

JOHN BLEASBY
CORRESPONDENT

Building Information Modeling software, commonly referred to as BIM, has redefined contemporary project design and execution around the world. It's more than simply a way to create highly accurate 3D visualizations — it's also way to store and communicate design and construction ideas among all project partners.

BIM software is also impacting mechanical and HVAC contractors as they discover the benefits of integrating their design and assembly work with BIM.

A recent industry analytics report based on research conducted in December 2019, says that forward-thinking contractors are, "seeking to expand their use of BIM as well as encouraging greater engagement with it and the collaborative, model-related processes that amplify its impact throughout their project teams and supply chains." The reasons are becoming clear in numerous ways.

> "Give yourself three to six months. Find a smaller 'pilot project' to work on to work out the kinks,"
>
> William Burton
> PGA Inc.

Donnelly Mechanical, based in Queens, N.Y. and part of the French-based multinational electric utility company ENGIE, cites three specific benefits to be gained by using BIM in mechanical and HVAC designs.

First is facilitation of single-source projects. "BIM software enables intense coordination in the field, between HVAC and energy contractors, and between contractors and building owners," the company says.

"With this superior level of coordination, one company can more easily be trusted to manage the entire process — making things much easier for building owners and managers."

Second is improved productivity during construction. "When there's one accurate point of reference for construction, cross referencing and approval times are drastically cut."

Third, Donnelly says that working with BIM software reduces rework and the high costs and time delays associated with errors, benefits many other BIM adopters have been promoting for some time.

"Building owners and managers that hire companies to leverage BIM software will find their projects are completed quicker, more productively and with easier management on their part."

Prefabrication of model-driven mechanical assemblies is a fourth benefit identified by the report that makes the adoption BIM particularly attractive to mechanical and HVAC contractors.

William Burton, Director for CAD/BIM/EST with PGA Inc., a multidisciplinary mechanical firm in Weston, WI, summarized the changes in the way mechanical and HVAC systems can be now built using BIM.

"The ability [of BIM] allows subs to prefabricate parts of their work at their shop, under indoor conditions, to speed up the process on the job site," he told the Air Conditioning, Heating and Refrigeration News (ACHR).

BIM's importance goes beyond mechanical and HVAC design and construction — it greatly improves building performance outcomes. Contractors and engineering firms who have successfully adopted BIM software into their mechanical design and assembly processes speak of the values derived from BIM in terms of project coordination, even prior to any work commencing.

For example, designs can be visualized without the need for expensive, time-consuming trials or mock-ups.

According to JM Engineering PLLC based in Missoula, MT, engineers can identify and eliminate any system flaws in advance that could potentially jeopardize the project's financial viability.

"It's no longer necessary to invest scarce financial resources in a commercial building only to learn that the building is nearly impossible to heat or cool after the construction crews have departed and the doors have been opened for business."

This enhanced coordination, along with BIM's tangible visible plans, means orderly installation and an increased overall confidence among project team members.

BIM integration of all project participants is becoming a contractual obligation for many public and private projects. There's little resistance from the construction industry. In fact, mechanical contractors are increasingly enthusiastic about BIM.

However, BIM adoption represents a big shift for mechanical and HVAC contractors used to 2D AutoCAD design who are now considering moving into the realm of 3D software.

The report found that some are hesitant to adopt BIM into their workflows and processes: the need for better BIM training, the lack of available manpower to create BIM models, a lack of support from other trades and stakeholders, and poor-quality BIM use by others were the challenges most often cited.

As is the case with the adoption of other new technologies into construction, there are buy-or-hire options available.

Two-thirds of mechanical contractors surveyed said they used their own internal resources to produce BIM models more than 50 per cent of the time, 42 per cent turned to third party BIM service providers when not using their own resources.

The report authors emphasized the attraction and future growth of such services. Third party providers can reduce the risks and costs of purchasing software and computers, and training new or existing personnel, particularly if the volume or complexities of BIM requirements for a project are unknown.

For those choosing to bring BIM workflows in-house, Burton offers advice similar to that heard whenever new technology meets current practice.

"Research software carefully," Burton told ACHR.

"Talk to the architects and firms you collaborate with. Find a solution that is compatible with them, not just what seems to work from your perspective. The parametric 3-D world is a bit of a hurdle from 2-D. Give yourself three to six months. Find a smaller 'pilot project' to work on to work out the kinks."

