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Regina Bypass

Saskatchewan's largest transportation project ever. P. 12

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ON THE COVER The $1.88-billion Regina Bypass project, delivered on time and under budget, comprises 60 km of 4-lane highways, 55 km of service roads, 33 bridges, 12 interchanges and significant Intelligent Transportation System (ITS) infrastructure. See story on p. 12.
PHOTO COURTESY REGINA BYPASS.

FEATURES

Comment

by Peter Saunders

Shows are back!

After taking a year off during the COVID-19 pandemic, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Winter Conference and the Air-Conditioning, Heating, Refrigerating Exposition (AHR Expo) returned as in-person events earlier this year in Las Vegas, Nev.

ASHRAE gathered more than 2,800 building systems engineers, contractors, architects and students at Caesars Palace from Jan. 29 to Feb. 2.

"While the numbers were lower than at past conferences, in-person attendance still exceeded our expectations," said 2021-22 society president Mick Schwedler.

The society's first-ever 'hybrid' winter conference featured more than 50 technical sessions, executive updates, tours, social events and livestreamed sessions for virtual attendees.

One of the most popular sessions was 'HVAC Design, Control and Operation of Hospitals After COVID-19 Fiasco.' Timothy Jacoby, corporate vice-president (VP) of facilities design for Scripps Health, outlined strategies for further reducing airborne infections in health-care facilities, including dilution ventilation, differential pressurization, local exhaust, central system filtration and personalized ventilation.

"I'm a huge fan of natural ventilation when you can open the windows," he said. "It also saves energy."

Another session focused on dental clinics. Dentists have reportedly faced greater COVID-19 exposure risk than almost anyone else, including paramedics and nurses.

"A dentist sees far more patients in a day than a surgeon does," said presenter Dr. David Ahearn, founder of Design Ergonomics. "With an understanding of aerosol patterns using computational fluid dynamics (CFD), we can control most of the probability of infection at the source."

The conference also recognized ASHRAE members' outstanding achievements. Robert Bean, president of Indoor Climate Consultants, and Tim McGinn, P.Eng., principal of McGinn Technical Services, both based in Calgary, Alta., were among those elevated to Fellow, a grade that recognizes contributions to industry education, research and mentoring.

> ***"In-person attendance exceeded our expectations."***
>
> ***– ASHRAE president Mick Schwedler***

In a student competition, which imagined the HVAC needs of a 50,000-sf post-secondary campus building in Prince George, B.C., first place in the HVAC design calculations category went to University of British Columbia (UBC) team members Brandon Jung, Arin Lee, Lukengo Miguel, Kyle Vanderhorst and Taewoong (Jeff) Yoon.

The Young Engineer in ASHRAE (YEA) Inspirational Leader Award went to Toronto-based Badri Patel, commercial market account executive for Johnson Controls Canada.

(And speaking of Toronto, I should mention that's where ASHRAE's Annual Conference is soon to be held, from June 25 to 29.)

The AHR Expo, meanwhile, took place at the Las Vegas Convention Center from Jan. 31 to Feb. 2, drawing 30,678 attendees. Some 1,573 exhibitors showcased heating, cooling, ventilation, building automation, plumbing, refrigeration and indoor air quality (IAQ) systems across 443,769 sf of exhibit space in two halls.

Next year, both events will head to Atlanta, Ga. **CCE**

Peter Saunders • psaunders@ccemag.com

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David Murray, P.Eng., is Chair of the Board of Directors for the Association of Consulting Engineering Companies – Canada (ACEC-Canada).

Toward a Carbon-neutral Future

When I assumed the role of Chair of the ACEC Board of Directors, I made supporting the sustainable development of Canada's critical and strategic minerals one of the pillars of my mandate and indicated our association would continue to promote that consulting engineering firms are—and will be—the artisans of this green shift. I also believe governments, investors and communities can leverage our industry's expertise in achieving this goal.

It was therefore music to my ears to hear Canada's federal minister of innovation, science and industry, François-Philippe Champagne, recently make clear his intention to make Canada a leading global supplier of battery materials for electric vehicles (EVs), stating, "This is an industry which has the potential to be, over a generation, as big as the aerospace industry for our country."

Developing a robust zero-emissions vehicle supply chain, from mine to mobility

As we approach 2035, meeting our nation's growing need for EVs will require a robust domestic supply chain from "mine to mobility," as Navdeep Bains, the previous minister of innovation, science and industry, put it. We must reduce our dependence on foreign supplies of the raw materials required for EV batteries, while developing domestic manufacturing capacity to produce those batteries and the EVs they power.

Our country is blessed with reserves of minerals needed for EV batteries and other components of a green economy: cobalt, lithium, nickel and graphite, to name a few. Canada can play a leadership role in providing the critical minerals that are essential to low-carbon technologies.

Canada can play a leadership role in providing the minerals essential to low-carbon technologies.

We also need to further develop our domestic capacity to process these strategic materials. The challenge is that Canada's higher environmental and labour standards, of which we are justifiably proud, currently entail greater processing costs than elsewhere. However, thanks to rapidly evolving technology being deployed by Canadian engineers, we will eventually overcome this cost differential through improved processes and necessary infrastructure that lead to greater productivity. As with many technologies that are expensive at first, innovation combined with economies of scale will lead to significant reductions in cost.

The key step in a circular economy: recycling

Finally, to develop a truly sustainable Canadian EV battery ecosystem, we must not neglect recycling, which is the final step in the circular economy—or rather the key step as, by definition, a circle does not have an end point. Fortunately, Canada boasts a nascent battery recycling industry under rapid development.

Among the world's cleanest energy

Underlying our country's growth across the entire battery value chain is the fact that most of Canada's electricity supply comes from green energy. To process strategic minerals or to manufacture and recycle EV batteries using carbon-intensive power sources, as do many of Canada's competitors, is counter-productive. Fortunately, we have harnessed the power of water, wind and nuclear fission to produce one of the world's cleanest energy portfolios and our governments have imposed stringent environmental standards, meaning Canada's EV sector is among the world's most ecological.

Engineers: Bringing new concepts to life

Already, Canada's engineers have developed world-class expertise in green energy and the electrification of transport—and we continue to build upon these achievements. As I have repeatedly observed as an active member of the University of Sherbrooke engineering alumni association, the role of an engineer is to apply theoretical knowledge gleaned from academia to the real world and bring new concepts to life for the benefit of society and the environment.

At the same time, there is a role to be played by the private sector as investors in research to advance the technology surrounding the electrification of transport. Both domestic and foreign investors can inject capital into this promising sector, knowing governments at both the federal and provincial levels are singing from the same hymn book, one that is geared toward seeing combustion engine vehicles replaced by zero-emissions vehicles by 2035 and one that supports a transport electrification process powered by some of the world's cleanest energy sources.

Nous, firmes de génie-conseil, soyons des acteurs de premier plan dans ce cette transition énergétique si importante. Mettons à profits notre expertise pour que les générations futures puissent parler de cette transition comme un fait marquant dans leur vie.

