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June/July 2018
Volume 59, No. 4

Cover: Street view of The Arbour, a proposed 12-storey tall wood project, part of George Brown College's waterfront campus in Toronto.
Image courtesy George Brown College/Moriyama & Teshima Architects/Acton Ostry Architects.
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Next issue:
Lighting and sound, transit stations, landfill solutions and more.

on topic

Many Voices

In early June I attended the final session at the Canadian Green Building Council's "Building Lasting Change" event in Toronto, where the closing keynote was presented by Mark Jacobson, a professor at Stanford University, who was talking about the possibilities of transitioning not only buildings, but entire cities and countries to 100% clean renewable energy.

Starting small, Jacobson shared how he recently moved into a home that runs completely on electricity, using an air source heat pump water heater (that uses 1/4 the energy of a gas or electric resistance heater), a ductless mini-split heat pump air conditioner/air heater, induction cooktop stove, solar panels on the roof, Tesla batteries in the garage and so on.

He's connected to the grid, but on a typical summer day, the only energy he draws is to top up the charge on his electric cars overnight.

As an aside, he pointed to the inherent efficiency of electric power over gas combustion. He says in an electric car 80 to 86% of the energy is used to move the car, the rest is waste heat. In a gas car, only 17 to 20% of the energy moves the car, the rest is waste heat.

Over one year, he generated 120% of his home energy use, so in other words he sent 20% of his solar energy back to the grid.

He paid no electric bill, and instead he received a $535 cheque. He says the payback for the entire system he's running will be five to six years.

"The point is, you do not need gas connections to any home or building in the U.S. or Canada or anywhere else in the world," says Jacobson.

As part of a not-for-profit called TheSolutionsProject.org, he's participated in a study of 139 countries around the world (including Canada) to examine the requirements for a global transition to 100% renewable energy.

In the end, Jacobson says the technology exists today to move the world onto cleaner energy solutions, but what's holding us up is polital will.

Well, certainly nothing changes overnight, including national economies. While it's hard to argue with inherent efficiencies of electically-powered vehicles, heating systems and the like, replacing mass amounts of existing infrastructure in homes, buildings and personal possesions (gas-powered cars) will take generations and true cultural shifts.

Following his talk, Jacobson was joined by a panel which included Kevin Hydes, P.Eng., CEO of consulting engineering firm Integral Group. Hydes is a former chair of both the U.S. Green Building Council and the World Green Building Council.

After leading the audience through a rendition of "You are my sunshine," Hyde kept his talk short but to the point. A strong advovate for zero carbon initiatives, when he looks at large organizations like ASHRAE (mechanical engineers) and the like around the world, he sees more adovacates for the cause. And as an optimist, Hydes is hopeful that sharing the zero carbon message among the some 4 million AEC people around the world will help to move the needle towards a clean energy future.

The many voices within the consulting engineering community are making a difference, but progress isn't always efficient. It's more like a gas engine, there's a lot of heat wasted for every move forward.

Doug Picklyk

FOR PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
CANADIAN CONSULTING engineer

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AWARDS

16th Grands Prix du Québec

The Association des firmes de génie-conseil (AFG) hosted its 16th annual Grands Prix du genie-conseil québécois ceremony at the Grande Bibliothèque in Montréal.

The top prize—the Visionary Award—went to Stantec for the Parcours Gouin Trail net-zero energy reception pavilion, the first net-zero site in Montréal.

A new award for firms with 100 or less employees went to IGF axiom.

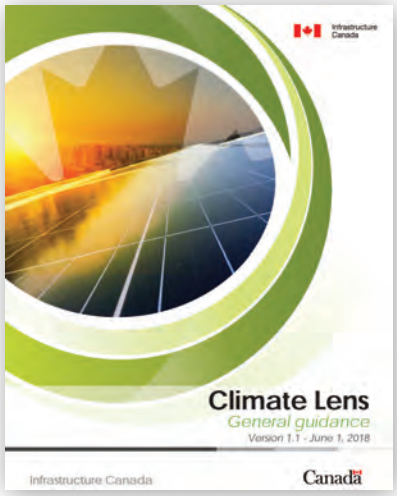
Other award winners included: Tetra Tech (environmental); SDK and Associates (structural); SNC-Lavalin (mechanical/electrical); WSP (industrial and transportation); CIMA+ (energy and civil infrastructure); and the project management award went to the DST Group (Stantec, SNC-Lavalin and AECOM).

Norda Stelo won a sustainable development/social impact award.

Two Mentor awards went to Jacques Blouin, P.Eng., WSP, and Gaëtan Boyer, P.Eng. SNC-Lavalin.

And the Young Professional award went to Slimane Bouakiz, P.Eng., of SNC-Lavalin.

Visionary Award winner, Stantec: (l-r) Réal Laporte, Hydro-Quebec; Alexandre Jean, P.Eng., Stantec; Nathalie Lapointe, City of Montréal.



INFRASTRUCTURE

Feds introduce Climate Lens for infrastructure projects

The Government of Canada has announced that as part of its Investing in Canada plan, applicants seeking federal funding for new major public infrastructure projects will be asked to undertake an assessment of how their projects will contribute to or reduce carbon pollution, and to consider climate change risks in the location, design, and planned operation of a project.

"Our investments in infrastructure are making a difference in the lives of Canadians by addressing natural disasters and severe weather events. Addressing climate change goes hand in hand with growing a low-carbon, clean economy. That is why I am pleased to announce that going forward, the environmental and climate change impacts of a project will be assessed when making new public infrastructure investments," said Amarjeet Sohi, Minister of Infrastructure and Communities.

The new Climate Lens is a requirement of the bilateral agreements being signed between Infrastructure Canada and the provinces and territories. The Lens also applies to the recently launched Disaster Mitigation and Adaptation Fund and certain Smart Cities Challenge winning proposals.

A General Guidance document explains the required approach, defines the scope of the assessment, and identifies the specific information that must be submitted to Infrastructure Canada.

Once a project is approved for funding, Climate Lens assessment expenses are retroactively eligible for cost-sharing.

New fund to support environmental infrastructure

The federal government's new Disaster Mitigation and Adaptation Fund (DMAF) is a 10-year $2 billion national program that will invest in projects that help communities better withstand natural hazards such as floods, wildfires, seismic events and droughts.

DMAF will support large-scale infrastructure projects with a minimum cost of $20 million like diversion channels, wetland restorations, wildfire barriers and setback levees.

Applicants wishing to be considered for funding under the program will have until July 31, 2018, to submit an Expression of Interest to Infrastructure Canada.

Eligible applicants include, but are not limited to, provinces and territories; municipal and regional governments; Canadian public or not-for-profit post-secondary institutions that partner with a Canadian municipality; and band councils and First Nation, Inuit or Métis governments.

COMPANIES

Dillon Consulting merges with Ricor Engineering

Dillon Consulting has merged with Ricor Engineering, a London, Ont.-based engineering firm that serves municipal and land development infrastructure clients in southwestern Ontario.

Founded in 2011, Ricor's 10-person team will be integrated into Dillon's existing London office.

"We are excited to welcome Rick Dykstra and his firm to Dillon. Ricor has done an excellent job at building

deep relationships with developers and municipalities while completing road, sewer, and watermain replacement & rehabilitation projects in southwestern Ontario," said Jeff Matthews, partner and engineering technical lead with Dillon.

Dillon is an employee-owned firm specializing in planning, engineering, and environmental science. Founded in London, Ont., the firm has offices across Canada.

SNC-Lavalin settles class actions brought in 2012

SNC-Lavalin has, subject to court approvals, reached a settlement agreement in relation to class actions in Quebec and Ontario filed in 2012 on behalf of security holders.

The actions were brought pursuant to the secondary market civil liability provisions in various Canadian securities statutes.

The company has contributed $88 million to a settlement of both class actions.

In 2012, the company initiated a series of significant changes and enhancements to reinforce its ethics and compliance procedures company-wide.

These enhancements include, but are not limited to, external validation of the ethics and compliance program by an independent compliance monitor, who reports directly to the World Bank.

In a media release the company says, "The Class action lawsuit settlement is another step in resolving our legacy issues and de-risking the future of SNC-Lavalin, along with signing an administrative agreement with Public Works and Government Services Canada under the federal government's new Integrity Regime in 2015, reaching an agreement with the Commissioner of Canada Elections and with the Ordre des ingénieurs du Québec in 2016, and reaching a fair and final settlement with Quebec's Voluntary Reimbursement Program in 2017."