Whether buy or hire is selected, most experts and contractors in the field agree that the commitment to BIM is worthwhile even without any contractual obligations to do so. The savings of time money are simply too compelling to resist.

# New leaders take on roles at Mechanical Contractors Association of Canada

**ANGELA GISMONDI**
STAFF WRITER

The Mechanical Contractors Association of Canada (MCAC) has new leadership, but neither the new CEO nor the COO are new to the association.

Tania Johnston, former executive director, education and special projects, is now the association's CEO and Ken Lancastle, former executive director, communications, industry outreach and innovation has taken on the role of COO.

The two started transitioning to the new positions at the beginning of March after Pierre Boucher stepped down as CEO.

"The executive committee felt with Pierre's departure, there was some skill sets internally that could step up to fill the capacity," said Lancastle. "Recognizing Tania's tenure and experience in the industry and what she has done here with respect to the education portfolio as well as a number of other special projects, they thought it would be a great fit for Tania to step into that role and at the same time have some support through my capacity as a COO."

"She lives and breathes MCAC and it means a lot to her to see this association do well," added Lancastle. "I think that leadership is going to be very important for us in the coming years."

Johnston, who has been with MCA Canada for 20 years, is the first female CEO of the association.

"It's a huge honour to be given this role," said Johnston. "I oversee the Women in Mechanical Construction Program as well. MCA Canada has been so supportive of that program and now they have been progressive enough to see the value of a female in the CEO position."

Over the years, Johnston has held several roles with the association. She started as national program coordinator for the education foundation, followed by executive director. Two years ago, she was given additional responsibilities and her title changed to executive director and special projects. She took on the Richard McKeagan Scholarship Series, the Student Chapter Program and most recently the Women in Mechanical Construction initiative.

Lancastle started with MCA Canada a year and a half ago. Prior to that, he spent seven years with the Canadian Construction Association in communications, industry practices and the innovation and technology file.

"When I came here (MCAC), I was managing the communications, industry outreach and the innovation file," said Lancastle.

"It's been enlightening and exciting at the same time watching the progress we've made on a couple different issues but also the potential we have to grow here representing our members across the country."

Johnston and Lancastle will work in close partnership on the strategy and operations of the association. Much of that will consist of providing the resources and support to help the 1,000 members in the mechanical contracting sector across the country succeed in their business.

"We do that through a federation with our provincial partners across Canada so it's working closely with all of our partners, all of our stakeholders to address those issues that matter to our members and then provide the national support and leadership where we can to make sure our members are getting that value out of their membership with MCAC," said Lancastle.

"The issues change but our approach is the same and that's to ensure that our members can succeed.

He added, "this provides an opportunity to look at what we are doing and determine what we are doing well and where we can best expend our resources to make sure that value is consistent or better."

Although they have just started in their new roles, Johnston and Lancastle do have a vision for the future which focuses on building on the association's strong foundation.

"When we talk about change and where we're going, at the end of the day the important part for us is that MCAC has a long history and a good track record of success for our members and it's important for us to continue build on that track record," said Lancastle.

"Whether it's continuing to monitor the prompt payment file, whether it's the promotion of skilled trades in the industry, whether it's assisting our members in education or adopting a new technology in innovation, our role here is to provide that to our membership and I think we are well positioned to move forward on a number of initiatives."

## MCAC supports COVID-19 safety measures, encourages continued aid for small- and medium-sized firms

OTTAWA

As the COVID-19 pandemic and crisis continues to unfold across Canada, the Mechanical Contractors Association of Canada (MCAC) has indicated its support of public health agencies in their efforts and measures to limit the spread of COVID-19.

As a national association of close to 1,000 contractor firms, the safety of members and their employees remains paramount, and MCAC understands the importance of measures being put in place to protect all Canadians. At the same time, the Association noted the importance to support businesses and employees as construction faces shutdowns and delays across Canada.

"As with all industries across Canada, the COVID-19 pandemic is having a disruptive effect on Canada's mechanical contracting sector, but we are encouraged the federal government is taking steps to support Canadians and businesses impacted by this unique situation," said Dave Holek, President and Chair of MCAC. "The announced programs to provide direct support to employees and additional liquidity for small and medium-sized businesses have been great first steps in dealing with this crisis. Our hope is the government understands how this crisis will negatively impact mechanical contractors in both the short and long-term, and put the appropriate measures in place to support our industry."