In my leadership role at ACEC, I will continue to encourage our nation's consulting engineering firms as they help innovate our way to greater self-sufficiency and a carbon-neutral future, while working in tandem with governments, the private sector and academia to advance Canada's EV sector for the good of people and planet.

ACEC-CANADA'S 2022 VIRTUAL PARLIAMENT HILL DAY

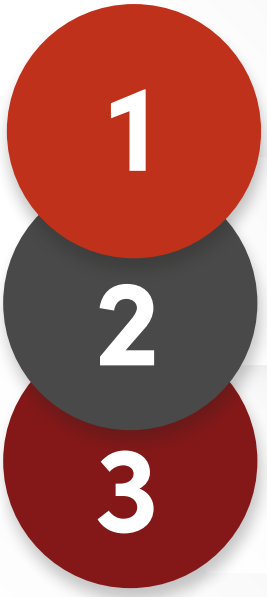
Amplifying the Voice of the Consulting Engineering Industry

The ACEC-Canada team is continually educating elected officials on how the work of consulting engineering firms positively impacts the economic, social, and environmental quality of life of Canadians. No one delivers this message more eloquently than our members! That's why our cornerstone government relations activity, ***Parliament Hill Day***, is so important - it engages the membership in building relationships with Members of Parliament that helps ACEC-Canada shape public policy affecting the sector.

In February, representatives from ACEC-Canada members firms helped amplify the voice of the industry by participating in the first ever virtual Parliament Hill Day. These dedicated volunteers took time to meet with Members of Parliament to discuss how consulting engineering firms help support a thriving and sustainable economy. Through their participation, these volunteers helped share ACEC-Canada's primary advocacy messages to a broad audience of elected officials from all the major parties.

Let's Work Together

During their meetings, participants shared how our industry is ready to work with elected officials to:

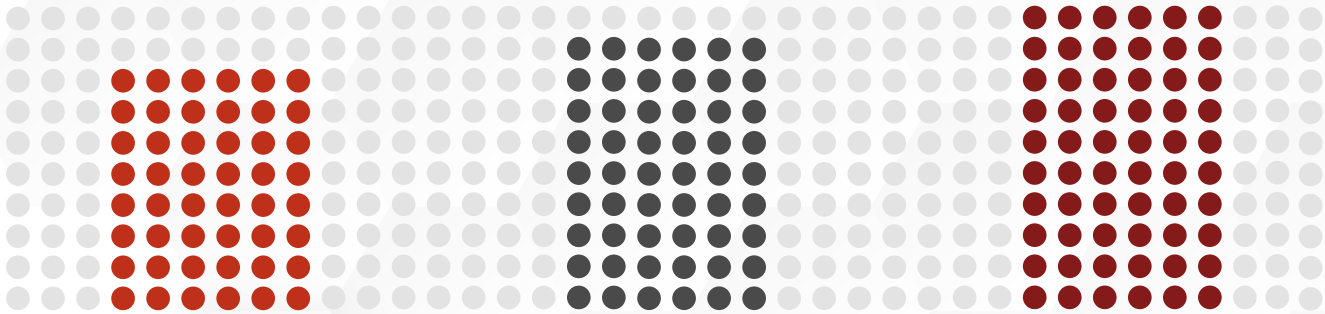


Implement an independent National Infrastructure Assessment that provides an integrated vision for the environment and economy
An independent and permanent National Infrastructure Agency should guide the Assessment to maintain a consistent and data-based view of Canada's long-term infrastructure needs.

Reinstate and reenergize the National Guide to Sustainable Municipal Infrastructure
Also known as InfraGuide, it was a collection of tools and best practices for sustainable infrastructure, offering municipalities the best in Canadian knowledge and experience.

Create clear and coordinated approval processes that are efficient and incentivize investment
The government should work with stakeholders and provincial counterparts to review and harmonize funding and project approval process across jurisdictions to identify opportunities for efficiency.

Key Results



82%
of participating MPs were familiar with the consulting engineering industry

90%
of participating MPs expressed their support for ACEC-Canada's goals and advocacy messages

100%
of participating MPs expressed a willingness to work with the industry

Overview of the Day

Over 25 meetings took place over the course of a week with MPs from all the major political parties. Participants met with:

What Participants Shared about their Meetings

"The Member of Parliament I met with was grateful to learn about ACEC and the breadth of work conducted by consulting engineering firms across Canada. They pledged support for our goals around the National Infrastructure Assessment and the recommendations ACEC has made around infrastructure investments" – **DIRKA PROUT, WOOD**

"The meeting with my Member of Parliament was a successful one. They understood the role of consulting engineers and how we positively impact society. They inquired into the InfraGuide and further information regarding this initiative." – **BEN HUNTER, LEA CONSULTING LIMITED**

"During our meeting, the Member of Parliament and I had a productive discussion on the need to improve the efficiency of approvals and funding processes to incentivize infrastructure investment and other issues related to the Industry (Resources) and Technology sectors in Ontario and across Canada." – **TOM MONTGOMERY, CIMA+**

If you have any questions about ACEC's advocacy efforts or are interested in participating in future Parliament Hill Days, please contact John Gamble, ACEC President and CEO, at president@acec.ca.

ESG and "I": How engineers can fuse innovation and ESG into their strategy

RSM

BY JAKE SALPETER, SUPERVISOR, ESG ADVISORY SERVICES, RSM CANADA

Over the past five years, environmental, social and governance ("ESG") has seen an exponential growth in industry focus and prioritization amongst a variety of stakeholders. RSM's 2021 ESG report showed a dramatic rise, from 39% to 69% in business executive familiarity with ESG, from Q4 of 2019 to Q3 of 2021. Once considered a differentiating factor, ESG has become an expectation, leading to the question, "How can companies and organizations differentiate themselves further through ESG?" The answer to this lies in an often-omitted additional letter: "i," representing innovation.

Innovation is the life blood that drives ESG progress and enables organizations to achieve their ESG goals. Without innovation, ESG would not have reached its current level of prominence within both public and private domains. Fortunately, engineers are uniquely positioned to drive this innovation and help their companies, clients and communities make significant strides in ESG progress, from a technical, operational and executive level.

THE TRUE BENEFITS OF ESG

Alignment to social and environmental goals, as well as improved financial performance, can only be truly achieved through the meaningful and intentional integration of ESG into the DNA of a company. Through innovation, consulting engineers can promote this integration in the following ways:

1. **Sustainable design:** Many innovative ESG concepts, including societal and environmental impact studies, circular economy and product differentiation, can be leveraged as part of the integrated design process for engineering projects. Asking the right questions at the outset of a project is imperative to enabling engineers to make innovative and well-informed decisions that will impact the design and outcomes of a project.
2. **Emerging technology:** Innovative and emerging technology is critical to incorporating ESG into the design, implementation and management of projects. Much like Building Information Modelling changed the landscape for how infrastructure projects are designed, managed and operated, new and emerging technologies, such as environmental management systems, void analysis tools and impact reporting software, are being utilized by engineering firms to incorporate and communicate the value of sustainability innovation in their projects.
3. **Fostering next-generation leaders:** Innovation and ESG can only successfully address global environmental and social issues if they are sustainable across multiple generations of professionals. Fostering a culture of innovation and creativity within a consulting engineering firm is just as important to the long-term success of the engineering industry as providing innovative solutions. The next generation of innovative engineers will require a canvas to learn, grow and explore and engineers in training can flourish in an environment that encourages innovative solutions and creative design-thinking.