Fredericton International Airport Authority

Architect rendering of airport expansion.

TRANSPORTATION

Fredericton Airport's $30 million expansion

Together the provincial and federal governments are investing a combined $18 million towards a $30 million expansion at the Fredericton International Airport (YFC).

The expansion will increase the size of the terminal by 50%. The project consists of installing additional ticket counters, modernizing security screening, creating larger arrival and waiting areas, enhanced building envelope insulation, LED lighting and updating the terminal's mechanical systems—which will include geothermal heating and cooling.

According to the Fredericton International Airport Authority, the current terminal exceeded the capacity it was designed to accommodate more than 10 years ago.

The airport has shown consistent growth over the past eight years, with passenger traffic increasing more than 33% in the past five years alone.

The Airport Authority retained Stantec in June of 2013 to do design work. With the design completed, the project is tender-ready. Construction is expected to begin this summer and last for 30 months.

Finch West LRT valued at $2.5B

Mosaic Transit Group signed a contract valued at $2.5 billion to design, build, finance and maintain the Finch West Light Rail Transit (LRT) project.

Infrastructure Ontario

Rendering of Finch West LRT.

Under the Alternative Financing and Procurement contract with Infrastructure Ontario and Metrolinx, the P3 contract reflects payments during construction, a substantial completion payment and monthly service payments during the 30-year maintenance period.

Mosaic (led by ACS Infrastructure Canada, Aecon and CRH Canada Group) will design, build, finance and maintain the 11-km LRT that will run in a semi-exclusive lane along Finch Ave. in Toronto.

It consists of a below-grade terminal stop at Humber College, 16 surface stops, as well as an underground interchange station at Keele Street that connects with the new Finch West Subway Station on the Toronto-York Spadina Subway Extension.

Mosaic will deliver the LRT by 2023.

Mosaic Transit Group's design team includes: Arup Canada, Dillon Consulting, DPM Energy, DTAH, Perkins + Will Canada, and Sener SES Canada.

Best original design, "Slicing through world hunger" by RJC Engineers at Canstruction Toronto.

David Crowder Photography

People's choice award, "Hunger's a Buzzkill" by GM BluePlan Engineering.

EVENTS

RJC Engineers tops Canstruction Toronto

The award for Best Original Design at Toronto's 19th Annual Canstruction Toronto Competition was presented to RJC Engineers for their entry Slicing Through World Hunger.

This year's competition included 19 entries from teams of professional engineers, designers, architects and students.

In all 52,165 lbs. of donated non-perishable food were sculpted into creative structures.

"Canstruction is a unique way for the design community to collaborate creatively in support of the Daily Bread Food Bank," says Helen Kabriel, co-chair of Canstruction Toronto. "The competition is a catalyst for a city-wide conversation about hunger and our collective responsibility to address the challenges facing Toronto."

Other award winners included: Diamond Schmitt Architects (structural ingenuity); rebanks pepper littlewood architects and Quinn Dressel Associates (best use of labels); Turner Fleischer Architects (best meal); Gensler Architecture & Design Canada (honourable mention); and GM BluePlan Engineering (people's choice)

To see more canstructions visit facebook.com/canstructionTO.

Eco Jam Rocks Toronto

For the sixth year running, the team Smith + Andersen and Footprint hosted its annual Eco Jam, a benefit rock concert highlighting the hidden musical talent within the AEC industry.

Held during Earth Week in mid-April, this year's event attracted industry leaders from across the GTA to see and hear their peers perform 70's rock hits inside a sold out Phoenix Concert Theatre in Toronto.

This year, the theme was "Back to the 70s", but aside from the music, the event also draws attention to the importance of trees to the construction industry.

Since 2013, Eco Jam, in conjunction with Forests Ontario, has planted well over 10,000 trees across Ontario, this year was the firm's biggest event yet, adding another 5,320 trees to the total.

Event sponsors & supporters included: B+H Architects, Brown Daniels, Bentall Kennedy, CS&P Architects, DIALOG, Diamond Schmitt Architects, EllisDon, Entuitive, Facio, Gillam, Guild Electric, IBI, In Studio, Ledcor, Montgomery Sisam, NORR, PCL Construction, Perkins + Will, Plan Group, Quadrangle, RAW, RJC, VR Mechanical, Walsh, Zeidler.

Eco Jam rocked the Phoenix Concert Theatre for the biggest show in its six-year history. Nic Pouliot/ROCKPHOTO

AWARDS

20 finalists in Smart Cities Challenge

On June 1, Amarjeet Sohi, Minister of Infrastructure and Communities, announced the 20 finalists of the Smart Cities Challenge.

More than 200 communities across Canada responded to the Challenge. Each finalist will receive a grant of $250,000 to further develop their ideas into final proposals that outline all design, planning, privacy, data protection and project management components of their plans.

Four winners will be announced in spring 2019 (one prize of up to $50 million; two prizes of up to $10 million, available to all communities below 500,000 residents; and one prize of up to $5 million, available to all communities below 30,000 residents).

$5 million prize

- Biigtigong Nishnaabeg First Nation, Ont.
- Bridgewater, Nova Scotia
- Cree Nation of Eastmain, Que.
- Mohawk Council of Akwesasne, Que.
- Yellowknife, Northwest Territories

$10 million prize

- Airdrie and Area, Alta.
- Communities of Nunavut
- Côte Saint-Luc, Que.
- Greater Victoria, B.C.
- Guelph and Wellington County, Ont.
- Parkland, Brazeau, Lac Ste Anne and Yellowhead Counties, Alta.
- Richmond, B.C.
- Saint Mary's First Nation and Fredericton, New-Brunswick
- Saskatoon, Sask.
- The Pas, Opaskwayak Cree Nation, and Kelsey, Man.

$50 million prize

- Edmonton, Alta.
- Montreal, Que.
- Quebec City, Que.
- Region of Waterloo, Ont.
- Vancouver and Surrey, B.C.

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Talking TALL WOOD TOWERS

The 18-storey Brock Commons Tallwood House at UBC, designed by Acton Ostry Architects, structural engineer Fast + Epp.

Photo courtesy of naturallywood.com/photographer: Brudder

By Doug Picklyk

There is no denying the appetite for constructing taller buildings with wood is trending, and in many ways Canada is leading the way. In Toronto alone, two new educational towers using mass timber have been in the news: George Brown College's Arbour project, a 12-storey building that will house a Tall Wood Building Research Institute; and a 14-storey academic tower at the University of Toronto's downtown campus.

When it was completed last year, the Brock Commons student residence at the University of British Columbia was the tallest hybrid mass timber tower in the world. And Vancouver is set to become the site of the Terrace House, a Shigeru Ban designed residential tower that has received approval to use exposed mass timber in the top seven storeys of the 19-storey hybrid mass timber building. It's the tallest hybrid wood structure approved for construction in North America.

With all of this activity around mass timber, we spoke with three structural engineers to get their take on the state of tall wood buildings:

Paul Fast, P.Eng., is founder of Fast + Epp, based in Vancouver. Fast + Epp was the structural engineer on the Brock Commons project and is on the Arbour project team.

Gerald Epp, P.Eng., formerly with Fast + Epp and now principal with StructureCraft, an engineer-led construction firm specializing in timber.

Corey Zurell, P.Eng., is a principal with Blackwell, the structural engineers on the U of T timber tower project. He's also an adjunct assistant professor at Waterloo University.

Rendering courtesy of MJMA and Patkau Architects

Proposed 14-storey tall wood University of Toronto academic tower, a hybrid mass timber project designed by MJMA and Patkau architects, structural engineer is Blackwell.

Is it fair to say mass timber is "hot" in Canada for tall buildings?

PAUL FAST: There is a lot of interest right now in mass timber, not just in Canada but it's across the border now in the U.S. big time.

CORY ZURELL: Industrial buildings used to be built out of wood, but then it fell out of favour because you could do longer spans with steel and concrete. But with some of the projects going up in the last decade or so people are realizing that mass timber can be used for bigger buildings quite effectively. And you get a lot of benefits from it.

GERALD EPP: We go back working with architects for many years, and the architects were kind of getting interested in exploring materials and wood is naturally aesthetic, a natural material, so a lot of architects were interested in exploring exposed wood. It started in B.C., but the interest level now is going far abroad.

Is a mass timber structure more cost prohibitive than other materials?

