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wins the Schreyer p. 12

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2023 Awards

National archival facility wins for
Engineering a Better Canada. P. 16

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ON THE COVER The new Library and Archives Canada (LAC) Preservation Storage Facility in Gatineau, Que., won this year's Engineering a Better Canada Award for its high-tech and sustainable approach to safeguarding heritage assets. See profile on p. 16.

PHOTO COURTESY STANTEC.



Comment

by Peter Saunders

Cause for celebration

What a difference a year can make! In 2022, the Canadian Consulting Engineering Awards program drew approximately 50 eligible submissions, down slightly from 2020 and 2021. In 2023, however, we were very happy to see the trend reverse, with submissions increasing significantly, to approximately 70.

Such a lineup of entries, of course, gave our esteemed jury of industry experts many more options and details to consider when assigning scores, choosing the 20 winners of Awards of Excellence and determining which (if any) of the honoured projects were also worthy of Special Awards. In short, the competition became more competitive!

“The competition became more competitive.”

I noted last year how entries in the Buildings category were becoming less dominant in our annual awards program, which we co-sponsor with the Association of Consulting Engineering Companies – Canada (ACEC-Canada). This trend certainly continued in 2023; out of 11 entries in the Buildings category, only one went on to win an Award of Excellence—but it was such a stand-out project, it also won the Engineering a Better Canada Award.

Geographically speaking, submissions poured in from Quebec (16), Alberta (15), British Columbia and Ontario (12 each), but there were also contenders from New Brunswick (four), Saskatchewan and Manitoba (three each) and Nunavut (one), along with a handful of international projects. We hope to see more entries from parts north and east in the years to come, as these regions seem to be underrepresented among nominations.

In the end, this year’s Awards of Excel-

lence were dominated by submissions from Quebec (eight), followed by British Columbia (four), Ontario (three), Alberta (two), Saskatchewan, New Brunswick and international sites (one each).

As for the submission categories, most winning projects were related to Transportation (six), Water Resources (four), Natural Resources, Mining, Industry & Energy (three), Project Management and Community Outreach and/or In-house Initiatives (two each), followed by Special Projects, International and the aforementioned Buildings (one each). Notably, there were no winners from the Environmental Remediation category this year.

After several years of ‘virtual’ deliberations, we were glad to convene our jury in-person in downtown Toronto in June to make their final decisions. And of course ACEC-Canada again organized an in-person awards ceremony in Ottawa. We’ve tried to ensure this special annual awards issue reaches you as soon as possible thereafter.

In the following pages, we offer in-depth profiles of all 20 winning projects. If you are interested in finding out more about all of this year’s entries, including the many that did not win awards, please keep an eye out for our updated Showcase of Entries, which we will post online at ccemag.com.

Through both these print and online platforms, we celebrate Canada’s engineering excellence. Congratulations to all of this year’s winners!

And if you have any feedback about this year’s awards program and any possible changes you’d like to see in the future, please do reach out to me at the email address listed below. I’d love to hear your thoughts. **CCE**

Peter Saunders • psaunders@ccemag.com



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CELEBRATING EXCELLENCE IN THE CONSULTING ENGINEERING INDUSTRY

It's an exciting time for the consulting engineering industry. We have so much to celebrate, and I'm truly honoured to be taking on the role of Chair of ACEC-Canada's Board of Directors—a role that allows me to serve our industry and showcase our members' incredible contributions to communities in Canada and around the world.

As consulting engineers, your work connects people, improves safety, enhances quality of life, creates jobs, and grows the economy. You also have the power to address some of the most pressing challenges of our time, including the fight against

of projects that showcased visionary design, innovative construction solutions, cultural sensitivity, collaboration with the communities, and creative problem solving. By pushing boundaries and delivering creative solutions in the face of complex challenges, these winning projects represent the very best of what our industry has to offer. Five of these winning projects were given a Special Achievement Award for going above and beyond to have a positive impact, whether through technical success, environmental innovation, international excellence, improving Canadians' quality of life, or community contributions.

These winning projects represent the very best of what our industry has to offer.

The evening was also a chance to honour two individuals for their personal contributions to the industry. Leon Botham was recognized as this year's Beaubien Award recipient thanks to a distinguished career defined by global expertise, thoughtful team building, and generous mentorship. As well, the Allen D. Williams Scholarship was presented to Rahim Ahmad, whose exemplary leadership and commitment to a thriving, diverse consulting engineering industry have set him apart as a young engineer.

A sincere congratulations to all of this year's CCEA winners on their impressive work. I encourage everyone to read more about

Our members have both
the skills and the knowledge
needed to strengthen our communities for this generation and next.

climate change. This is something that matters deeply to me in my personal and professional life, especially as we've seen the devastating effects of wildfires raging across the country this past summer. Whether it's designing resilient infrastructure, driving sustainable development, or advancing climate adaptation and mitigation, our members have both the skills and the knowledge needed to strengthen our communities for this generation and the next.

The outstanding feats achieved by our members deserve recognition, and the Canadian Consulting Engineering Awards (CCEA) were created over 50 years ago to do just that. Co-hosted by ACEC-Canada and *Canadian Consulting Engineer*, this year's event on October 19th highlighted 20 consulting engineering projects from firms across the country. The jury selected winners from a wide range

of their remarkable stories in the pages that follow. Thank you to our jury members, who had the difficult task of selecting the winning projects among so many worthy entries. And finally, congratulations and thank you to all members who submitted projects for consideration—the work you do truly matters, and your contributions are deeply valued by your communities and our entire industry.

Stay tuned for ACEC's upcoming #20DaysofExcellence campaign, where we will be celebrating each of the winning projects throughout the next month on social media.



Allyson Desgroseilliers, P.Eng.
Chair, Board of Directors
ACEC-Canada

LEON BOTHAM HONoured WITH BEaubien AWARD FOR LIFETIME ACHIEVEMENT



Leon Botham was recognized for his lifetime contributions and achievements as the 2023 **Beaubien Award** recipient during this year's Canadian Consulting Engineering Awards on October 19th.

Leon is the President and Principal Engineer of NewFields and has built a long and successful career in Saskatchewan and beyond. With more than 30 years of experience, Leon has worked primarily in the mining industry, having previously held senior positions at respected firms including Golder, McElhanney, and Clifton. Widely viewed as a leading Canadian expert in mine waste management, Leon uses his expertise to ensure the safe and efficient planning and execution of projects. He also provides technical and risk management reviews and has managed environmental studies and impact assessments related to mine development.

Leon's impressive portfolio of work speaks for itself, taking him across Canada and around the world to deliver best-in-class project work for clients. In Canada, he has completed numerous projects in Saskatchewan, BC, the Northwest Territories, Ontario, and Quebec. Internationally, he has worked on projects in over two dozen countries, including the United States, Australia, Brazil, Turkey, India, Zimbabwe, Uzbekistan, and Mongolia.