By focusing on innovation, engineering firms will be better able to meet ESG goals for their clients and communities. Visit us at rsmcanada.com to learn more.

READ INSIGHTS FROM RSM'S ESG SPECIAL REPORT.

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Specifying for Smart Buildings

Technology has evolved by leaps and bounds.
By Peter Saunders

Ryerson Universi's SCITHub will both test and showcase a variety of 'smart' devices and systems.

If you got the chance to design the ideal 'smart building' from the ground up, which technologies would you specify?

Last year, Ryerson University announced plans for the Smart Campus Integration and Testing Hub (SCITHub), which it says will be the world's first 100% digitally enabled building. Set for construction on a vacant lot at 136 Dundas Street East in downtown Toronto, the two-storey, 3,000-sf mass-timber facility will both test and showcase a variety of smart building technologies, before potentially being dismantled again.

Notably, SCITHub is the first project that will integrate the Intelligent Structural Panel (ISP), developed in recent years by WZMH Architects principal Zenon Radewych with support from Stephenson Engineering, Quasar Consulting Group and C3PoE (see *Canadian Consulting Engineer*, December 2018, cover story). The ISP is a modification of Intelligent Engineering's sandwich plate system (SPS), which bonds two steel plates with a polyurethane (PU) elastomer to provide a solid-panel alternative to reinforced concrete in walls and floors.

Specifically, the modification adds fibre, copper, a low-voltage DC system and Power over Ethernet (PoE) connectivity, allowing the panels to form a plug-and-play 'intelligent highway,' supporting smart building systems to address heating, ventilation and air conditioning (HVAC), lighting, security, power management and more. Circuitry running between the plates resembles the layout of a microchip and the devices are added via RJ45 connectors.

"One of the most important things we realized is the importance of working with consulting engineers in 're-mapping' existing building technology," says Radewych. "It is time to work more collaboratively and challenge each other with respect to how systems are designed and interact with each other. The goal should be combining systems with a focus on energy efficiency, safety and accessibility."

WZMH's innovation lab collaborated with Toronto-based Argentum to develop the various low-voltage devices to interact with the ISP, which won an Award of Excellence in the 2019 Canadian Consulting Engineering Awards.

"Ryerson came to our office to see the

"It's time to work more collaboratively," - Zenon Radewych, WZHM Architects

RENDERING COURTESY WZMH ARCHITECTS.

mockup of the ISP," Radewych explains. "It was determined the panel would be a perfect fit for the research building. We are also working with Argentum to see how their DC low-voltage devices can be integrated into SCITHub, including a smart PoE controller that can intelligently control non-PoE devices, such as lights."

Headed by WZMH associate principal Jamie Lee, SCITHub will incorporate ISPs into its floor slab to provide direct access for its PoE device network. An in-house digital twin will gather the building's performance data for purposes of further optimization. Cisco, Schneider Electric and Mitsubishi are among the other companies contributing to the project.

"The integration of these systems and various Internet of Things (IoT) components must be addressed at the very early stages of the design process and not treated as an 'add-on' feature after all other building components have been specified," says Radewych. "The key for consulting engineers is to ensure the infrastructure is vendor-neutral for the components that interact within the digital building."

A connected environment

In the meantime, more modular approaches have continued to be introduced to the market. The O3 Sensor Hub from Delta Controls in Surrey, B.C., is a ceiling-mounted unit that can control a room's temperature, humidity and lighting as an independent IoT device, without the need for a building management system (BMS).

Indeed, after many years of experience with BMSs, Delta now also offers software-as-a-service (Saas) with its EnteliCloud platform, which centralizes building management operations, site engineering and energy analytics. Executives, energy managers and building operator can view data on personalized dashboards.

"Home automation has become a big business," says Robert Hemmerdinger, Delta's chief sales and marketing officer, "and people now expect that immersive, digital, mobile connection to their environment everywhere, including commercial buildings."

Another factor he cites is COVID-19, which has pushed 'contactless' technologies to the fore.

"You can do more from your smartphone now, from turning on a fan to opening doors," he says.

More modular approaches continue to be introduced to the market.

The company's Red5 platform has added cybersecurity encryption to building control. It integrates with the O3 Sensor Hub and modules to control HVAC, access, lighting and more.

Assessing the results

Another question is how to measure the performance of a smart building. With this in mind, Underwriters Laboratories (UL) and the Telecommunications Industry Association (TIA) recently developed SPIRE, which they call the world's first objective, comprehensive self-assessment and rating tool for smart buildings. Based on the collaborative efforts of a working group that includes consulting engineering firms Arup and Stantec, the framework addresses such criteria as connectivity, cybersecurity, power, energy, health, well-being, sustainability and safety.

"SPIRE pushes us to consider real data," said Dan Michaud, former technology consultant for Arup (and now business technology department leader for HGA Architects and Engineers), in a recent TIA webinar about the rating system. "It focuses on the outcomes of design, system selection, budgets and day-to-day operations. It's a good way to get ahead of the cybersecurity risks, for example, that face systems in typical buildings today."

A completed evaluation may earn a verified assessment and rating. There are also plans for benchmarking based on anonymized building performance data. **CCE**

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Managing the Regina Bypass Project

Saskatchewan's largest-ever transportation project came in on time and under budget.
By Nancy Inglis, P.Eng.

Existing intersections along the highway were replaced with grade-separated interchanges.

Associated Engineering (AE) and CIMA+ led the owner's engineer team for the Regina Bypass, the largest transportation project in Saskatchewan's history and the first public-private partnership (P3) for its ministry of highways. Substantially completed in 2019 and comprising 60 km of 4-lane highways, 55 km of service roads, 33 bridges, 12 interchanges and significant Intelligent Transportation System (ITS) infrastructure, the $1.88-billion project was delivered on time and under budget.

Other members of the owner's engineer team included Golder Associates, WSP (Opus International), Lindsey Quality Solutions, Associated Environmental, Coldstream Technical, AmeriCost Infrastructure Estimators, David Kriger Consultants, HJ Linnen and Associates, Hemson Consulting, NCE Value Engineers, Andrew Johnson Associates, PVP Engineering and International Road Dynamics (IRD).

A new model

The ministry had identified a need for a bypass around Regina as a result of safety concerns, the area's rapidly growing population, economic growth requirements, traffic congestion and access issues. Specifically, between 2006 and 2011, eight deaths and 600 collisions occurred on Highway 1 between Regina and Balgonie—24% higher than other sections of Highway 1 within Saskatchewan.