GERALD EPP: Private developers are showing interest in doing it for commercial reasons. We worked with Hines [a major U.S. developer] on the T3 building in Minneapolis [a seven-storey hybrid mass timber office building]. They chose to do it purely on commercial grounds and it's paid dividends for them.

PAUL FAST: We know what the costs were on the Brock Commons, and they were slightly higher but they were competitive. I think it's safe to say that we're within zero to 10% in terms of overall capital cost difference, with 10% being on the high side. (It really depends on the geographic market and cost of materials in those regions.)

CORY ZURELL: Going through an alternative solution process is what takes time and money. Building codes are slow to change, especially when you have industries that don't want them to change.

How different is it working with timber?

GERALD EPP: We've come up with smart ways to put together pre-fabricated elements in the shop that can be very quickly erected on site. The pieces are CNC machined for accuracy, and it's just like putting together a kit of parts.

For example, on the T3 office building project in Minneapolis, we effectively erected the 180,000 sq. ft. building in 10 weeks.

It's much faster than concrete, and even faster than steel construction.

PAUL FAST: It's a bit like rethinking precast concrete construction except using mass timber components.

The Brock Commons and many new towers are of a hybrid construction, using concrete for the lateral bracing (the core). Why not use wood for all structural components?

PAUL FAST: For Brock Commons we didn't go with wood cores for two reasons: because it would have required a more rigorous code review on behalf of the authority having jurisdiction—prolonging the whole approval process and then we wouldn't meet the schedule—and the other thing we were concerned about is being in a high seismic zone. If you're going up 18 stories and you're trying to do that with wood cores, then we felt the cost was going to start becoming a problem. So it was in part an economic rationale going with concrete.

Right now we've shown an all-timber structure for the Arbour project in Toronto. That's only 12 storeys and the seismic conditions are not as severe as on the west coast.

GERALD EPP: Typically our designs use a concrete core, but we're finding we can put the buildings up faster if we don't wait for the core to be built. The first T3 building has a concrete core, but now the second one that we're working on is actually a steel core which involves wood beams and wood columns but uses steel cross bracing.

Has there been enough research done on mass timber structures?

PAUL FAST: There are several systems that are proven and they work, but as buildings get taller there is more research that needs to be done.

The Canadian government's Tall Wood Building Demonstration Initiative [through Natural Resources Canada] was helpful, and it has been followed up by the Green Construction through Wood (GCWood) program.

That type of funding really assists in the design and research effort that's required to take it to the next step.

What challenges are you seeing working with wood?

PAUL FAST: With mass timber you like to keep it as dry as possible. It's not the end of the world if it gets wet, but you want to control it to enure you don't get the wood swelling excessively.

CORY ZURELL: A challenge with timber on large buildings is acoustic or sound attenuation, which is why hybrid sys-

tems, using concrete and timber together make sense. You get the benefit of adding the mass of the concrete which helps with sound.

What are some of the greatest benefits of building with mass timber?

PAUL FAST: It's much quieter than building with cast-in-place concrete. Brock Commons went up so quietly. So when you're in a dense urban environment, that's a soft factor to consider.

When the wood is exposed the ambience you create is a benefit as well. In my view, classic t-bar ceiling is on the way out, and exposed concrete or exposed wood is in.

Expressive wood combined with natural daylight is a wonderful aesthetic. These are the soft benefits that come along with the justification that go beyond the dollars and cents cost.

CORY ZURELL: Wood goes together easier, you don't need welders. And when installing services, you're not coring through a concrete slab, you're drilling through panels with a wood drill. So, the structure goes up faster, there's less site waste, and so overall construction times can be greatly reduced.

Is structural engineering with mass timber still a niche in the industry?

PAUL FAST: There are more engineers getting educated about mass timber and that's a good thing. Many are afraid of it, but as it becomes more mainstream more firms will realize they have to start working with it.

GERALD EPP: Engineers are being forced to learn because their clients are designing with timber. I know in Vancouver there are a number of engineering firms that are getting quite familiar with it.

CORY ZURELL: I would say the majority of engineers don't understand wood very well. They really haven't been exposed to it, so it's not something they're looking to get into.

There is a gap in engineering education. Not every university engineering program has a course in timber, but there is a shift coming.

Is the environmental story a main driver behind mass timber?

PAUL FAST: Absolutely. But for the last 25 years working with timber, we've found it wasn't just driven by environmental factors, we're also creating an interesting aesthetic.

CORY ZURELL: That's part of it. More emphasis is being placed today on the environmental impact and recycled costs of materials in buildings, as well as the end result in terms of the internal atmosphere in the building.

The whole concept of biophilia is, I think, playing a role in that shift.

GERALD EPP: I guess some architects are enamoured with the idea that they can build with this "green" material. But the question remains whether mass timber towers will be done on a mass scale, and whether they are going to be economical.

Can mass timber structures keep getting taller?

GERALD EPP: With the technology and the advances of engineered wood materials we're able to do a lot more than we used to. But to talk about very tall buildings in wood sounds glamorous, but I don't know if it's practical.

Every building material has its strengths, and so we can talk about these very tall wood buildings, but I'm a firm believer that we should be using the strengths of the material with the right application.

For example, we're working on a basketball arena right now, which I'm really excited about, because it's bringing a new material to that genre. We're doing long span, but we're doing hybrid timber and steel. So we're using wood for its strengths in compression and bending, and then we're using steel and its strengths in tension.

Are mass timber towers just a trend?

CORY ZURELL: It's not a phase. We're not necessarily moving away from concrete and steel, but now we're including wood in the conversation, in the way that it hasn't been in the last 70 years or so.

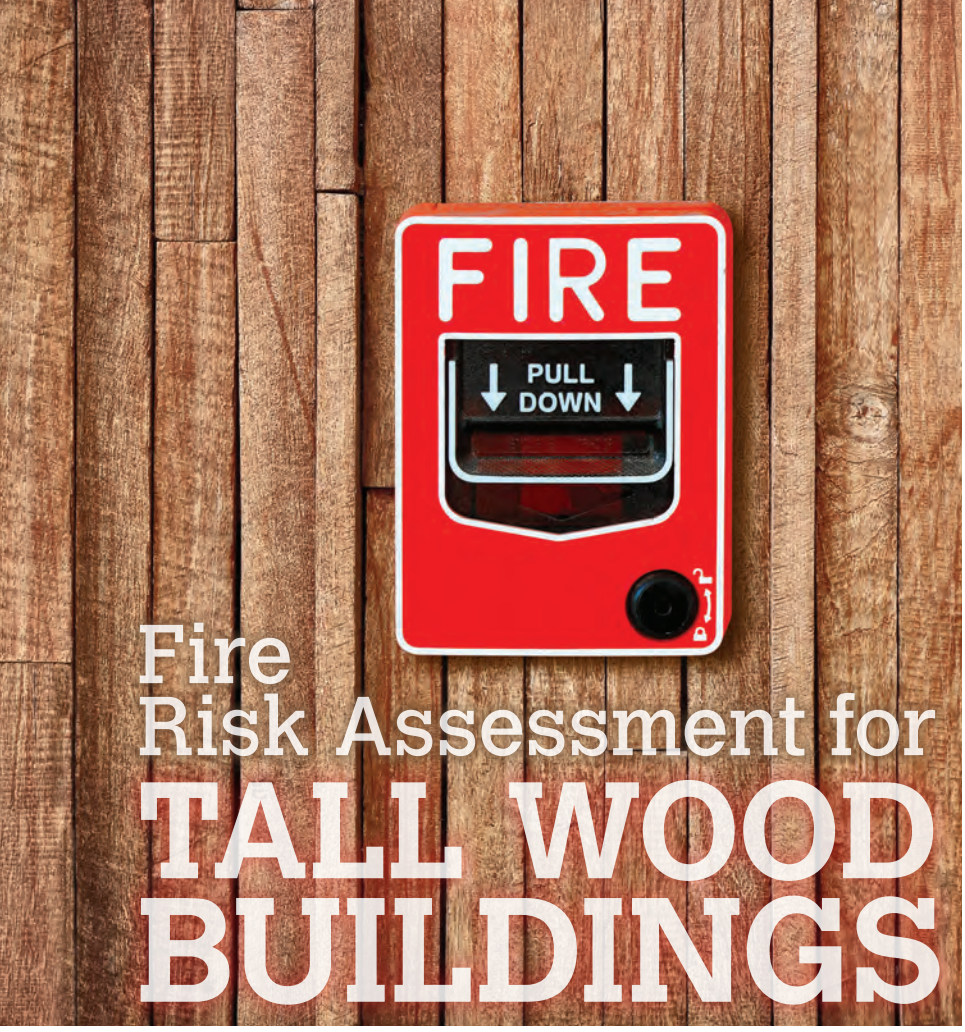
It's more a case of people realizing that it's an option and trying to build smarter, so using wood where it's appropriate. Just as you would use steel and concrete where they're most appropriate.