Leon has an exceptional network of relationships, thanks in large part to his approachable and caring nature.

Deeply trusted by his colleagues and clients, Leon has an exceptional network of relationships, thanks in large part to his approachable and caring nature. He is known to be generous with his time, advice, and support, and has served as a mentor to many industry professionals.

Dorothy Williams said it best when she remarked that Leon "excels at the art of giving" – she's seen Leon's generosity in action over the years. Perhaps one of Leon's greatest contributions to the industry was the instrumental role he played in the creation of the Allen D. Williams Scholarship Award, named in honour of Dorothy's late husband and former Chair of ACEC-Canada. The annual award provides a scholarship for young leaders in Canada's consulting engineering industry to gain exposure to the International Federation of Consulting Engineers. Leon first proposed the idea to the ACEC-Canada Board when he was Chair, eventually helping to get the scholarship off the ground and serving as one of its primary fundraisers. He has remained very active as a Scholarship Board member since its creation.

Leon's devotion to consulting engineering doesn't stop there. A thoughtful team-builder, he has consistently advocated for his colleagues and the entire consulting engineering industry over the past decades. He has served on the Board and as Chair of both ACEC-Canada and ACEC-SK and remains an active participant in both associations. Examples of his leadership include helping to create Young Professionals groups for both ACEC-Canada and ACEC-SK, leading fundraising efforts for the ACEC-Canada Engineering Legacies project, and currently chairing the ACEC-SK Equity Diversity and Inclusion committee. For his contributions to ACEC-SK, Leon was recognized with the Saskatchewan Centennial Leadership Medal in 2005 and the ACEC-SK Mentor Award in 2022. He's also part of the Mining Association of Canada's Tailings Working Group and has held executive leadership roles with the Association of Professional Engineers and Geoscientists of Saskatchewan. Furthermore, Leon is a frequent guest presenter at the University of Saskatchewan and uses this opportunity to encourage young engineers to consider consulting engineering as an exciting career path.

When he's not travelling for work, Leon always makes time to give back to his community as an active volunteer for causes across his home province of Saskatchewan. For over a decade, he has served on the Board of Pinehouse Business North Developments Inc., a northern Saskatchewan Indigenous-owned and -operated company specializing in construction and labour services for the mining industry. Inspired by his sons who are enthusiastic freestyle skiers, Leon has also served as Director and President of various Freestyle Ski Associations at the club, provincial, and national levels.

In his speech accepting the award at the Canadian Consulting Engineering Awards ceremony, Leon expressed his honour at receiving this award, saying "Beyond your family, there is no greater recognition an individual could receive than being recognized by your peers in your profession. I am truly humbled and honoured to be recognized with the likes of Allen D. Williams, John Boyd, Wayne Clifton, Chris Newcomb, Réjean Breton, Andy Robinson and all the other past recipients of the Beaubien Award."

With a distinguished career rooted in technical excellence, strong commitment to the industry, and exemplary generosity, Leon Botham is this year's recipient of the 2023 Beaubien Award.

Visit www.acec.ca/beaubien2023 to check out a video about this year's winner.

RAHIM AHMAD IS THE 2024 ALLEN D. WILLIAMS SCHOLARSHIP AWARD WINNER



Earlier this month, the Association of Consulting Engineering Companies-Canada (ACEC) was pleased to announce that Rahim Ahmad, P.Eng., of Associated Engineering was awarded the 2024 **Allen D. Williams Scholarship**. Mr. Ahmad was named this year's scholarship winner during the Canadian Consulting Engineering Awards celebration which took place on October 19th.

A great communicator, Rahim is well-known to be generous, compassionate, and a person of high integrity. Currently serving as a Project Manager and Project Engineer at Associated Engineering, Rahim designs and manages infrastructure and water engineering projects for municipal and industrial clients in Saskatchewan, Alberta, and British Columbia. Rahim is passionate about making projects more sustainable and climate-resilient, and consistently helps clients complete projects on schedule and on budget. His clients and colleagues alike appreciate Rahim's winning combination of professionalism, technical excellence, and genuine desire to help.

Noted for his selfless nature, Rahim is said to be “unsurpassed in his volunteer efforts in the community.”



The son of a former refugee, Rahim grew up in BC's Lower-Mainland, then moved to small-town Saskatchewan as a teen, and he credits this upbringing with helping him develop his strong people skills. That has certainly translated to the workplace – Rahim is known for demonstrating sincere interest in getting to know his colleagues, staff, and clients. He is an exceptional relationship builder, which colleagues note is often only seen at the most senior levels of consulting engineering firms.

Throughout his career, Rahim has worked on a range of diverse projects, including the Husky Direct River Intake Project, the Westside Irrigation Project, the Buffalo Pound Water Treatment Plant Renewal, and multiple projects in the Town of Maple Creek. A particular highlight for Rahim was when he was called on to manage a team that delivered the annual Fort Chipewyan Winter Road, an important link that connects rural and Indigenous communities to Fort McMurray.

Noted for his selfless nature, Rahim is said to be “unsurpassed in his volunteer efforts in the community.” Within the consulting engineering industry, Rahim serves as the Saskatoon Representative for the ACEC-SK Future Leaders Network, as well as an industry mentor for engineering students in the University of Saskatchewan's engineering co-op program. In the broader community, Rahim serves as a Director on the Board of the Saskatoon Open Door Society, where he lends

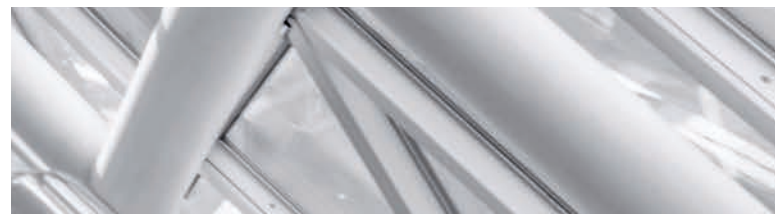
his business acumen to help newcomers build their lives in Canada; as an External Affairs Secretary for the Ahmadiyya Muslim Jama'at in Saskatoon; and as a Youth Mentor with the Ahmadiyya Muslim Youth Association. Rahim is also a founding member of the Sunflower Network, an organization of Saskatchewan industry leaders that helps Ukrainians fleeing the war to find safety and a new home in the province. He has received many accolades for his professional and community contributions, including the 2022 ACEC-SK Young Professional Award, as well as the Queen Elizabeth II Platinum Jubilee Medal (Saskatchewan).