While the need for a bypass was great, the magnitude of the project was far larger than any other ministry undertaking to date. Within three months of securing the owner's engineer, the owner's team (*i.e.* government and consultant) worked collaboratively to develop a reference concept design and cost estimates for the business case. The design moved traffic away from the city while allowing local connections; and to improve safety, existing intersections along the highway were replaced with grade-separated interchanges.

A value for money assessment, undertaken through SaskBuilds and Procurement, determined using a design-build-finance-operate-maintain (DBFOM) P3 model would realize a significant cost saving and allow the project to be completed approximately six years sooner than using a traditional approach. The federal government provided $200 million in support of the project as a P3.

The owner's team developed technical specifications and contract documents for the DBFOM project. The process involved refining cost estimates, developing risk and quality management strategies, supporting land acquisition, conducting safety planning and assisting stakeholder consultation.

The project attracted multiple bidders. AE and CIMA+ supported the ministry in shortlisting three proponents to provide detailed bids and assisted in selecting the project company to undertake detailed design, construction, operation, maintenance and rehabilitation.

During construction, the owner's team

PHOTOS COURTESY REGINA BYPASS.

audited quality, environmental, health and safety systems and technical compliance, oversaw non-conformance tracking and reporting and undertook contract administration. Mutual trust was developed with the project company, which helped to minimize claims. Indeed, the bypass opened in 2019 with no major claims.

Working as a team

The concept design provided appropriate access points to the highway and service roads, which allowed a free flow of traffic while enabling rural communities and businesses to remain connected and positioned to grow.

The owner's engineer team collaborated with Ernst & Young and SaskBuilds to develop the business case that supported project delivery under a P3 model. This model saved approximately $380 million compared to traditional design-bid-build (DBB) delivery, minimized risk to the ministry and allowed the project to be built more quickly.

The 'one team' approach involved developing an online project collaboration site to support communication and information exchange. Members of the team collaborated to address issues, review lessons learned, undertake risk workshops, identify risks and allocate them to the parties best-positioned to manage them, ensuring value to the government.

A key concern was the number of teams that would bid on the works. SaskBuilds reviewed the Canadian market so the team could promote the project at the right time, thus attracting multiple bidders.

With up to 200 personnel from different organizations across North America working on the project at the same time, the online collaboration site ensured secure data storage, provided easy access to information and helped foster and integrate the 'one team' culture with ministry staff. This tool helped manage more than 7,700 reviews, 800 fabrication and construction audits and 100 quality, environmental, health and safety management audits.

Environmental planning

The bypass was built within the Glacial Lake Regina basin. The route bisected ephemeral drainage, creeks and streams that were essential to maintain, so as not to impact the local ecology or agricultural practices.

Easily maintainable and reliable drainage strategies were established, such that during rainfall, the original overland flows were maintained without compromising operation of the new highway or putting at risk existing local establishments or land features.

The greenfield portion of the project required a significant amount of fill material. Fill sources were established along the bypass route to minimize the need for long-haul routes and the associated environmental impact.

Resurfacing of Highway 1 was part of the project. The owner's engineer team worked with the ministry to amend its Pavement Manual to enable the contractor to recycle as much of the existing pavement as possible, reducing the need for new materials and making the project more environmentally sustainable.

One month after the bypass opened, the provincial government reported an average of 1,230 trucks were using it daily, taking them off Regina streets. It is estimated the free-flow highway will reduce greenhouse gas (GHG) emissions by 1.5% and fuel consumption by nearly 300 million L over 30 years.

The bypass also reduces transportation noise within the city and improves air quality, thanks to large reductions of a variety of compounds that contribute to air pollution from vehicle idling.

Fostering innovation

During construction, an online tracking system was implemented to manage non-conformance reports. This system tracked non-conforming supplies and materials, preventing unintended use and helping ensure corrective actions.

The collaborative approach facilitated the development of innovative, cost-saving solutions. For one, the project included Canada's first diverging diamond interchange in a rural area, reducing queuing and resulting in safer, free-flowing left turns. This interchange opened at Pilot Butte one year ahead of schedule.

The project included approximately 60 km of four-lane highway, 12 interchanges, 33 structures and 54 km of service roads.

The ITS infrastructure developed for the Regina Bypass project provides building blocks for broader ITS use across Saskatchewan. It includes a data management centre, a significant number of field devices in the Regina area and a wireless network to transmit data.

The Highway 11 interchange has been constructed in a manner to allow for future expansion of the Regina Bypass to the north and the addition of more bridges and ramps as traffic volumes increase and a new level of service is required. **CCE**

Nancy Inglis, P.Eng., is manager of special projects for Associated Engineering. For more information, visit www.ae.ca.

Legal

By Heather L. Jones

Heather L. Jones is a Vancouver-based senior litigation partner in Miller Thomson LLP. For more information, visit www.millerthomson.com.

Remedying Environmental Contamination

The obligation upon a party who contaminates another's property to remediate was upheld in dramatic fashion in the recent 122-page decision of the British Columbia Supreme Court (BCSC) in *Ward v. Cariboo Regional District*, 2021 BCSC 1495. The court found the district liable for environmental contamination and provided a wide breadth of injunctive relief, requiring it to not only remedy the situation, but also to test and remediate the property and take action to ensure the contamination does not occur again. And the decision set out the legal consequences a party may face if it fails to remediate in a reasonable manner.

Background

The Wards own a rural residential property near Williams Lake, B.C., which includes a home, buildings and a pasture. This property is serviced by a gravity sewage system operated by the district.

In 2015, a power outage resulted in an estimated 49,000 gallons of raw sewage flooding the property and contaminating the Wards' well. The flood was the third sewage spill on the property by the district and, by far, the largest.

Following that flood, the district paid for the restoration of the Wards' home and chlorinated their well, but took no steps to remove the sewage from the pasture or ponds, in spite of the plaintiffs' requests and contrary to their own emergency plan and protocols. Instead, the district suggested sunlight would be sufficient to decontaminate the property.

In 2017, the Wards commenced an action against the district in trespass, nuisance, negligence and the cost recovery provisions of British Columbia's *Environmental Management Act* (EMA). Approximately six months before the trial in 2020, the plaintiffs experienced another sewage spill after creek water flooded the sewer system; the district denied liability for this flood.

Trial

A week prior to trial, the district amended its response and admitted liability for negligence, continuing trespass and continuing nuisance for the 2015 flood, but stated the continuing trespass and nuisance stopped on an arbitrary date some six months after the event. The district continued to deny liability for the 2020 flood.

At trial, the Wards provided evidence their property remained impaired by sewage. Experts testified for both parties. The Wards' expert provided evidence about the types of contaminants found in the sewage (such as plastics and heavy metals, which do not dissipate by sunlight or otherwise), the continuing odours emanating from the property and changes to vegetation.