PAUL FAST: We're still in the early stages of this mass timber movement and we'll see where it settles out in the next 10 to 15 years.

GERALD EPP: The structural component of a building is typically 20 to 25% of the cost of the building. Even if you increase the cost of the structural component by 10%, that's only a 2% increase on the whole building cost. And with timber, you get to delete the ceilings and there are other benefits. So I think it's going to find a permanent home. Certainly we're staking on it. **CCE**

Photo courtesy Moriyama & Teshima Architects

The 12-storey Arbour mass timber project for George Brown College in Toronto, designed by Moriyama & Teshima and Acton Ostry Architects, structural engineer is Fast + Epp.



Fire Risk Assessment for TALL WOOD BUILDINGS

By Steve Craft, P.Eng.

Current Canadian building codes require, under the prescriptive requirements, that buildings taller than six storeys must be of noncombustible construction. The prescribed acceptable solutions require that buildings be sprinklered and have a noncombustible structure with a fire-resistance rating of two hours.

Wood is permitted in several places in a building required to be of noncombustible construction; this includes wood stud or solid wood partition (non-loadbearing) walls, and interior finishes such as flooring, wall coverings, and trim. In recent years there has been increasing interest in alternative solutions seeking approval to construct tall wood buildings with mass timber. Although some designs may use gypsum board to varying degrees to encapsulate the mass timber, many projects will seek alternative solutions that will allow for a large amount of the mass timber structure to be left exposed (e.g. beams, columns and ceilings).

These proposed alternative solutions may be approved if it can be demonstrated to the authority having jurisdiction (AHJ) that they will deliver the same level of fire performance with respect to life safety and property protection as the code-compliant acceptable solution.

In an effort to support Ontario's wood industry and to contribute to the knowledge base for tall wood buildings, the Ontario Ministry of Natural Resources and Forestry recently published Ontario's Tall Wood Building Reference. This reference is written primarily for the municipal Chief Building Official (CBO) who may receive an alternative solution proposal for a tall wood building.

It's also a valuable tool for developers, architects and engineers who want a better understanding of the various considerations that go into the development of an alternative solution when seeking approval from a CBO to construct a tall mass timber building.

Alternative solution submissions can take many forms, from simple trade-offs to complex fire safety engineering analyses. Alternative solutions for tall wood buildings are likely to be on the more complex end of the spectrum. It is, therefore, recommended that fire safety engineers follow a standardized fire safety engineering process, such as that published in the international standard ISO 23932, "Fire Safety Engineering – General Principals" (ISO, 2009) or that published in the "International Fire Engineering Guidelines" (ABCB, 2005).

As explained in Ontario's Tall Wood Building Reference, fire risk assessment is a useful tool for comparing the fire-safety performance of a proposed alternative solution for a tall wood building against a code-compliant acceptable solution of noncombustible construction.

The first step in a fire risk assessment is to identify the unwanted consequences that are to be limited; for example, injury to or death of occupants, and/or the extensive spread of fire beyond the point of origin.

The second step is to estimate the probabilities that these unwanted consequences can occur for both the acceptable solution and the proposed alternative solution. The product of these consequences and probabilities is the risk of injury to or death of occupants, or the risk of fire spread in the building. If these risks are no greater for the proposed alternative solution than for the acceptable solution, the alternative solution has been demonstrated to achieve the required level of performance.

There are several methodologies that can be used to estimate the risks from fire in buildings depending on the required level of mathematical complexity and the level of "richness" of available data. These methodologies can be classified into three groups: qualitative, semi-qualitative, and quantitative.

Qualitative Methods

Qualitative methods do not entail any

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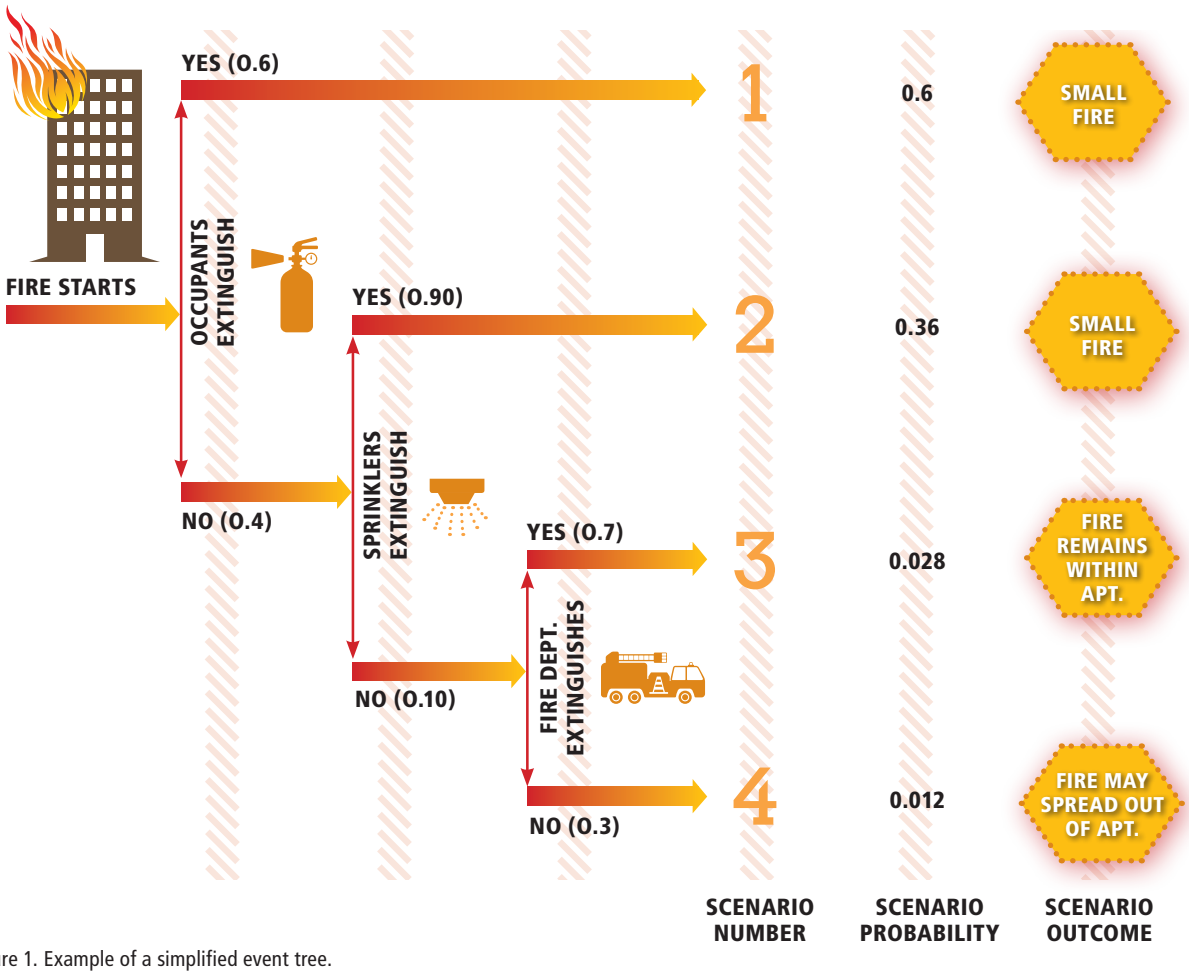


Figure 1. Example of a simplified event tree.

calculations to assess risk. They are often used as a first step to identify the most hazardous events and, thereby, become a screening method for identifying events that should be included in a quantitative risk analysis. They use techniques such as "what-if analyses," checklists, event trees and risk matrices. Often, they characterise hazardous events as having a high or low probability of occurring, and a high or low consequence should they occur.

In some instances, a rather quick qualitative assessment can be made. If the only difference between two building designs is that one (the alternative solution) has a combustible mass timber structure protected with multiple layers of fire-rated gypsum board, and the other (the acceptable solution) has a noncombustible structure, there will likely be no difference in the risk of ignition or early fire growth.