When it comes to the future of the industry, Rahim is optimistic. He has stated that his vision is “for consulting engineering to represent the diversity of Canada, so that we can better understand and address the needs of all people as we design infrastructure to better our communities today, and for generations to come.”

Given his dedication to a strong consulting engineering industry, as well as his technical expertise and exemplary service-based leadership, Rahim Ahmad is the clear choice for the 2024 Allen D. Williams Scholarship.

Every year, ACEC awards a young engineer with a scholarship to recognize their leadership within the industry and to commemorate Allen D. Williams, past ACEC Chair and founder of Williams Engineering Inc. The scholarship provides the recipient with funding to cover registration, airfare, and accommodations to attend the annual conference of the International Federation of Consulting Engineers (FIDIC).

Visit www.acec.ca/adw2024 to view the recipient's award video and learn more.



2023 Awards

The following pages present the
Top 20 Awards of Excellence from the
2023 Canadian Consulting
Engineering Awards.

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2023 CANADIAN CONSULTING ENGINEERING AWARDS / PRIX CANADIENS DU GÉNIE-CONSEIL

This year marks the 55th annual edition of the Canadian Consulting Engineering Awards, a program produced jointly by *Canadian Consulting Engineer* magazine and the Association of Consulting Engineering Companies – Canada (ACEC-Canada).

The awards are the longest-running and most important national mark of recognition for consulting engineers in Canada. The following pages present this year's 20 Award of Excellence winners, selected from more than 70 qualifying entries from across the country.

From these top 20 selections, the competition's esteemed jury singled out five for Special Awards.

The Schreyer Award, the top prize presented to the project that best demonstrates technical excellence and innovation, went to Hatch for the K3 expansion project's south shaft headframe at Mosaic's enormous potash mine in Esterhazy, Sask. The jury praised the firm for focusing heavily on health and safety and being innovative with techniques that are now being adopted elsewhere in the industry.

The Engineering a Better Canada Award, which honours the project that best showcases how engineering enhances the social, economic or cultural quality of life of Canadians, was presented to Stantec for Library and Archives Canada's (LAC's) ambitious preservation storage facility, which stood out to the jury as the largest automated archival system in the world, built to last for "a time frame of 500 years."

The Breton Environmental Award (formerly known as the Tree for Life Award), presented to the project that



K3 Expansion - South Shaft Headframe



LAC Preservation Storage Facility



Standing Column Wells for Clé-des-Champs School



REFAM Argan Predictive Model



Million Meals Campaign

best demonstrates outstanding environmental stewardship, went to gbi for demonstrating the viability of a geothermal heat exchanger with permanent column wells at Clé-des-Champs primary school, to reduce energy consumption and emissions.

The Ambassador Award, which honours projects constructed or executed outside Canada that best showcase Canadian engineering expertise, went to WSP for developing a predictive model for argan tree production in Morocco and integrating it into a new geoportal, which aims to help promote the economic empowerment of women working in this traditional agricultural sector.

Finally, the Outreach Award, which goes to the project that best demonstrates donation of a firm's time and/or services for the benefit of a community or group, was presented to Dillon Consulting for the Million Meals Campaign to combat food insecurity across Canada. The jury praised the effort as "substantial" and for "identifying the best projects to support with a long-term commitment."

The 55th annual Canadian Consulting Engineering Awards were presented in-person at a special celebration in Ottawa on Oct. 19. Congratulations to all of our winners! **CCE**

Canadian Consulting Engineering Awards Jury

This year's jury of industry experts convened in downtown Toronto in June to discuss and vote on the candidates in the final round of award selections.

The following are the esteemed members of the 2023 jury:



CHAIR
Jennifer Drake,
Ph.D., P.Eng.

Dr. Jennifer Drake is an associate professor in the department of civil and environmental engineering at Carleton University. She specializes in drainage engineering, low-impact development (LID) and green infrastructure. Her work draws heavily on principles of sustainability, best management practices and holistic, interdisciplinary design. Her research team works to advance stormwater design, operations and maintenance for the unique climate and urban environments of Canadian cities.



Ahmad Al-Ali,
P.Eng., M.Eng.

Ahmad Al-Ali is director of hydro business development at Ontario Power Generation (OPG), leading efforts in developing untapped hydroelectric potential in Northern Ontario, including greenfields, existing generating station upgrades, advocacy and broader system integration. He has firsthand knowledge of the utility industry, having led key undertakings in engineering, operations and asset and project management.



Marcy Burchfield

Marcy Burchfield is vice-president (VP) of transit planning for Metrolinx. She has worked in regional planning for nearly two decades, influencing transportation, land use, environmental and economic development policy from a place-based, data-riven perspective, to understand metropolitan-scale problems. She also sits on the board of directors for the Canadian Urban Institute (CUI).



Jim Burpee,
P.Eng., ICD.D.

Jim Burpee has more than 40 years' experience in the electricity and climate change field, much of it with Ontario Hydro and its successor, Ontario Power Generation (OPG). While he is currently chair of the board of directors for Atomic Energy of Canada Ltd. (AECL) and senior counsel in the energy and environment practice of Sussex Strategy Group, he considers himself semi-retired.

CHAIR'S COMMENTS

It was with pleasure that I again assumed the role of chair for the Canadian Consulting Engineering Awards' jury. This year, we embarked on a journey of engineering excellence that has left me truly inspired.

Canadian consulting engineers have demonstrated their dedication to innovation, pushing the boundaries of what's possible and shaping a future characterized by ingenuity and progress. What sets the 2023

submissions apart is not only their technical brilliance, but also their resounding commitment to modernization, environmental stewardship and community welfare. This year's projects embody a vision of inclusivity, equity and harmony, reflecting the very best of our profession's values.

A highlight of this year's awards process was the opportunity for our panel of judges to convene in person, in Toronto,

for the first time in four years. This invaluable experience allowed for rigorous debates and discussions about the merits of each project—interactions that could not be replicated through a virtual meeting. The depth and richness of these deliberations added to our evaluation process, ensuring every facet of each project was thoroughly explored.

The 2023 awards are a testament to the extraordinary tal-

ent and dedication that drive our industry forward. To the teams and firms that have shared their projects with us this year, I extend my deepest gratitude. The high calibre of submissions made the task of selecting honorees both challenging and immensely rewarding.

— Jennifer Drake,
Ph.D., P.Eng., Jury Chair



**John T. Evers,
Ph.D.**

Special guest judge John T. Evers is president and CEO of the American Council of Engineering Companies of New York (ACEC New York), an association of nearly 300 firms. He was previously senior director of government affairs for the Business Council of New York (BCNYS), responsible for construction, transportation, telecommunications, technology, contract procurement and manufacturing issues.