The district's 2018 testing of the site was found to be lacking. The district's expert evidence was not accepted, but the testing results did show exceedances of heavy metals on the property in the 2015 sewage release.

Decision

In its reasons for judgment, the court found the district liable in trespass, nuisance and negligence for both the 2015 and 2020 floods. Trespass and nuisance were found to have continued as of the date of trial. The EMA claim was found to be premature, as the costs for remediation had not yet been incurred.

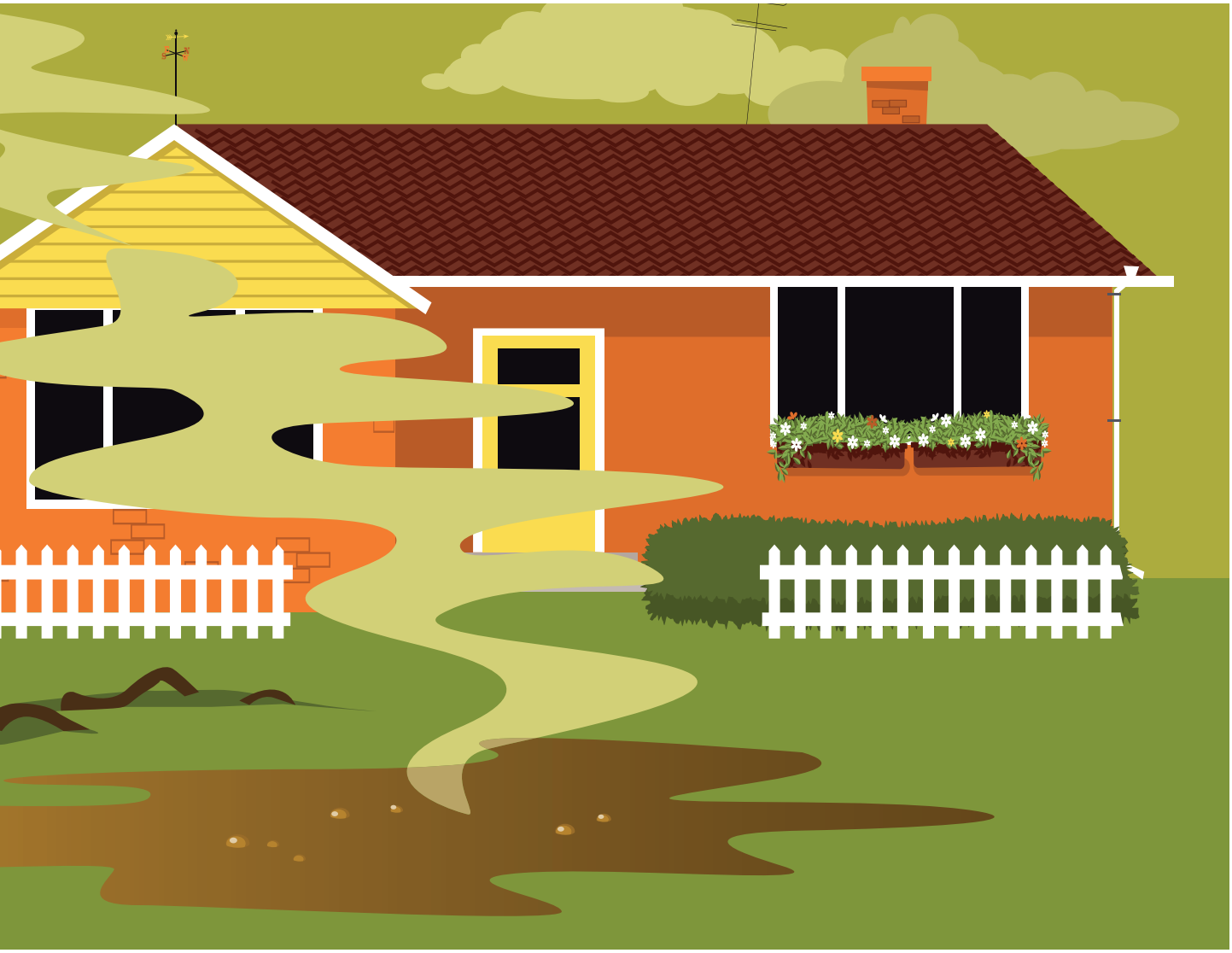
The award of the court was primarily by way of injunctive relief, with limited monetary damages. The court determined awarding damages alone would be akin to giving the district a licence to continue to pollute and trespass on the property. The court noted it would not be reasonable to force the Wards to live on a property that was contaminated with sewage and observed that where there is interference with property rights, injunctive relief is strongly favoured.

In finding continuing trespass, the court explained "… once an object is placed on another's land, not only the initial intrusion, but also the failure to remove it, constitutes an actionable wrong and there is a 'continuing trespass' as long as the object remains."

The district had taken no action, failed to follow its own protocols (including the vacuuming of spilled sewage where possible) and failed to comply with baseline standards to ensure adequate protection.

The decision set out the legal consequences a party may face if it fails to remediate in a reasonable manner.

IMAGE © ALEUTIE / ADOBE STOCK.



The district had effectively followed a policy of "inaction." The court determined there was a continuing nuisance and significant and detrimental impacts to the Wards' use and enjoyment of their property and to their mental health and well-being.

To remedy the ongoing situation, the court imposed a wide breadth of injunctive relief designed to ensure the removal of the contaminants, the restoration of the land and the implementation of repairs and protective measures to minimize the likelihood of a future flooding event.

Specifically, the district was ordered to retain an engineering firm to create a testing plan, test the property, develop and implement a restoration plan to remove any contaminants and ensure the property is restored to its condition prior to the flood. The court further ordered the district to, among other things, repair and restore its manholes on the property, install a gravity overflow system, install functional backflow preventers, repair sinkholes above the sewer line, inspect and repair any deficiencies along the sewer line and inspect and test drainage systems on the property.

Meaning

The court's decision makes it clear a party responsible for causing a continuing trespass or nuisance, including a municipality, will be required to fix the problem. The fix must not only be in the form of remediation, but also address the cause of the contamination. It appears a party that causes environmental contamination will need to remediate it and take steps to ensure it does not happen again—or it will be subject to a claim for damages and injunctive orders tailored to do so.

The district appealed portions of the Supreme Court's decision. In October 2021, the district sought a stay of the primary injunctive orders requiring it to create a testing plan and a resulting restoration plan and to install the gravity overflow system. The court found the appeal of the order to test and restore had no merit and refused a stay, but did grant a stay regarding the installation of the gravity overflow system. The appeal has yet to be heard. **CCE**

How Can Engineers Reduce the Risk of a Claim?

It's important to be ready for clients' accusations, whether legitimate or groundless.
By Aun Japanwala and Tasmeea Islam

Engineering projects can be complex and challenging to manage. Whether you're designing a small storefront or a new transportation hub, the pressure is high, as is the potential for errors. And when errors arise, regardless of who's at fault, today's society is quick to point the finger. Accusations of negligence or malpractice can cost a lot to defend against—and tarnish your reputation and credibility.