Many construction contracts do not allow for remuneration to occur if a project is delayed due to unforeseen conditions or any cause beyond the control of the contractor. The result is that many contractors will find themselves in difficult circumstances as it relates to cash flow, particularly if payments have been made or are due to suppliers and other parties and stakeholders in the construction project supply chain.

**Read the rest of this story on our website at www.dcnonl.com.**

DCN-JOC NEWS SERVICES

# Refrigerant handling course demanding, eyes a better ozone future

DAN O'REILLY
CORRESPONDENT

With aim of protecting the Earth's ozone layer, an environmental awareness training session on the proper handling of refrigerants demands a lot from its attendees.

Conducted by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) and delivered by approved partners including community colleges, the Ozone Layer Protection Awareness Program for Air Conditioning and Refrigeration Systems covers a lot of topics.

Based on Environment Canada's "Code of Practice for Elimination of Fluorocarbon Emissions in Refrigeration and Air Conditioning Systems, it deals with environmentally-correct equipment design and the proper handling of refrigerants and is intended to prepare participants for complying with Federal and Provincial refrigeration and air conditioning systems regulations.

Just some of the subjects of the theory-only course include the Science of Ozone Depletion, the Canadian Environmental Act, Federal Halocarbon Regulations, provincial regulations, recovery/reusing/recycling/reclaiming technologies, plus installation and servicing.

Although the HRAI has just introduced an online course which students can complete at their own pace, the in-class session is approximately seven hours long and then the students have to write an open book exam and achieve a 75 per-cent passing mark.

In this case the book is an approximately 100-page manual developed by HRAI and Environment and Climate Change Canada.

"We're surrounded by refrigerants," says HRAI institute's manager of education delivery, Angie Mantei, citing residential air conditioning, commercial tower chillers, car air conditioners, and supermarket freezer and cooling chests, all of which require refrigerants.

SHUTTERSTOCK

**The HRAI's Ozone Layer Protection Awareness Program for Air Conditioning and Refrigeration Systems aims to train its participants on environmentally-correct equipment design and the proper handling of refrigerants in preparation for federal and provincial regulations.**

And the improper installation, servicing, or disposal of refrigerants contributes to the depletion of the ozone layer, which is why the program was first developed in the 1990s — with a major revision in 2016 to reflect new changes in environmental regulations, she says.

The program is mandatory for anyone requiring an Ozone Depletion Prevention (ODP) Card and that covers a wide range of trades and technicians in fields as diverse as construction, the automotive industry, and appliance manufacturing. It is not a replacement and does not supersede any of the required training programs for those trades, she emphasizes.

Wholesalers who sell refrigerants are required by law to ask for that card and then enter the purchase transaction into their computer system. Building and safety inspectors can also ask to see the card, says Mantei.

HRAI manages the program for Environment Canada and the Ministry of Environments across Canada with the exception of the Manitoba Ozone Protection Industry Association.

Although each province has its own regulations and correct procedures, the manual is applicable across the nation. Because of the volume of HVAC work in Ontario, the manual lists and describes the various sections of the province's Regulation 463/10 which deals with Ozone Depleting Substances and Other Halocarbons.

In Ontario there is a five-year renewal process, meaning all certifications issued have an expiry date and are valid for that five-year period. The renewal process is managed online and is designed to obtain current contact information on all certification holders in Ontario. In all other provinces, the certification is obtained through attending the course and it is a one-time requirement, she says.

Community colleges conduct the training as an integral component of their various HVAC-related programs such as Georgian College's Gas Technician program. Usually, the training is conducted at the beginning of those programs.

Stand-alone sessions are usually offered twice a month at HRAI's Mississauga Ontario headquarters, although availability is based on demand, says Mantei.

In selecting potential instructors, HRAI looks for candidates who have worked in the HVAC industry and have some teaching experience. Before being chosen, they have to have completed a 'train the trainer' course with a minimum 85-per-cent passing mark.

"We are teaching this (the course) today with the goal of leaving future generations with a better environment than we have now. In the world it may seem hard to make a change, but we can all take small steps that will together mean real and meaningful change," says John McTaggart, the institute's lead ozone awareness instructor.