**Guy Mailhot,
Eng., M.Eng.**

Guy Mailhot worked for 15 years for consulting firms in Vancouver and Montreal in bridge engineering before joining the Jacques Cartier and Champlain Bridges in 1999, where he was principal director of engineering. Under a federal government exchange program, he has been on loan to Infrastructure Canada since 2012, acting for the authority as chief engineer for the Samuel De Champlain Bridge Corridor.



**Louise Millette,
Eng., Ch.O.M., FEC, Ph.D.**

Louise Millette is a professor in the civil, geological and mining department at Polytechnique Montréal and head of its sustainable development office. She was the first woman to hold the position of department head at the university and in 2004 proposed its first environmental policy. She now works to integrate sustainable development principles into the training of engineers.



**Steve Panciuk,
P.Eng.**

Ottawa-based Steve Panciuk is senior vice-president (SVP) and national engineering professional lead for Marsh Canada's construction practice, which provides expertise to clients with risks related to commercial and residential construction. He specializes in developing and implementing a national strategy for large design firms and single project errors and omissions across Canada.



**Anne Poschmann,
P.Eng.**

Anne Poschmann began her career as a geotechnical consulting engineer with Golder Associates in 1981, providing geotechnical engineering expertise, value engineering and constructability reviews for the development and improvement of transportation and infrastructure. In 2014, she became the first female chair of ACEC-Canada. She is now retired, living on Gabriola Island, B.C.



**Aryan Rezaei Rad,
Ph.D.**

Dr. Aryan Rezaei Rad is an assistant professor of structural engineering in the department of civil and mineral engineering at the University of Toronto (U of T), with a focus on automation in design-to-construction, computational structural design, sustainability-based design, development of computer modules and digital fabrication and robotics for timber structures.



Adriana Shu-Yin

Adriana Shu-Yin is an environment and climate change project manager for the Canadian Standards Association (CSA) Group, developing standards that prioritize the circular economy, resource recovery and sustainable consumption patterns. She has four years' experience in Canada's transportation sector, where she actively supported the electrification of transit.



Clive Thurston

Clive Thurston is president of Thurston Consulting Services. He previously served as president of the Ontario General Contractors Association (OGCA), from 2001 to 2020. He has extensive experience in the construction industry and specializes in contract language, claims preparation, risk assessment and avoidance, promoting policies that benefit all construction industry stakeholders.



Schreyer Award and Award of Excellence

K3 Expansion - South Shaft Headframe

Hatch

With headframes rising over 350 ft above surface and shafts linking to the underground development 3,350 ft below, mining company Mosaic's K3 expansion project in Esterhazy, Sask., is one of the largest and most competitive underground potash mines in the world.

Replacing the existing K1 and K2 underground mines, which are now decommissioned, the K3 expansion project was designed and constructed with a focus on modernization and efficiency, to avoid and mitigate any potential future environmental impacts.

Hatch managed the engineering and construction of the shafts, headframes and hoisting systems, deploying new techniques that successfully achieved project safety goals and enabled the final phase of the project to finish ahead of schedule and under budget.

A novel approach

The greenfield K3 expansion project consisted of:

- two 3,500-ft production shafts.
- two 350-ft headframes.
- hoisting systems for production and personnel.
- surface infrastructure and underground development.

As part of Mosaic's mandate to execute a safe and expedited project, Hatch deployed its construction and modularization groups to develop



solutions that would minimize the construction timelines. By leveraging the firm's knowledge already gained from the conventional construction of the north shaft headframe, the team implemented advanced modularization techniques in the south shaft headframe.

Structural steel pre-assembled modules (PAUs) were connected

into floor sections on ground level. After each floor was assembled, permanent equipment was installed and construction materials were loaded.

Once loaded, each of the six floors was raised as an individual unit on a proprietary-design jacking system with over 1,000 t of lifting capacity. At elevation, each floor was pinned

PHOTOS COURTESY HATCH.

into the walls of the headframe.

In comparison to conventional stick-built construction, this innovative approach provided significant safety and production advantages, including:

- a significant reduction of direct hours working at height.
- a reduced risk for falling objects.



- more than 12 months of scheduling savings.
- significant execution cost savings.

Such innovations were not only executed on the surface above the mine, but also deployed within the confines of the shafts. Despite the constraints of a 3,500-ft shaft measuring only 20 ft in diameter, Hatch

delivered an underground modular approach that had never been executed before.

With an eye toward minimizing the risk of welding within the confines of a wet shaft, the team identified an opportunity and developed a novel solution: to lower each of the 150-t flasks in a single section.

“The scope was like any other structural erection,” says project manager Chris Congram, “except it was happening 3,500 ft below surface, with modules varying in height, weight, shape and size, each requiring unique lift-and-rope management plans. Using the existing shaft-sinking hoists required a high level of planning, teamwork and communication.”

Together with multiple contractors, Hatch and Mosaic reviewed the feasibility plan and implemented key modifications to the execution strategy. The work was completed by a fully integrated team, with a successful outcome, as more than 150 t of steel was lowered and erected at the shaft’s bottom in less than one week, without any safety incidents, saving 18 days off the critical path schedule.

The success of the project gained industry-wide recognition, resulting in plans to repeat a similar ‘fully built flask’ lowering process in other potash mines across Saskatchewan.

One of the most complex slipforms

Due to its continuous construction and reinforcement requirements, along with its scope and lack of internal structure, the south shaft headframe slipform was exceptionally complex.

The structure had to hold more than 2,000 t of suspended structural flooring. With more than 342 embedded plates, 43 blockouts and 3 million lb of rebar, the south shaft headframe was indeed one of the most challenging slipforms ever performed.

“An impressive operation that reduced risks to workers by eliminating working at heights or in confined spaces. It’s good to see a project really emphasize health and safety as a design principle.”
- Jury

Every hour, more than 2.5 t of re-inforcement was installed; and every day, more than 225 m³ of concrete was poured. Extensive planning, constructability reviews and re-engineering were required to co-ordinate the construction effort, which ran 24 hours a day.

Complicating the challenge further, the team had to execute the slipform during the global COVID-19 pandemic, when they were tasked with co-ordinating the mobilization of expertise from key resources across closed international borders.

The team successfully managed significant contractor commercial challenges, including a force majeure, and ultimately completed the slipform safely, under budget and ahead of schedule. It was a true success story for both Hatch and Mosaic.

A hub of employment

As a leading employer in Saskatchewan, Mosaic focused on the development of local business, specifically working with vendors and contractors within the surrounding regions. Representing more than 10 years of execution, including engineering, project management and construction, the K3 expansion project provided more than 12 million employment hours for a primarily Saskatchewan-based workforce.