Understanding the risks

The following are the top three risks faced by engineers:

52% of claims are caused by design errors, according to Victor Insurance.

1. A client claims you made a mistake.
According to claims data from Victor Insurance, 52% of claims are caused by design errors. With so many different measurements and models, it's easy to slip up, no matter how careful or precise you are. When you're juggling multiple projects, it's near-impossible to detect every single error before submitting the final plans, even if you're double- or triple-checking your calculations.

2. A client accuses you of negligence.
Engineering projects rarely go smoothly. Sudden disruptions in performance, schedule and pricing may be unaccounted for under the existing terms of the contract. If a client isn't aware of delays or cost overruns well in advance, you might be accused of negligence or breach of professional duty.

3. A client names you in a lawsuit.
When a budget is at stake, clients can become aggressive. Whether or not you're at fault, they may look to pass financial responsibility onto you if an error or omission loses them money. And even if a claim is frivolous, you'll still have to defend to clear your name.

Managing the risks

Here are some tips and tricks to help you avoid a claim:

1. Practise good contract management.
Set clear expectations regarding the project, including the terms and conditions; the timing, delivery and termination of services; and the pricing and payment schedules. Seek legal counsel if necessary. Make sure you understand your legal obligations and amend your contracts as needed for adequate protection.

2. Ensure you have the contractual ability to stop working if you're not being paid.
This is key just in case your project gets held up. Additionally, all invoices should state they are subject to the terms of the master agreement.

3. Implement quality control processes.
Review your work constantly and keep a list of active clients to make sure you don't bite off more than you can chew.

IMAGE COURTESY PROLINK.

4. Document everything.
Maintain a complete record of all provided services and interactions. Note the date and time, all discussed topics, any issues, any recommendations you made and why, along with the client's refusal, if applicable.

5. Be thorough.
Take photos and/or videos of any problems or errors you encounter. Always follow up discussions with a summary email, particularly for verbal agreements or instructions given to other parties.

6. Be cautious.
Don't put your stamp of approval or sign off on anything you're not 100% comfortable with. You may have to explain your reasoning to a judge if it's called into question. Similarly, don't agree to switch materials or brands of specified products unless you've tested them yourself and can certify such changes will have no major impact. Always document your rationale for switching and/or not switching materials.

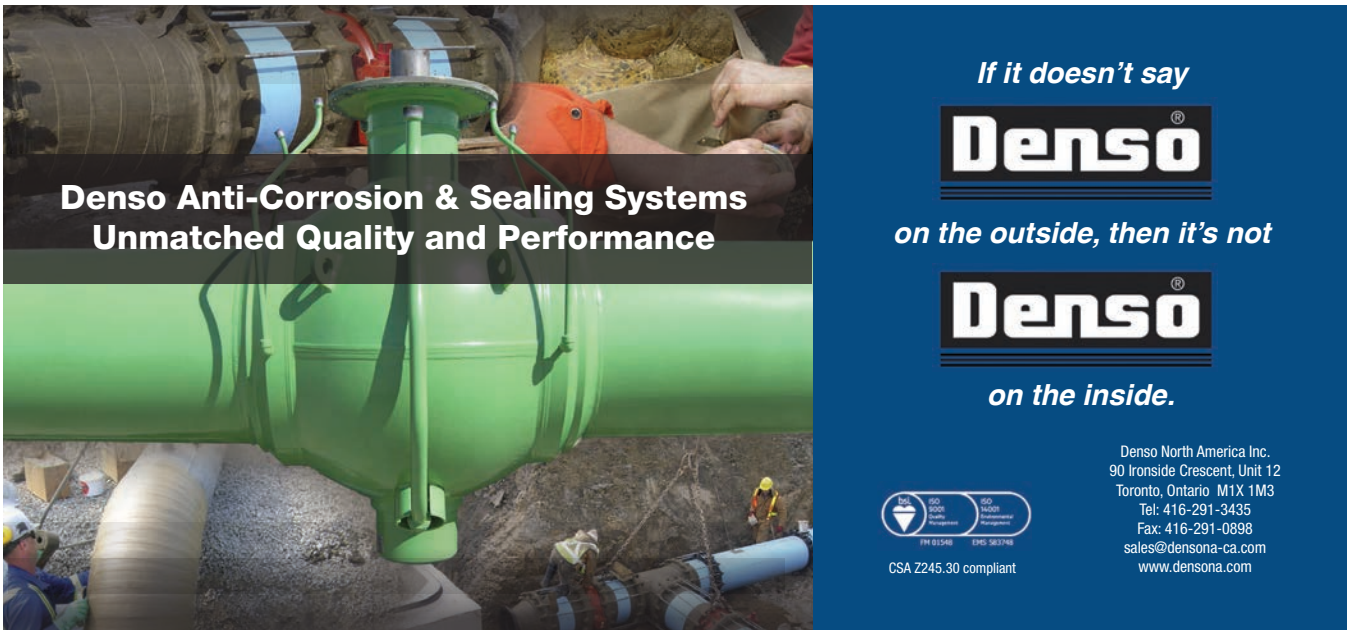
7. Don't certify what you can't see.
This is key even if a contractor tells you they've done something before with no issues. Do your research. Ask for third-party reports on efficacy and safety before making any changes or approving anything risky.

8. Communicate.
Keep all relevant parties informed of updates to design plans and layouts, pricing and deadlines, bylaws and government and safety protocols. Be particularly mindful of budgetary and scheduling changes or anything else that could drive up the project's total cost.

9. Strengthen your insurance coverage.
By covering your damages, including legal expenses, administrative costs and court settlements, the right insurance will mean legal action doesn't jeopardize your business, even if the claims made against you are groundless.

10. Consult with a risk advisor who specializes in the engineering sector.
A licensed broker will have the expertise to deliver a specialized approach that aligns with your needs and strategic objectives. Risk advisors can also help identify your exposures and adopt a proactive approach to risk management. **CCE**

Aun Japanwala is the engineering practice manager and Tasmeea Islam is a marketing and communications specialist for PROLINK. To learn more about your exposures and how you can protect yourself, visit www.prolink.insure.



Classifying Occupancy for Outpatient Clinics

The most crucial factor is a building's principal use.

By Avinash Gupta, P.Eng., Mohamed S. Mohamed, P.Eng., and Dominic Esposito, P.Eng.

Canada's National Building Code (NBC) and related provincial codes are occupancy-based, with classifications depending on potential fire load and risk. Each classification dictates the type of construction and structural fire protection requirements for a building based on its area, height, intended use and number of facing streets.

Classifying the occupancy correctly is therefore of significant consequence. Otherwise, the wrong code requirements could be applied, resulting in the insufficient provision of life-safety systems or the addition of unnecessary features.