There would also be no difference in the occupant response and evacuation times needed to exit the building, since the combustible structure of the building would not be expected to become involved in a fire event until sometime well into the event, if at all. Furthermore, as far as property protection is concerned, sprinkler activation and firefighter response should be similar in the two buildings. It would, therefore, be unlikely that a detailed fire risk assessment would be required in such cases.

Semi-Quantitative Methods

Semi-quantitative methods quantify the expected consequences of unwanted events or their expected frequencies, but not both. Using these methods, unwanted events can be ranked in terms of either their consequences or their frequencies.

For example, deterministic fire models can be used to determine the severity and impact on the occupants of a building or to estimate damages to the building without considering the frequencies of fire events.

There are also semi-quantitative methods that permit the ranking of design solutions based on a predetermined scoring system that involves both consequences and frequencies.

Quantitative Methods

Quantitative methods use computational tools to calculate both the expected consequences and expected frequencies of anticipated unwanted events and, thereby, compute an overall fire risk for a building.

While such tools are challenging to use, they can provide a global estimate of the overall fire risks involved for an acceptable solution and an alternative solution. As noted above, the use of quantitative methods may not be necessary if the mass timber is fully encap-

sulated; however, if the proposed alternative solution entails some exposed mass timber elements, it may be necessary to compare the resultant fire risks with a code-compliant acceptable solution in which there is also some exposed wood.

Fire Risk Analysis Process

If a proposed alternative solution includes exposed mass timber, a more detailed fire risk assessment may be required to compare the relative performances of the alternative solution against acceptable solutions in which there is also some exposed wood.

As mentiond, Canadian building codes do permit some wood to be used in buildings required to be of noncombustible construction, including the use of interior wood-stud or solid wood partition (non-loadbearing) walls, interior finishes such as floor and wall coverings, and architectural trim.

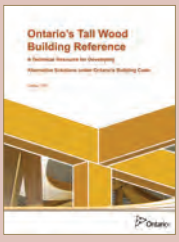
For such cases, the SFPE Engineering Guide on Fire Risk Assessment (SFPE, 2006 – currently being updated) provides a structured approach for undertaking a fire risk assessment, including the selection of appropriate fire models and statistical data. The Guide outlines the main tasks that must be undertaken including: identifying the fire hazards and the likely fire scenarios; determining the probability of each fire scenario (based on fire statistics and the reliability of fire protection systems); and determining the consequences of each fire scenario (injuries, deaths and property damage).

Event Tree Analysis

A very useful tool for undertaking a fire risk assessment is an event tree. Event trees start with an initiating event and then, by considering the impact of subsequent events, generate potential fire scenarios. Event trees can incorporate both the consequences of unwanted events as well as their frequencies (probabilities).

An example of a simple event tree is shown opposite (Fig. 1) for demonstration purposes. The initiating event is a fire that starts in the kitchen of an apartment in a multi-storey building. The building is equipped with smoke detectors, an alarm system and a sprinkler system. The events considered in this scenario and their corresponding probabilities are:

- Occupants respond to the alarm and extinguish the fire 60% of the time resulting in little fire damage;
- If activated, automatic fire sprinklers will extinguish the fire 90% of the time, once again resulting in little fire damage;
- Once they arrive on the scene and face a major fire, firefighters are assumed to be able to contain the fire to the apartment of fire origin in 70% of fires.



Additional information on fire risk assessment in designing tall wood buildings can be found in Ontario's Tall Wood Building Reference available for download from the Government of Ontario's website:

https://www.ontario.ca/page/building-with-wood

This event tree considers only four events, including the initiating event, and results in four scenarios. The probability of each scenario is the product of the probabilities along the scenario branches. The outcome or consequence of each scenario can be expressed in qualitative terms as shown in the figure or can be expressed in quantitative terms using mathematical tools to predict the impact on occupants and/or to predict the extent of property damage.

If the quantitative approach is taken, the overall risk can be computed by summing the product of the consequence and probability of each scenario.

The final step in the process would be to use this event tree approach to compare the risks associated with the proposed alternative solution and the appropriate acceptable solution.

In applying this approach for tall wood buildings, the probabilities of an occupant suppressing the fire and the sprinklers suppressing the fire should be similar for both the acceptable and alternative solutions, since both events should take place very early in a fire and long before the structure of the building or boundary elem ents of the apartment become involved.

Since, in both the acceptable and alternative solutions, the fire resistance of the apartment boundary walls (which could be constructed of wood protected by fire-rated gypsum board in both cases) would be one hour and the structure of the floor/ceiling assembly would be two hours, the probability of fire spread beyond the apartment of fire origin should be no greater for the tall wood building than a similar building of noncombustible construction, provided the structure does not continue to support the fire after the combustible furnishings and contents have been consumed.

The use of fire risk assessment in designing buildings that are beyond what the prescriptive building code allows, or ever considered, will become an increasingly common method to demonstrate fire safety in building design as designers continue to push the envelope in terms of building size, occupancy, height and materials. **CCE**

Steve Craft, Ph.D., P.Eng., is a principal with CHM Fire Consultants Ltd. and an adjunct professor in the Fire Safety Engineering Program at Carleton University. He is active in many North American and international codes and standards committees.

By Associated Engineering

A cost-effective and repeatable solution was required to maintain water delivery to this northern Saskatchewan community when the power goes out.

Back-Up Power SOLUTIONS

For many northern communities across Canada, a reliable, safe water source is a major issue. The principal concern for the town of La Ronge and the northern village of Air Ronge in Saskatchewan has been power outages which disrupt water and wastewater services. Whenever the power went out, government regulations required shutting down the water supply and issuing a "boil water" advisory.

In 2014, Associated Engineering was contracted to lead the design and construction of upgrades to keep the tap water flowing. The project encompassed 21 facilities—18 sewage pump stations, two water pump stations, and a sewage treatment plant—each with its own unique issues and history.

The Lac La Ronge Regional Water Corporation is a regional utility that was formed by, and is jointly owned by, the La Ronge, Air Ronge, and the Lac La Ronge Indian Band. The back-up power project involved working with two distinct municipal jurisdictions as well as SaskWater as their project manager. The project also demanded innovative solutions to remain within a strict budget.

Power outages

For many years, the area of La Ronge (as the three communities are often referred to collectively) – with a population of around 5,600 people and located about 240 km north of Prince Albert – has experienced power outages for several reasons such as downed trees, forest fires, harsh weather conditions, problems with wildlife, and the remoteness of the lines.

The outages require de-pressurization of the utility's water system, leading to the water advisories. These disruptions would continue for days, until samples had been collected and analyzed so the order could be lifted.

An unreliable water source is not only inconvenient for homeowners, but also a serious concern for the regional hospital, tourism industry, educational institutions, government departments, and businesses that have made La Ronge the major service and supply centre and "jumping off point" for the industrial activity in the north.

Back-up options

There was no single solution to ensure a constant power supply to the water system, and innovative options were needed for the diverse range of upgrades required.

Designs had to consider options such as adding an external generator, adding a generator within an existing building, and, for the more critical locations, replacing the entire building with a larger structure to accommodate the equipment.

One solution involved raising a building and surrounding components by one metre to avoid the risk of flooding during high-water levels in the Montreal River which leads into the large Lac La Ronge body of water.

Given the harsh climate, the selection of housing for the external generators was critical to reduce the strain on the generators. After exploring several options, the team developed the model of a self-contained metal structure, into which the various components could be incorporated as modules, shipped on-site and easily assembled. This reduced both time and costs without compromising quality.

The cost-savings are significant enough to warrant adoption of this approach in the future for other remote communities. The final deliverable of the project will be a complete set of record drawings which will be essential for maintenance and future upgrades.

Project management

In 2016, two construction contracts were tendered for a total construc-

Photos courtesy Associated Engineering

Top left: Several sites were very close to houses and businesses.
Above: The metal structures housing the generators were designed with efficiencies in mind.

tion budget of just over $5 million. Rigorous engineering and project management resulted in consistent progress without major disruption or dispute, along with significant cost savings through reduced travel costs.

Highlights of the process included:

- Conforming all 21 sites to current building and electrical codes.
- Assessing and developing concurrent design on multiple facilities with multiple options for any one site.
- Completing the design and tenders simultaneously to achieve economies of scale.
- Project Coordination and Project Management; Project meetings and project phases were managed by SaskWater and AE to minimize travel to site. The AE design team and construction team were consistent between both contracts to maximize efficiency.
- Ensuring minimum disruption of services and impact on adjacent homes and buildings. Several of the sites were very close to houses and businesses.