Two key contractors—both major contributors to the project surface and underground works—established new permanent offices in the town of Esterhazy. With these contractors living and working in the area, the project can continue to provide further employment opportunities for local communities.

A local concrete batch plant was awarded the scope for the execution of the south shaft headframe slipform. While this represented a massive undertaking for the family-owned company, Hatch worked with them to develop procedures and prepare for the execution of the

5,000-m³, 22-day continuous pour. Despite some challenges, the concrete was supplied safely and with exceptional quality. In addition, as part of the execution, with Hatch's support for diversity on this aspect of the project, the concrete supplier fielded an all-female crew for one of two shifts during the execution of the slipform.

Avoiding environmental impacts

The project was designed to maximize efficiencies and minimize the use of energy and natural resources, thus helping to reduce Mosaic's environmental footprint.

Throughout the design, construction and operation of the K3 expansion, there was a key focus on avoidance and mitigation of environmental impacts. Studies were completed with the implementation of key mitigations, including the use of consultants in the field to provide guidance and leadership during construction. Detailed air quality studies and testing were completed to ensure minimal impacts and compliance with permits and approvals.

Now in operation, the K3 mine was constructed at a profound time in line with current demands for environmentally efficient food production. The world-class project is a benefit to millions of people as a reliable source of fertilizer production for the agricultural industry for decades to come.

A significant commitment

When the existing K1 and K2 mines were decommissioned due to the water inflow, Mosaic and Hatch accelerated the final K3 project phase and achieved operational milestones ahead of schedule. The hoists, now fully operational, are capable of lifting more than 21 million t of potash to the surface each year.



The construction effort ran 24 hours a day.

By leveraging Hatch's knowledge already gained from the conventional construction of the north shaft headframe, the team could implement advanced modulization techniques in the south shaft headframe.

ponents underground. Key components of the loading pocketing, including the flasks at the base of the mine shaft, can now be safely constructed outside the shaft barrel and then lowered as pre-assembled units.

Modular approaches like those used on the south shaft headframe demonstrate new ways to prioritize safety through the reduction of work at heights, while optimizing schedules and minimizing costs. With these advanced techniques in place, workers and production timelines are protected from the risks posed by conventional stick-built methodologies. **CCE**

The K3 expansion project signifies a commitment to the long-term sustainability of Mosaic's operations. Potash is an essential element in fertilizers and the K3 mine is Mosaic's flagship development that will help the world grow the food it needs in the years to come.

The modulization strategy, in particular, could revolutionize mining construction concepts and projects in the future. Equipment lowering, once a long and arduous process, can now be optimized through the lowering of larger com-

K3 Expansion - South Shaft Headframe, Esterhazy, Sask.

Award-winning firm (engineering, procurement and construction management): Hatch, Mississauga, Ont. (Chris Congram, P.Eng.; Rafi Abu, P.Eng.; Adam Bale, P.Eng.; Levi Thoner, P.Eng.; Collin Watson, P.Eng.; Dan Bennett; James Kavanagh; Scott Williamson; David Meldal-Johnsen; Peter Gray).

Owner: Mosaic.
Other key players: DLT Engineering (hydraulic jacking system), ABB (production hoist).

WHY SPECIFY UPONOR?

BECAUSE NOT ALL PEX F1960 FITTINGS ARE THE SAME

Did you know that not all PEX F1960 fittings are the same? There are real differences far beyond just the name on the fitting that can have a significant impact on the buildings you design.

Manufacturers and suppliers that claim their fittings are **compliant** to ASTM F1960 feel that, in their opinion, they meet the standard. However, there is no third-party agency certification to confirm that compliance.

Certification Difference

Uponor ProPEX® fittings are a highly engineered product **certified** by third-party agencies — NSF and the Canadian Standards Association (CSA) — to ensure the raw materials, manufacturing process, and resulting product accurately meet the ASTM F1960 standard.

The CSA testing and listing includes the Uponor PEX-a pipe, ProPEX expansion rings, and the ProPEX fittings as a complete system. The testing program includes sustained pressure testing, bent-tube pressure testing, excessive temperature and pressure capability testing, and other tests that also include weekly and yearly follow-up audit procedures.

The Uponor system is highly reliant on the elastic memory of the PEX-a pipe and the unique material properties in its formulation. CSA will only provide a system certification if warranted, and the properties of each of the components are proven to be required to form a fully functional system.

In fact, the companies that mold ProPEX EP fittings are partners that are integrated into the codes and product standards, helping ensure the highest-quality product. ProPEX fittings also undergo internal quality testing that extends beyond the ASTM F1960 standard requirements to provide customers with the strongest value proposition and reliance available on the market.

“It’s important that engineers and installers are aware there is a real difference in products and to understand the importance of specifying and installing Uponor,” says



Bradfield Craig, director of Marketing at Uponor. “In fact, Uponor testing on generic F1960 fittings has exposed various manufacturing design and quality inconsistencies, and some fittings can’t even pass the ASTM F1960 standard requirements. This is putting projects at considerable risk for failures and potentially voids the associated system/component warranties.”

Identifying ProPEX

How can professionals tell if they’re getting Uponor? The easiest way is to look for the Uponor logo on the products. Other indicators include thicker tube stops and thicker sealing barbs on the ProPEX fittings. This is especially important because the thin tube stops on the generic, low-quality F1960 fittings can allow the expanded PEX pipe to extend past the stops and cause leaks.

With the CSA system certification, building and plumbing officials, contractors, and other customers will have the confidence knowing the system has been thoroughly tested by CSA to meet the requirements of the National Plumbing Code of Canada (NPCC) and all subsequent provincial plumbing codes.

To learn more about the quality and 25-year warranty that accompanies the Uponor system as well as the risks of low-quality F1960 fittings, visit uponor.com/askforuponor.