In the absence of a scientific algorithm to classify a building (except for industrial occupancies), a certain amount of good judgment is warranted. The designer may use Appendix Note to Article 3.1.2.1. of Division B of NBC as a guide, but its list is not exhaustive.

The most crucial factor is a building's principal use. A day-surgery clinic, by way of example, could be classified as a business and personal services occupancy (Group D) or a treatment occupancy (Group B, Division 2), based on the terms defined in the codes.

Defining patients' use

The NBC does not permit sleeping and housing accommodations, treatment or personal care assistance or administering medicine or transient medical service in a business and personal services occupancy. Treatment occupancy, on the other hand, refers to the use of a building for the provision of medical or other health-related interventions, where overnight accommodation is available to facilitate that treatment and where the administration of these interventions may render outpatients incapable of evacuating to a safe location without the assistance of another person.

This definition was included in NBC 2010 with an encrypted, insinuative narrative to classify dentistry and day surgery procedure clinics as business and personal services occupancy. The National Fire Code (NFC) 2020 requires a fire emergency procedure to be provided where treatment is contained, but the above requirements do not restrict the number and type of patients permitted at any time, define day-surgery clinics, redefine treatment or revise the definition of business and personal services occupancy to incorporate the type of treatment permitted in a day-surgery clinic.

A dental clinic has assistants who would help evacuate patients safely in case of an emergency.

PHOTO COURTESY DR. NABIL NADJI, PERIODONTIST, RED DEER, ALTA.

The prescriptions for both occupancies are foundationally different in the codes. The most obvious difference is the sizeable population of inpatients in a treatment occupancy who would require assistance to evacuate in case of an emergency. Since these people usually need

additional time to evacuate a building, the quantity and quality of exits carry a greater significance. Where possible, many designers prefer to locate the required entrances and exits at the ground level.

Fire safety for day-surgery clinics

A day-surgery clinic provides services, surgeries (usually non-invasive) or medical procedures to outpatients who are not admitted for longer-term care, housing and overnight sleeping accommodations. These outpatients receive medical 'treatment-service' or observation and are subsequently discharged to go home or admitted to a hospital as inpatients. Operating rooms (ORs), recovery rooms, intensive care units (ICUs), birthing rooms and emergency wards, typically located in hospitals, are not permitted in outpatient clinics.

The number of outpatients in a day-surgery clinic should be limited based on the life safety systems deployed, as medical services might render a patient incapable of taking action for self-preservation. A day-surgery clinic must also have an adequate staff-to-client ratio.

Fire emergency procedures conforming to NFC 2020 are to be provided for every building where treatment is provided in business and personal services occupancies, irrespective of the number of outpatients, staff-to-client ratio and fire protection systems availability. The fire safety plan prescribes the identification, operation and maintenance of exit routes, exits, obstructions (like snow) in the evacuation route, exit signs, emergency lighting, fire-alarm systems and any other services required for the safe evacuation of patients and residents. It provides a safe and orderly evacuation under emergency situations, but has no direct perceptible impact on the additional time required for patients incapable of self-preservation.

Dental and dialysis clinics

The above context makes it feasible to classify a day-surgery clinic as a business and personal services occupancy if the pre-established maximum number of patients who might be rendered incapable of self-preservation complements the available life safety features. However, the current editions of NBC and NFC do not specify a maximum number of outpatients permitted under such occupancy classification.

Day surgery or medical service in a dental clinic, for example, may involve administering sedative drugs. The intent is to achieve unconsciousness or near-unconsciousness, but not to knock out the patient. A dental clinic has assistants who would help evacuate patients safely in case of an emergency. (More complicated procedures are usually performed in a hospital.)

Dialysis, meanwhile, is a treatment for kidney failure that clears the body of unwanted toxins, waste products and excess fluids. The patient's blood is circulated through a dialysis machine and cleaned before being returned to the patient's body. During an emergency, this procedure can be paused, providing an opportunity for

Table 1: Major life-safety provisions for outpatient clinics

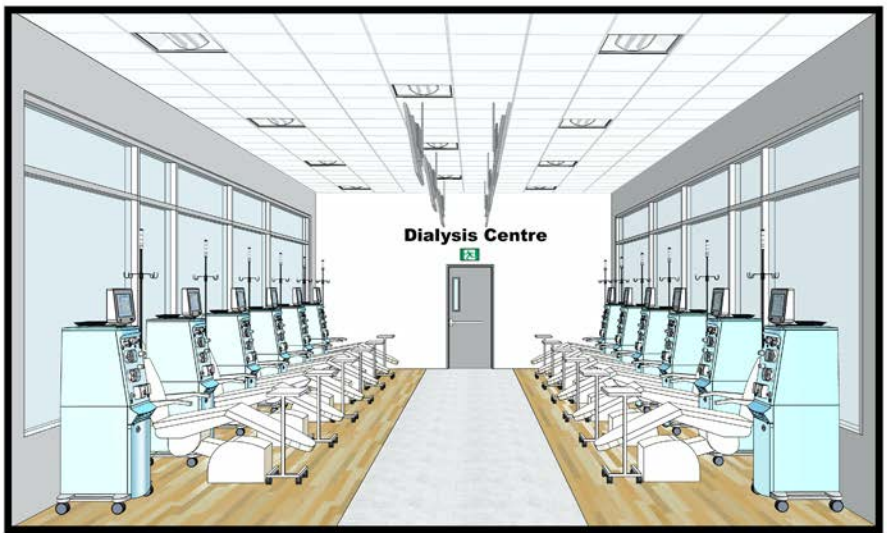
Life Safety Provisions	NBC/NFC	NFPA 101 (2021)
Minimum Construction	Combustible construction is permitted.	Combustible-traditional wood {Type V (000) or Type V (111)} is permitted.
Number of Exits	A single exit is permitted for a unsprinklered building, 200 m2 floor area (maximum), and not more than 2 storeys in building height, and occupant load not more than 60.	A single exit is permitted under conditions and one of them is that the exit is to discharge directly to the outside.
Separation from a Treatment (Group B, Division 2) or Health occupancy	Usually emergency or similar clinics are taken as subsidiary to a hospital.	Separated from the health care occupancy by construction having a minimum 2 h fire-resistance rating.
Number of Patients	No restriction.	Less than 4 outpatients receiving simultaneous treatment are permitted.
Type of Patients Permitted	It does not categorically prescribe the type of patients.	Prescribes in the definition that it is for outpatients only.
Staff-Client Ratio	NFC 2020 is silent on the number of patients permissible in it.	Less than 4 outpatients receiving simultaneous treatment, and the number of staff to help them evacuate is not specified.
Travel Distance to Exit for a nonsprinklered outpatient clinic	25 m for a single exit and 40 m where for two or more exits are provided.	Total travel distance to the outside of the building to be not more than 30 m if a single exit is provided or 61 m under different conditions.
Automatic Sprinkler System (other than high buildings)	Not required for a single storey in building height. For six storeys in building height facing a single street, it is not required for a building area not more than 2400 m2.	Not mandatory.
Fire Alarm System	Not required for a unsprinklered building, less than 3 storeys, including a storey below the first storey, and a total occupant load is not more than 300 or an occupant load more than 150 above or below the first storey.	Required if the building is three or more stories in height, the occupant load is 50 or more above or below the level of exit discharge, or the occupant load is more than 300.
Fire Safety Plan (other than high buildings)	Required as per Model NFC 2020.	Not required.
Emergency Lighting	Required in principal routes providing access to exit in an open floor area.	Required when a building is three or more stories in height, and the occupant load is 50 or more above or below the level of exit discharge or the total occupant load is more than 300.
Exit Signs	Not required.	Due to transient occupant, exit sign may be provided when an exit is not clearly identifiable.