In all cases, the infrastructure had to keep operating while the housing for that infrastructure was refurbished or replaced altogether.

Water security

The La Ronge region is a flagship of economic development in northern Saskatchewan. Securing its water and sewer utilities is a significant advancement using practices that other northern communities can adopt and adapt.

The upgrades at La Ronge protect both the treated water supply and the environment, by helping to allay contamination concerns during power outages.

Overall, the upgrades will more effectively deliver water to the community, and eliminate the need of the community and institutions to routinely bring in bottled water from the south. As of July 2017, when the power goes out, the water stays on.

La Ronge is a gateway to the north and supplier for mining, exploration, tourism and other industries. The upgrades to the utilities will be an advantage in attracting and retaining these industries.

Project management and planning – including the involvement of key people from these communities at critical points – helped to promote understanding and a perspective that saw "the larger community as a whole." The positive experience over the past two years will foster increased cooperation in the future to ensure a healthy, prosperous and forward-thinking community.

The project received an Award of Merit at the ACEC-SK Awards. **CCE**

Municipal Utilities Back-Up Power Project, La Ronge & Air Ronge, SK	
Client:	Town of La Ronge & Northern Village of Air Ronge
Engineer:	Associated Engineering

ROUND & ABOUT

An overview of the Canadian Roundabout Design Guide, defining the intent and suitable applications for the traffic calming solution.

By Gene Chartier, P.Eng., Michael MacDonald, P.Eng., Mitchell Jacobson, P.Eng., Michael Skene, Eng.L. and Tom Eichenbaum, P.Eng.

Roundabouts are becoming a more prominent intersection treatment across Canada. From the east coast to the west, decision makers have been convinced that roundabouts are safer, operationally superior and less expensive than comparable intersection treatments.

Until recently, there was no single source of guidance for the application and design of roundabouts in Canada. Recognizing the need for improved national guidance, the Transportation Association of Canada (TAC) developed the Canadian Roundabout Design Guide.

Published in 2017, the Guide provides recommended practices for the planning, design, construction, operation, maintenance and safety of roundabouts in Canada. The content of the Guide was based on research of other national and international best practice documents, along with extensive consideration of Canadian jurisdictions with roundabouts already in service. Two documents served as the principle sources of information for the Guide: American *Roundabouts: An Informational Guide, Second Edition* (NCHRP Report 672, Transportation Research Board of the National Academies, 2010); and the *British Geometric Design of Roundabouts* (Design Manual for Roads and Bridges, August 2007, Volume 6 – Road Geometry, Section 2 – Junctions, Part 3, TD 16/07).

What is a Roundabout?

A modern roundabout is a type of circular intersection in which vehicles travel counter-clockwise around a central island. Drivers entering the roundabout must yield to circulating traffic. Figure 1 (below right) shows the basic geometric design and traffic control features of a roundabout.

Although the terms roundabout, rotary, and traffic circle are sometimes (inappropriately) used interchangeably, these different forms of intersection control have distinct features and characteristics. Roundabouts provide several advantages over traditional traffic circles and rotaries, resulting in superior safety and operational performance.

Different Types of Roundabouts

The Guide separates roundabouts into three categories:

- **Mini-roundabouts** are small and characterized by a fully traversable central island and splitter islands that allow larger vehicles to manoeuvre through the intersection without travelling around the island. Mini-roundabouts, which differ from neighbourhood traffic circles, are commonly used in low-speed urban environments and locations where roadway right-of-way is not sufficient to accommodate a typical single-lane roundabout.
- **Single-lane roundabouts** are characterized by single-lane entries and one circulatory lane. When compared to a mini-roundabout, the central island diameter is much larger, and the island is non-traversable. The geometric design often includes a non-traversable central island with a mountable truck apron, raised splitter islands, and crosswalks.
- **Multilane roundabouts** are characterized by at least one entry with two or more lanes and in some cases may have a different number of lanes on one or more approaches. The circulatory roadway is wider to accommodate vehicles operating side-by-side and may have higher entry, circulating and exit speeds. The geometric design typically includes a non-traversable central island with mountable truck apron if required, raised splitter islands, and crosswalks. The circulatory roadway and exits are striped to accommodate each

Photo courtesy HATCH

turning movement of the entry lane configuration in such a way as to require no lane changes for any movement through the roundabout.

Advantages and Disadvantages

Roundabouts offer several advantages over other forms of intersection traffic control, including:

- **Safety –** Roundabouts have been proven to reduce the frequency and severity of collisions when compared to stop controlled and signalized intersections due to fewer conflict points, lower entering and circulating speeds and deflection on entry. Improving safety is the main reason road authorities construct roundabouts in North America.
- **Operational –** Roundabouts often operate with lower delays and shorter queues than other forms of intersection control.
- **Traffic Management –** Roundabouts can be a useful traffic management and calming tool, especially when used in conjunction with other measures in an overall plan.
- **Access –** Roundabouts facilitate safer and more efficient turning movements at intersections and driveways and provide U-turn opportunities, eliminating the need for more difficult midblock left-turns.
- **Environment and Sustainability –** Roundabouts decrease fuel consumption and vehicle emissions by reducing delays and idling time, consume less energy than traffic signals and require little maintenance.
- **Aesthetics –** Roundabouts can provide an opportunity to create an aesthetically pleasing focal point within or adjacent to a community.
- **Economic –** Roundabouts require less maintenance than traffic control signals, offer time and fuel savings to users, provide societal cost savings through less severe and fewer collisions, and alleviate the need for auxiliary turn lanes.

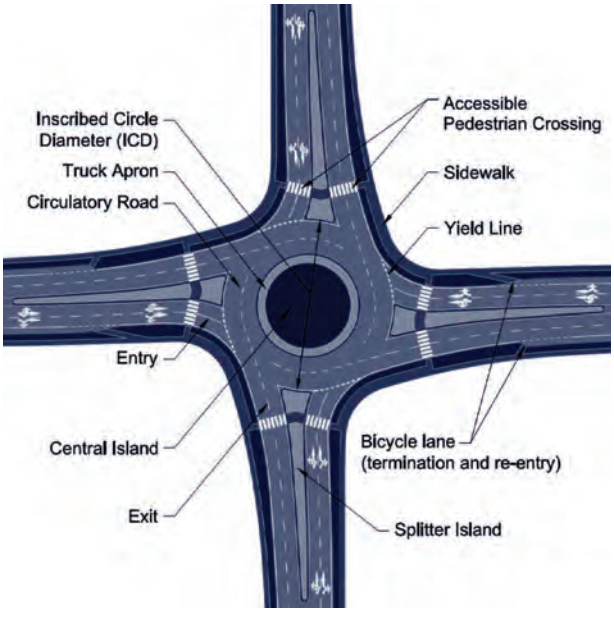


Figure 1. Basic geometric design and traffic control features of a Roundabout. (Source: Transportation Association of Canada)

Although there are many benefits of a roundabout, there are certain limitations to consider, including:

- **Spatial Requirements –** Roundabouts may require more property because of their shape compared to a conventional stop-controlled or signalized intersection.
- **Construction Costs –** Roundabouts may have higher initial construction costs due to a larger intersection footprint, complexity in traffic management, greater property acquisition and degree of landscaping.
- **Constructability –** Retrofitting to install a roundabout may require a longer construction period and present greater complexity for traffic management and construction staging.
- **Operational –** Approach volumes and traffic patterns may adversely influence roundabout capacity. Large vehicles can also impact operation.
- **Accessibility –** Roundabouts may be more challenging to navigate for pedestrians with vision impairment or mobility challenges, and for cyclists.
- **Public Education –** In communities where roundabouts are not common, new installations may require public education and outreach prior to implementation.

Where to Consider a Roundabout?

The decision to implement a roundabout depends on many factors such as the environment in which the roundabout is being considered, the capacity and operational characteristics of the subject intersection and adjacent road network, prevailing roadway geometry, safety, and a range of other site-specific influences. Their safety and operational attributes make them particularly suitable at intersections:

- With frequent collisions or a history of safety concerns;
- With heavy left-turn volumes;
- Where higher-order traffic controls (i.e. all-way stop, traffic signals) are not warranted;
- With unusual or complex geometry;
- At interchange ramp terminals;
- Where a transition from a rural to an urban environment occurs.