Engineering a Better Canada Award and Award of Excellence

LAC Preservation Storage Facility

Stantec

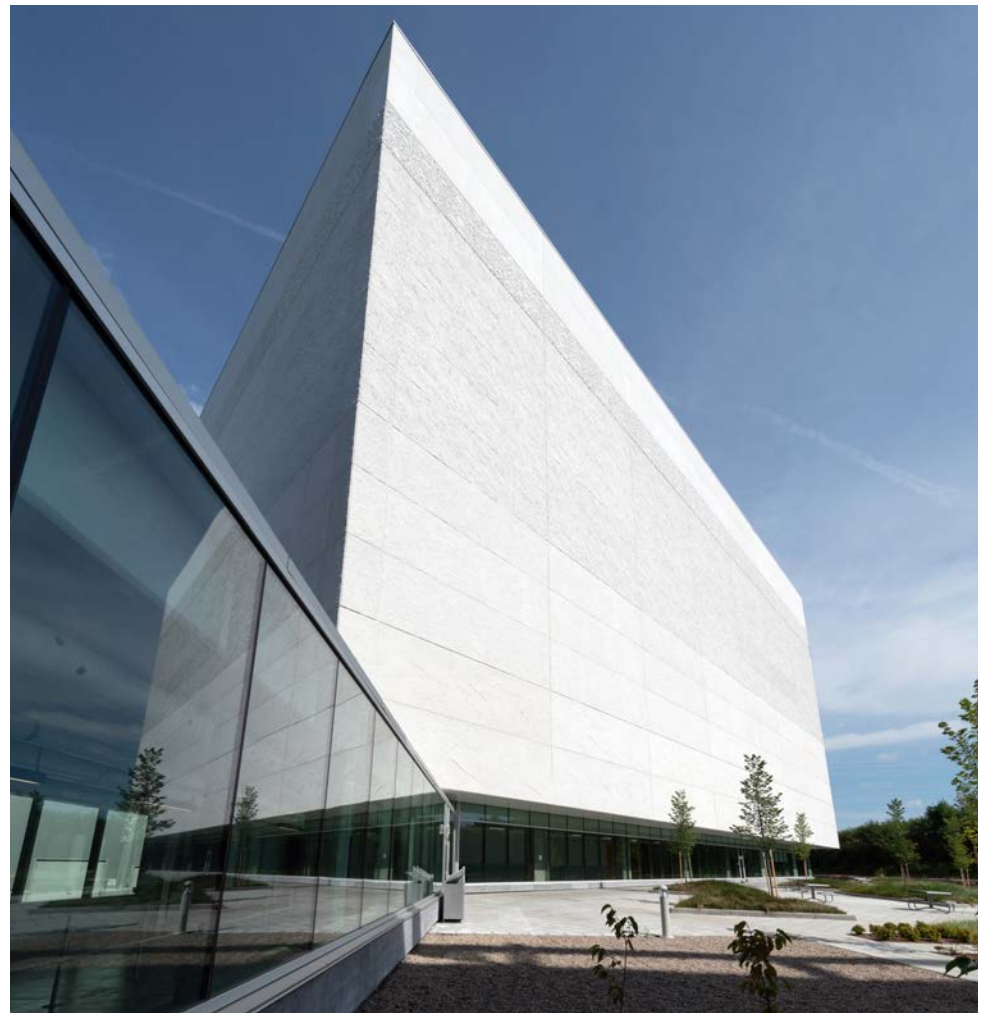
Library and Archives Canada (LAC), a federal government institution, sought a sophisticated and ecologically responsible building to increase its storage capacity in controlled ambient conditions. Stantec, as project engineer, was tasked with creating these ideal conditions to preserve Canadian heritage assets for the next 500 years, redefining archival standards. The firm also met the government's expectations for sustainable development, with the first federal special-purpose building to meet the requirements of the Greening Government Strategy.

"This building has set a benchmark for archival preservation facilities worldwide," says Brian Budden, president and CEO of Plenary Americas, which led the project.

Indeed, project director Nathalie Éthier says the high quality of the infrastructure is already attracting attention from around the globe, to the point where contact has been established with such countries as France, South Korea, Australia and the U.S.

The first of its kind

The public-private partnership (P3) project dubbed 'Gatineau 2' involved constructing a new building, linking six controlled-environment vaults to the existing LAC preservation centre. These spaces, which can accommodate 21,328 m³ of archival documents, are operated with an automated storage and retrieval sys-



tem, making it the largest automated records centre in the world.

Never before had a controlled museum environment been designed for a volume of space of such magnitude. Gatineau 2 was also the first automated records centre in North America to be designed to a net-zero carbon standard. Stantec

was responsible for all of the engineering.

To optimally preserve documents and microfilms, the ambient temperature should remain between 6 and 10 C, with relative humidity of 30% to 40%. With motorized cranes producing heat and the risk of air stratification, collaboration was

needed with robotics consultants, computational fluid dynamics (CFD) simulations and commissioning professionals.

Another daunting challenge involved fire protection, which had to meet the centre’s extremely high functional criteria. As the standards of the National Fire Protection Association (NFPA) do not specify requirements for 28-m high vaults, such standards had to be redefined.

Consequently, the building relies on fire detection by air aspiration, a pre-action system with a simple inter-barrier to prevent the presence of water at the level of the vaults and pipes maintained under nitrogen pressure to maintain a sterile environment.

Smart specifications

Spread across seven different offices, the project’s teams used information sharing and building information modelling (BIM) on an accelerated design schedule and with an integrated approach.

Strict temperature and humidity control had to be guaranteed without interruption to maximize the shelf life of the collection. The installation of a model in the hall of the other building allowed the operators to test new air diffusers and become familiar with their mode of operation in the vaults. The building’s normal operations would rely on electrical systems with a neutral carbon footprint; meanwhile, in the event of an outage, the generators needed to maintain the controlled environment could use renewable natural gas (RNG).

Working with the robotics consultant made it possible to optimize energy recovery when braking the cranes and to program a sequential use of the robots when they are in emergency mode, halving the need for supplementary feeding.

The assembly and construction of the shelves also proved to be a major challenge. Stantec’s team worked



In the event of a breakdown, the robots operate in turn, to limit requests.

with suppliers to define a strategy for assembling the shelving and integrating the majority of the pipes, which helped speed up construction and limit work at heights. The concerted phasing also compensated in large part for delays caused by COVID-19 during construction.

Environmental initiatives

One of the project objectives was to achieve the Canadian Green Building Council’s (CaGBC’s) Leadership in Energy and Environmental Design (LEED) v4 Silver certification. In the end, the team helped exceed the client’s expectations, achieving Gold certification, thanks in particular to the mechanical and electrical engineers’ contributions, including reduction of indoor water use, optimization of energy performance (which reduced consumption by 29.3%), improved refrigerant management and recovery of energy from the robots’ braking.

To meet CaGBC’s Zero Carbon Building (ZCB) standards, the facility’s normal operations use electricity, as well as geothermal energy for air pretreatment, while auxiliary heating systems can be supplied with RNG. And in the event of a breakdown, the robots operate in turn, to limit requests.

The chosen site is located near a wetland inhabited by Western Chorus Frogs. Stantec’s environmental

engineering teams supported the project in obtaining the required permits and developing compensation measures to integrate suitable habitats.

A project for the people

While the clients are LAC and the federal government, the Canadian people are the true beneficiaries of this project, which helps preserve a collection of heritage artifacts—including 22 million books and 425,000 works of art—for the next 500 years. So, an archived piece that entered one of the vaults in 2022 will be intact in 2522!

“This new building will make it possible to keep documents safe that bear witness to our collective past,” said the federal minister of Canadian heritage, Pablo Rodriguez, at the building’s inauguration. “Today is an important step in preserving our history.”