This table is not exhaustive and only covers a few major life-safety features.

staff to move patients to a safer location.

Dialysis treatment is not surgery, but a procedure during which patients remain relaxed and vigilant of their surroundings. Therefore, a dialysis clinic could be classified as a business and personal services occupancy.

However, patients are rendered incapable of self-preservation due to the insertion of needles in their arms. Dedicated staff would need to pause the dialysis machine and remove the needles in an emergency.



A planned dialysis clinic could be classified as a business and personal services occupancy.

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NFC 2020 vs. NFPA 101

NFC 2020 accepts a treatment area in a business and personal services occupancy without restricting the number and type of patients permitted in it. The National Fire Protection Association (NFPA) 101 Life Safety Code, on the other hand, permits dentist offices, emergency care clinics, dialysis clinics and ambulatory outpatient clinics to be classified as business occupancies or ambulatory health care facilities, provided they meet both of the following conditions: (a) they are not intended to provide services or treatment simultaneously to four or more outpatients who are incapable of self-preservation; and (b) they are separated from health-care occupancy by construction with a minimum two-hour fire-resistance rating and the primary intent of the business occupancy classification is to provide services for the outpatient.

Table 1 on page 19 illustrates the startling difference between the life safety system features in a business and personal service occupancy containing a treatment area versus a business occupancy used as an ambulatory health-care facility.

Unproportional disconnect

Contrary to NFPA 101, NBC does not specifically prescribe life-safety guards for day-surgery clinics, whereas all the evidential explanations demonstrated in Table 1 unequivocally confirm permitting a treatment area in a business and personal services occupancy, without an organic mechanism of protecting patients rendered incapable of self-preservation, may lead to serious life-safety, financial and legal consequences.

Prescription of a fire safety plan in NFC compared to NFPA is not sufficient to compensate for the adequate features required for the safe evacuation of patients rendered incapable of self-preservation.

Classifying a building containing a treatment area as a business and service occupancy without noting the number, type and ratio of patients, along with the quantity and quality of exits, may well compromise the safety of outpatients. Failure to provide conclusive requirements for a day-surgery/outpatient clinic may result in a subjective, inconsistent and discretionary approach.

Authority having jurisdictions (AHJs) permitting a building containing 'treatment-services' as business and personal services occupancy might therefore recommend (a) limiting the number of patients incapable of self-preservation without assistance and (b) installing the minimum life-safety provisions listed in NFPA 101. **CCE**

Avinash Gupta, P.Eng., is chief code compliance engineer and assistant fire marshal for the government of the Northwest Territories. Mohamed S. Mohamed, P. Eng., is East Canada manager for Jensen Hughes. Dominic Esposito, P.Eng., is a senior project consultant for Jensen Hughes. For more information, contact Gupta at avinashguptap.eng@gmail.com.

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Licensing More Women Engineers

Jeanette Southwood, P. Eng., is vice-president (VP) of corporate affairs and strategic partnerships for Engineers Canada, a role which encompasses the organization's equity, diversity and inclusion portfolio, among others, and aims to increase the number of women licensed as engineers across the country. She previously led the Canadian urban development and infrastructure sector and global sustainable cities teams at Golder, where she was the first Black woman to be appointed to the senior leadership position of principal globally.

What are the unique challenges of attracting women to engineering?

Gender stereotypes start early on and lead to fewer girls taking the courses required to get into a post-secondary engineering program. And once women do enter engineering, there is often bias, harassment and discrimination against them, whether from colleagues, superiors or hiring practices. This all contributes to a culture of exclusion.

They may also encounter a poor work-life balance, making it difficult to meet family and/or community demands, which leads to a problem of retention, as women leave engineering. There is a need to change the culture of the industry, improve its image and combat gender stereotypes.

Part of our work includes research into success factors for underrepresented groups in the engineering profession. These include a strong peer network, role models, allies, mentors, sponsors and bonds with social, professional and technical networks.

At Golder, I was fortunate to join just prior to the launch of a mentorship program and a global leadership program. Mentors were important to my professional development. They became my allies and sponsors and, similarly, I became a mentor, sponsor and ally to others.

How well is Engineers Canada doing in meeting its goals in this area?

Our 2019-2021 strategic plan prioritized the recruitment, retention and professional development of women in the profession. We made great progress, including the rollout of equity, diversity and inclusion (EDI) training to our board, regulator CEOs and volunteer groups; the expansion of the '30 by 30' network to include 65% of higher-education institutions; the launch of an annual 30 by 30 conference; the continuation of EDI research; and the completion of an EDI training module that will be made available to all engineers and geoscientists in Canada.

As of the end of 2020, our work resulted in an all-time high of 20.6% of newly licensed engineers who identified as female. We achieved '20 by 20,' so to speak!

What is your focus now and looking ahead?

Our 2022-2024 strategic plan will continue to champion an equitable, diverse, inclusive and trustworthy profession by accelerating 30 by 30; conducting research on the perceptions of women who graduate from engineering programs and/or are eligible for licensure; providing a 30 by 30 report card and needs assessment to regulators; and convening groups to facilitate the sharing of best practices. We want to see representation increasing at every step of the pipeline: enrolled students, graduates, engineers-in-training (EITs) and licensed engineers.

"Mentors were important to my professional development."

Jeanette Southwood, P.Eng., Engineers Canada

SCAN HERE
This article is based on this year's Women in Construction podcast. To hear the full interview, scan the QR code above or visit ccemag.com/podcasts.

What else would you like to get across to people currently working in the industry?

We need to move away from the view of women in engineering and equity, diversity and inclusion as 'issues' that can be solved by simply hiring a woman or a person of colour on your team.

Instead, we have to first acknowledge there is an issue of discrimination. We must raise awareness of unconscious bias, microaggressions and systemic barriers for underrepresented groups, including women, Indigenous, Black, people of colour, people with disabilities and internationally trained engineers. We need to all commit to learning and unlearning stereotypes and actively making engineering workplaces into sites where these groups can thrive.

A key obstacle to attracting and retaining women is the culture of exclusion. Everyone in the industry can contribute to a workplace culture that fosters mutual respect and creates a more inclusive culture. And employers can share their knowledge and practices with and learn from each other, so the industry moves forward together. **CCE**

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