Roundabouts may operate less optimally or be less effective than conventional intersection forms in certain locations. While this does not necessarily preclude their consideration, additional caution should be exercised at intersections with higher volumes of large vehicles, bicycles and pedestrians, particularly children, the elderly or persons with disabilities or other accessibility challenges. The Guide provides recommended practices for addressing these challenges.

Roundabouts have specific geometric design and traffic control features to enhance safety and allow the maximum capacity of traffic through an intersection. For further planning and design guidance for the construction of roundabouts seek out the *Canadian Roundabout Design Guide* at the TAC bookstore (www.tac-act.ca). **CCE**

Keeping the PASSION Alive

Georg Josi is the managing principal of the Edmonton studio for the multi-disciplined engineering, architectural, planning and design firm DIALOG, which has four locations in Canada and one in the U.S.

With the firm for for nine years, Josi is originally from Switzerland, where he worked as a structural engineer in a civil engineering firm. In his prior experience working on buildings, engineers always served as sub-consultants to architects, offering very little input up-front. Now, as an engineer at DIALOG, where project teams are often multi-disciplined, he has a seat at the table with the architects and says he finds the atmosphere much more rewarding.

The concept of amalgamating disciplines under one roof goes to the firm's origins in 1960 (Cohos Evamy in Calgary), and then in 2010 when four firms (adding Hotson Bakker Boniface Haden, Mole White Associates, and Office for Urbanism) joined forces to form DIALOG, creating a national practice built upon a multidisciplinary approach and committed to collaborative design.

DIALOG takes a multi-pronged approach to keeping employees engaged and building on its collaborative culture.

As the firm continues to grow—now with over 700 employees across Calgary, Edmonton, Toronto, Vancouver and San Francisco—it's also evolving and developing new processes and programs to keep its culture cohesive and moving forward in this competitive industry.

This year DIALOG was selected among Canada's Best Managed Companies in 2018, a business awards program managed by Deloitte.

This was a significant accomplishment, according to Tania Oppedisano, national director of human resources at DIALOG. Based in the Toronto studio, Oppedisano has been with the company for nine years, becoming national director 2½ years ago.

She says that employee-focused programs introduced at the company over the past couple of years played a role in securing this national recognition.

"There are a lot of tools out there for employee retention, and often people tend to focus on awards, but doing research we found a focus on the individual development of employees leads to high retention, high engagement, as well as high performance," explains Oppedisano. "So we changed the model of our retention strategy to really focus on the development of our people."

DIALOG did away with its annual performance review process, and replaced it with quarterly check-ins where employees have developmental conversations with their assigned coaches. The objective is to focus on their own goals as professionals. "We've seen higher engagement in the program since it's been implemented. It's removed the anxiety of the performance review process, for both the reviewer and reviewee."

Employees at the Edmonton studio gather to watch a live stream of ElevateDIALOG presentations.

DIALOG

Also, having employees share personal and professional goals, and documenting that information, allows the HR department to use that data to better focus its learning initiatives throughout the company.

The firm has also created a leadership program called BuildDIALOG, where about 10 people a year are selected from across all disciplines are enrolled in courses combined with peer and external coaching.

"The core concept is developing leadership skills," says Oppedisano "Professionals, engineers for example, will often look at their development within their profession, but maybe not from a broader leadership perspective. So we wanted to make that a focus to help people develop in that way."

"We've grown significantly over the last two years, and we have not had an increase in our turnover rates. Which is not what you usually see," she notes.

A presentation at AspireDIALOG 2017 in Calgary. DIALOG

Elevate and Aspire

Aside from personal development, DIALOG is also committed to retaining and building upon its established collaborative company culture.

In 2016 the firm started its AspireDIALOG program, where each studio encourages teams from every discipline to share work being done by groups or individuals.

Team members create display boards and present in front of peers at their own studio. The projects are presented and then critically discussed. Four top selections from each studio then move on to the national level where a panel of external judges evaluate the presentations.

Diana Smith, an associate with the mechanical engineering team in Edmonton, collaborated on an Aspire presentation last year sharing the activities a group at the studo did to participate in Edmonton's first ever Design Week.

"We had mechanical, electrical, architectural, planning and someone from marketing all on the team," says Smith. "Five people presented at Aspire, talking about the process we went through along with some of the outcomes and lessons learned."

Smith's team ended up moving on to the national AspireDIALOG event in Calgary, a two-day gathering where the presentations were live-streamed via webcam so members from every studio could view the event.

For Smith, who's been at DIALOG for eight years, says the program works well at bringing the company together.

Another program is called ElevateDIALOG, a creative exercise first attempted in April 2016, springing out of the structural engineering team in Edmonton.

"We said, let's take one day for the team to stop doing project work and instead work on a creative project," explains Cameron Franchuk, an associate with the structural engineering team that helped spearhead the program. "You can work on whatever you want, with whomever you want in our group, but it has to be for the betterment of DIALOG. And at the end of the day you have to present what you've done to the rest of the group."

From a team of 20 structural engineers in Edmonton, about 15 participated in the first endeavour.

"We came up with a lot of different ideas, some of them grew into larger projects, some are still on the backburner," says Franchuk.

"I would say we had mixed success," notes Josi, who was overseeing the structural engineering team at the time.

"It was a bit of a leap for some, while others really thrived. They were able to get their creative minds going, which can maybe sometimes be a hindrance in engineering, when caution and safety are your main concern."

Word of the experience spread around the studio and to the corporate level, so in March 2017 the program ran again but on a wider scale. This time all of the company's associates, around 90 people across all disciplines and all studios, were invited to take part.

"We had about 60 participate," says Franchuk, "It was almost all teams with people working cross studio, and that was really neat because we don't get an opportunity to do that very often."

According to Josi, the net outcome of the second ElevateDIALOG was better than the first. "One of the associates decided to write everyone a small personal note," he recalls. "It was a lot of work, but it made such an impact. It put a smile on my face, and I think it put a smile on 150 others as well."

Like the AspireDIALOG program, the teams shared their ideas with the rest of the company as a live stream video webcast across the studios.

Franchuk admits that within a firm with more creative disciplines like architecture and interior design, it may be surprising that engineers startd the initiative, but he also chalks that up to the firm's culture. "I think working directly with, and in the same office as, architects really helps our engineers become more creative."

His message harkens back to Josi's experience of personal fulfillment derived from working collaboratively in a multi-discipline design environment.

The willingness of the firm to experiment and actively promote collaboration and creativity, together with its in-house personal development initiatives, all combine to secure its rank among Canada's Best Managed. CCE

By Inna Koldorf, Miller Thomson

EMPLOYEE *or* INDEPENDENT CONTRACTOR?

Recent trends in the classification of workers could affect the employment status of engineers.

Canadian workplaces have gone through significant changes in the last two decades. The rapid development of technology has caused the traditional bricks-and-mortar workplace, which was most common in the past, to morph into various non-traditional spaces. Likewise, workplace relationships today look much different than they did only a few decades ago, with relationships falling somewhere along a wide spectrum between the traditional employer-employee relationship and the arms' length independent contractor arrangement.

Traditionally, most engineers worked as employees. With the cost of retaining employees being at an all-time high in some Canadian jurisdictions, employers are increasingly looking at non-traditional arrangements as cost-saving measures, and as ways to allow organizations more flexibility with utilizing its professionals, including engineers.

For employers, engaging engineers as independent contractors rather than employees would result in cost savings with respect to overtime pay, vacation pay, public holiday pay, termination and severance pay, and statutory deductions such as Employment Insurance (EI) and Canada Pension Plan (CPP) premiums. For engineers, performing work as independent professionals rather than as traditional employees provides certain tax advantages, the ability to deduct business earnings and expenses, and the freedom to earn income from a variety of entities rather than being tied down to performing work for one organization only.

However, classifying a worker as an independent contractor rather than an employee has its pitfalls and legal risks. Some Canadian jurisdictions, such as Ontario, have recently cracked down on employers who classify individuals as independent contractors rather than employees, whether the misclassification is intentional or not. Bill 148: Fair Workplace, Better Jobs Act has amended Ontario's Employment Standards Act, 2000 to put the burden on employers to prove that any given worker is an independent contractor rather than an employee. A misclassification of a worker may lead to significant liability for the employer. This recent legislative change has caused a shift in the willingness of some organizations to treat certain workers as independent contractors.