By optimizing resources to provide high-quality and sustainable infrastructure, meeting advanced standards and achieving the lowest possible life-cycle cost, the project team has generated a return on investment (ROI) for society as a whole. **CCE**

“A unique showcase project featuring an impressive use of automation, climate control, fire detection and water avoidance.”
- Jury

LAC Preservation Storage Facility, Gatineau, Que.

Award-winning firm (lead designer):

Stantec, Longueuil, Que. (Martin Carreau, P.Eng., PMP; Bruno Lehoux, P.Eng.; Olivier Charron, P.Eng.; Jonathan Hallée, P.Eng.; Anthony Giday, P.Eng.; Alexandre Briot, P.Eng.; Patrick Brunet, P.Eng.; Julie Massicotte, Biol.; Patrick Bourgeois, P.Eng.; Aboubakeur Bensikhelifa, P.Eng.).

Owner: Library and Archives Canada (LAC).

Other key players: Plenary Properties (design-build-finance-maintain lead), PCL Construction Eastern (builder), B+H Architects, Lapalme Rheault (architecture), Footprint (sustainable design), Dematic (automated storage and retrieval system supplier), Maya HTT (computational fluid dynamics simulations), Kolostat, Britton, Viking Fire Protection.



Breton Environmental Award and Award of Excellence

Standing Column Wells for Clé-des-Champs School

gbi

The Centre de Services Scolaire des Mille-Îles (CSSMI) mandated gbi to replace the heating, ventilation and air-conditioning (HVAC) system at its Clé-des-Champs primary school, which involved refitting its mechanical room. Through collaboration with the client, it was decided to install a geothermal heat exchanger with permanent column wells—a first for an institutional building in Québec—to make a major shift in energy consumption, reduce pressure on the local electricity generation and distribution network and combat greenhouse gas (GHG) emissions.

The concept is to heat and cool an indoor environment efficiently by directly using groundwater, which exchanges heat through conduction and advection with the hydrogeological environment. The technology can rely on a process called the ‘bleed,’ whereby undisturbed groundwater infiltrates a pumping well through a network of fractures in the rock.

A new concept

This technology has been the subject of research at Polytechnique Montreal, which worked with gbi to test its theoretical model and then demonstrate its viability.

The main advantage of perma-



nent column wells is a significant reduction in the total number of wells that need to be constructed in the field, compared to a closed-loop well system.

With the use of closed-loop geothermal energy, 22 wells of 150 m in depth would have needed to be drilled at the school. With the permanent column wells, on the other hand, only five pumping wells of 135 m in depth and one injection well were required, reducing the project cost by 40%.

Standing column wells are feasible in small spaces where geothermal energy was not previously con-

sidered an option, including the sites for many existing buildings that will need to be decarbonized in the years to come. Also, water resides longer in them and allows users to reduce their electrical power demand during severely cold winters.

Exploration with a deadline

The project began as soon as classes ended. The schoolyard had to be available to students, with its new wells, two months later.

Most of the work was condensed into short two-phase periods. Existing mechanical spaces were tight, so the team had to work creatively to

“A really innovative project that will set a standard for other schools.”
- Jury

PHOTO COURTESY GBI.

optimize the available volume. The project also stood out for its complexity at the level of the exploratory phase, since a lot of new information was needed to design the geothermal heat exchanger. In addition to a thermal response test, a pumping test and groundwater sampling were required.

The gbi team worked closely with Polytechnique to deploy an automatic control system capable of measuring and recording essential data for academic research activities. The use of groundwater raised several issues, such as the management of suspended solids, the risk of clogging and the durability of the facilities. The team responded to these challenges, among others, with the addition of a filtration system,

a plate heat exchanger redundancy system to maintain continuous operation during maintenance and stainless steel components.

Just the beginning

Fewer wells mean less drilling time, which can reduce the initial investment cost compared to traditional geothermal energy. The reduced duration of work on-site allows teams to compress the schedule and to increase the number of projects achievable, which is important given drilling contractors are in high demand.

The team from gbi continues to work with the Polytechnique research chair. This collaboration not only makes it possible to advance knowledge, but it also helps inspire confidence

in customers, who see the benefits of the technology through the success of the project at Clé-des-Champs School. Indeed, many have responded to the call to test permanent column wells in their own projects.

This innovation also makes it possible to extend the life of equipment and systems. With the geothermal heat pump's stable operating conditions, due to the thermal inertia of the ground at great depth, its lifespan is estimated at 25 years compared to, for example, 15 years for aerothermal. This makes it possible to act on the problem of managing end-of-life refrigerants, which too often have a high global warming potential (GWP). **CCE**

Standing Column Wells for Clé-des-Champs School, Mirabel, Que.

Award-winning firm (mechanical and electrical engineering): gbi, Montreal, Que. (Olivier Paquette-St-Jean, ing.; Jean-Michel St-Georges, ing.; Jasmin Faucher, CPI; Maxime Boisclair, ing.; Guillaume Giguoux-Théorêt, ing., M. Ing.; Eric Lemieux, Tech.).

Owner: Centre de Services Scolaire des Mille-Îles (CSSMI).

Other key players: Polytechnique Montréal (concept development), Lachance et associés architectes (architecture), Construction Genfor (general contractor), Groupe Charbonneau (plumbing and heating contractor), Reguvar (automatic control contractor), Les forages LBM (drilling contractor), Multistack (water and heat pump), Franklin Electric (submersible pumps), Armstrong (heat exchanger and pumps), Delta Controls, Belimo, Siemens, Versaprofiles (piping), Bollfilter (filter).



60 years of engineering excellence



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gbi.ca



Ambassador Award and Award of Excellence

REFAM Argan Predictive Model

WSP and Cowater International

As part of the Renforcement Économique des Femmes de la Filière Arganière au Maroc (REFAM) project developed by Cowater International, WSP Canada was mandated to design and develop a predictive model of argan tree production and integrate it into a collaborative web platform to help assess the annual yield of this fruit, using deep learning algorithms. This geoportal allows stakeholders in Morocco's general population to access relevant information and, thus, promotes the economic empowerment of women working in this key sector.

An invaluable tool

Produced from the kernels of trees endemic to Morocco, argan oil represents traditional Moroccan agriculture. The fruits of the tree are harvested and processed by local Berber pickers, mostly women, and then distributed by co-operatives.

Given an increase in global demand, players in the argan sector wanted better visibility of the probable volume of fruit harvests, so they could better manage the resource and negotiate a fair price.