In addition, if an organization is being audited or investigated by the Canada Revenue Agency (CRA) with respect to its classification of certain workers as independent contractors, and the CRA ultimately determines that a worker ought to have been treated as an employee rather than an independent contractor, the organization will be required to pay both the employer's share and the employees' share of statutory deductions such as EI and CPP, in addition to penalties and interest. In other words, misclassification can be costly to an organization.

Workers, and in particular professional engineers, may also determine that it is not in their best interest to be classified as independent contractors. In Ontario, for example, professional engineers who perform work as independent contractors must hold a Certificate of Authorization (C of A) under the Professional Engineers Act. The C of A must be renewed annually. Professional engineers who are employees, on the other hand, are not required to hold a C of A.

Professional engineers who are independent contractors must also carry professional liability insurance. This requirement does not apply to employees. In some jurisdictions professional engineers who are independent contractors are restricted in the manner in which they can advertise their services, restricting the way they can develop and carry on their business.

If a professional engineer does decide to hang up his or her own shingle, or work in association with others to carry on an independent business, it should be kept in mind that both the Canada Revenue Agency and adjudicators who are tasked with determining whether one is an employee or an independent contractor, ultimately weight a number of factors regarding the status of a worker, including the following:

The degree of the worker's control or independence:

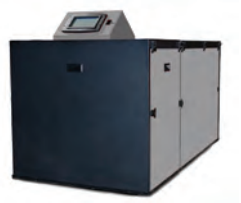
- Did the worker have the ability to negotiate the terms of the contract, or were the terms dictated by the employer entity?
- Does the worker have a registered business and an HST number?

continued on page 24

FOTOLIA

HVAC

Bryan Boilers introduces the BFIT Series of condensing boilers, units that require 46% less space than competitors and an optional racking system allows for double the BTU's within the same footprint. Large diameter, circular tubes provide desired waterside traits for variable flow or primary/secondary applications.



www.bryanboilers.com

Marketair introduces RD-Series and PD-Series commercial rooftop enclosure and support systems designed for multiple linesets used with variable refrigerant flow/volume (VRF/VRV) multi-split systems. The RD-Series (rectangular metal) and PD-Series (round PVC) are practical, economical, durable, and aesthetic enclosure solutions preventing mechanical damage and premature insulation degradation from UV light.

www.marketair.com

SPX Cooling Technologies' MarleyGard Chemical Delivery System and MarleyGard Basin Sweeper Piping System are preassembled systems that help maintain cooling tower water quality. The chemical delivery system uses electronic monitoring to evaluate cooling water treatment. The sweeper piping system uses nozzles to "sweep" solids toward the sweeper outlet suction pipe, discouraging the formation of biofilm, scale and corrosion.

www.spxcooling.com

BUILDINGS

Reliable Controls' MACH-ProView is a programmable BACnet Building Controller that allows access, control, and monitoring of building performance from a mobile device. MACH-ProView can reside on a variety of networks, (Ethernet, Power over Ethernet (PoE), Wi-Fi, and EIA-485) and supports BACnet and Modbus protocols.

www.reliablecontrols.com

CONCRETE

GSSI introduces StructureScan Mini LT, an economical concrete inspection ground penetrating radar system. Rugged, compact, and flexible, the Mini LT can locate rebar, conduits, post-tension cables, and voids. It can help identify structural elements, including pan deck and concrete cover, and provide real time slab thickness.

www.geophysical.com

FIRE

Johnson Controls new SPRAYSAFE Autonomous Fire Suppression System is a fully-automatic fire identification and intervention system designed to deliver fire protection for the external facade of a building. The standalone system can identify and pinpoint the location of the fire and deliver water to that exact location within seconds.

www.johnsoncontrols.com

New Saniflo CEO for North America

Regis Saragosti has been named North American CEO for SFA Saniflo, gaining responsibility for the U.S., Canada and Mexico business sectors.

Previously, Saragosti served as the CEO of Saniflo USA for over 10 years, doubling the business and growing market share to 90% for the wastewater pump manufacturer.

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- Does the worker have set hours of work, or can he or she work at will?
- Can the worker refuse work from the employer entity?
- Are tools and equipment provided by the worker, or by the employer entity?
- Can the workers assign the work to his or her own employees or subcontractors without seeking permission from the employer entity?
- Does the worker have financial risk in carrying on the work?
- Is he or she financially liable if the work does not get performed?
- Does the worker market his or her own services?
- Is the worker hired for a specific project rather than being provided with work on a continuous basis?
- Does the worker incur expenses in performing the work?
- Is the worker well integrated into the employer's business such that he or she looks and acts like an employee of the employer entity?

In conclusion, given recent legislative changes in some jurisdictions and the risk of liability that comes with misclassification of a worker, many organizations are no longer willing to enter into independent contracting relationships as quickly as in the past. However, through an analysis of the above factors, and the use of a well-drafted contract, professional engineers may continue to enjoy the benefits of being independent contractors. **CCE**

Inna Koldorf is a Partner with Miller Thomson. ikoldorf@millerthomson.com.

Specifier's Literature Review

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Canadian Expansion & Clear Horizons

Gus Sarrouh, CEO McIntosh Perry

The Canadian consulting engineering industry has experienced plenty of consolidation, and while M&A activity has slowed down nationally, Ontario-based McIntosh Perry has been active, more than doubling in size over the past two years. We spoke with Gus Sarrouh, company CEO, about the recent activity and the firm's plans for the future.

What is your background?
I graduated from Cleveland State University in mechanical engineering and moved to Canada spending about 25 years with the Ingenium Group (NORR, Cion/Coulter) operating in Canada, the U.S., Latin America, the Middle East, Eastern Europe and Asia. I ultimately became COO of consulting and construction worldwide.

In May 2015 I became CEO of the CCI Group, with the intention of growing the company and taking it to the next level. In October 2016, CCI Group announced its merger with McIntosh Perry, and in June last year the transaction completed. I became CEO of McIntosh Perry, a national firm now with more than 600 people.

Why merge CCI and McIntosh Perry?
The old McIntosh Perry focused mostly on civil engineering for the public sector, whereas CCI Group focused on building engineering for the private sector.

Together we work with a lot of national private-sector clients that have assets across the country, and we want to mirror our clients and become national. And also on the public-sector side, it provides us with the ability to move resources around and help each other out across the country with various expertise.

What are the benefits to being larger?
For our shareholders, [controlling interest in the firm is owned by the private equity fund, Signal Hill Equity Partners] we wanted to create a company that is diverse geographically, between public and private sector clients, and operates in different market sectors and services so we can be more robust and adapt quicker to changing economic conditions.

For our staff, being larger provides much more opportunity for career growth and also allows us to attract the best talent.

How will the firm continue to grow?
We're focused on both growing organically, particularly in new geographies. We're also planning on growing from acquisitions.

What's critical to making a merger work?
A culture fit is the number one thing we look at. I'm not looking for a company to run; I'm looking for partners who want to grow the company.

Why the recent focus on the West?
The first company we acquired was OEL Projects Ltd., a Calgary-based oil and gas company already owned by Signal Hill, so we joined forces. We anticipate things are going to turn around in Alberta. I think that will happen over the next year or two.

Then ARA Engineering in Calgary added more public sector work, specifically in transportation infrastructure. I knew the ownership, and the cultural fit was easy. It also gave us entry into B.C.'s transportation market.

More recently we acquired Luiz Leon & Associates, a structural engineering firm in B.C. and we're really excited about that.

Our strategy in the West is to make sure we have a good blend of public and private work. We have that in Alberta, and we'll continue to look at B.C. so we have a critical mass and better diversity.

Is there interest in adding architecture or construction to the firm?
There are opportunities out there for an architectural presence, but at this time the plan is to remain as an engineering firm and not get into construction at all.

Where are the next opportunities?
I mentioned B.C., and we're looking at opportunities throughout Ontario and Quebec as well. There's still a lot of opportunity in Ontario, and we really like the economy right now.

You've worked internationally, is there value beyond our borders?
For the next three years in our strategic plan, we don't see significant international expansion, but beyond that, who knows. There are people within the firm who have those aspirations, and I have that background as well.

So overall, business is good?
I think consulting engineering in Canada is a very good business to be in.

If you look at the past 15 years, where we have seen ups and downs in the economy, certain places in Canada remained strong for the consulting engineering business. And to be quite frank, they've become targets of international companies that have moved into the Canadian market.

I'm foreseeing changes for sure over the next three to five years, but I'm not seeing any dark clouds on the horizon. **CCE**

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