The REFAM project is a five-year initiative, designed by Cowater with the financial support of Canada's federal government (specifically, Global Affairs Canada). Within this context, WSP designed a geographic information system (GIS), predictive model and portal for production



*“They successfully adapted Quebec technology from one industry to another specific context.”
- Jury*

management and forecasting of argan trees in Morocco's Arganeraie Biosphere Reserve, listed by UNESCO as the first of its kind.

To generate the GIS portal, WSP's project team—based in Quebec—co-ordinated two field operations in collaboration with Moroccan experts. Observations and measurements were collected from 300 plots, representing more than 900 sample trees. The data was then associated with satellite images, making it possible to estimate the density and defoliation of trees and many other forest health indicators in the territory under study.

These characteristics were coupled with field observations, climatic observations and other vari-

ables via deep learning algorithms, so the team could generate an annual yield forecasting model.

The GIS portal was made available in both French and Arabic, so local entrepreneurs could more easily take ownership of it. WSP anticipates the portal will become an invaluable tool for 20,000 Moroccans whose livelihoods depend on argan oil. The industry generates a turnover of \$150 million annually and an export value of \$36 million for communities living mainly in desert areas.

Built for the long term

The GIS portal was custom-developed over three years in collaboration with its main beneficiary, the

Agence Nationale de Développement des Zones Oasiennes et l'Arganier (ANDZOA), through all stages of the project, from technological choices to management of the solution, which the project charter requires to be handled by the local argan sector itself over the long term. Taking that need for sustainability into account, the team based the digital interactive mapping GIS platform on open-source software and used free satellite images and other publicly available data.

The experimental device used for the project was modelled on Quebec forestry expertise in networks of sample plots. This technology made it possible to improve the solution through annual observations.

Weekly meetings were established between WSP and ANDZOA's technical team to enable the integration of new data and the configuration of the tool. Guides and videos were produced to document various processes and technologies.

Virtual sessions and workshops, culminating in the arrival of the ANDZOA technical team in Canada, ensured effective management of the solution—such that the technology is still being used today. Indeed, ANDZOA is considering extending its use to other applications.

Conserving resources

The development of the GIS portal is part of the Moroccan government's strategy for the sustainable development of the argan sector. The Arganeraie Biosphere Reserve is a natural rampart against desertification, as its ecosystem protects soil against wind erosion and run-

off, promoting the supply of groundwater.

The portal represents an effort to conserve these resources, as improvements in knowledge of the state of the argan tree will contribute to better decision-making. Sustainable exploitation of the tree can strengthen the resilience of the local population in the face of climate change, which has had severe impacts in the region and especially affects vulnerable communities.

As data is analyzed through a predictive model, it provides a better understanding of the correlation between extreme climatic variables and the seasonal development phases of argan trees. Various stakeholders, including academics, industrialists, co-operatives and government, benefit from more up-to-date and usable data.

Stakeholder involvement

The main area of complexity was the co-ordination of various stakeholders across the argan sector who contribute to and/or benefit from the project. Several levels of political authority were involved to ensure good communication through institutional hierarchies.

The argan harvesting system is based on a vast and generational system of rights holders, for which consideration and respect are essential during field operations. There is no database for this system, however, and the means of communication remain very limited.

It was therefore necessary to identify the rights holders, with the help of local representatives for each of 900 selected sample trees, and then to communicate directly with those rights hold-



The fruits of the argan tree are harvested and processed by local Berber pickers, mostly women, and then distributed by co-operatives.

ers in the field. This represented a colossal task for randomly selected trees in a semi-desertic environment.

The work took place during the global COVID-19 pandemic, limiting the team's trips to Morocco; but thanks to local experts and consultation between stakeholders, the project was developed and implemented according to the planned timelines.

Meeting objectives

At the start of the mandate, WSP's project team recognized the existing state of knowledge and showed how the limited amount of data available was insufficient to generate a viable predictive model. Thanks to the subsequent establishment of a sample plots network, remote sensing, deep learning and local stakeholder engagement with rights holders, the team was able to meet its objectives.

A rigorous process was undertaken to create the GIS portal, including workshops to identify the project's specific needs and select the platform best-suited to support the various components of the solution.

The combined efforts of all those involved will contribute

to the project's sustainability. As the GIS portal now provides reliable annual production forecasts to harvesters and co-operative members, they have expressed how this tool will greatly assist them in negotiating a fair price. **CCE**

REFAM Argan Predictive Model, Morocco

Award-winning firm (prime consultant): WSP, Montreal, Que. (Michèle Laflamme, M.Sc., PMP; Christian Bélanger, Ph.D.; Félix-Antoine Audet, B.Sc., M.Sc.).

Owner: Agence Nationale de Développement des Zones Oasiennes et l'Arganier (ANDZOA) and Fédération Interprofessionnelle de la Filière de l'Argane (FIFAR-GANE).

Other key players: Cowater International (client), École Nationale Forestière d'ingénieurs (subconsultant), Mohammed V Faculté des Sciences (subconsultant), Fédération Interprofessionnelle de la Filière de l'Argane (collaboration), Global Affairs Canada (collaboration), European Space Agency (satellite imagery), Climate Hazards Group InfraRed Precipitation with Station (satellite data), Centre royal de télédétection spatiale du Maroc (satellite imagery), Direction générale de la météorologie du Maroc (data), METER Group (sensors and instrumentation).



Outreach Award and Award of Excellence

Million Meals Campaign

Dillon Consulting

Dillon launched the Million Meals Campaign to help sustainably combat food insecurity across Canada. The specific goal was to provide the equivalent of one million meals throughout the communities where the firm's employees live and work.

The campaign targeted the root causes of food insecurity by working directly with organizations within these communities, which involved employee volunteer hours, in-kind pro bono consulting services and donations. In March 2022, the firm met its goal, supporting more than 250 organizations throughout the country.

Committing support

Dillon launched the campaign in October 2020 in response to the United Nations' (UN's) Sustainable Development Goal #2: Zero Hunger. As a signatory to the UN Global Compact, Dillon has committed to principled business practices.

In addition to providing the one million meals, the firm worked to help solve some of the problems associated with the root causes of food insecurity and, in doing so, contribute to a transformation of existing systems. In 2021, Dillon solicited pro bono consulting applications from non-profit organizations in its communities, so as to support their immediate needs relating to food security.



The applications were evaluated on the basis of such factors as feasibility, impact and geographical diversity. Dillon then awarded its pro bono services to nine non-profit food organizations to help increase their impact and remove barriers in their communities.

These services included:

- Engineering design and support services.
- Landscape architecture.
- Planning.
- Hydrogeology and other water resources expertise.

“A very purposeful, programmatic and well-executed project, with clear goals. It will have a lasting benefit.”
- Jury

- Engagement.
- Feasibility studies.
- Geographical information system (GIS) mapping.
- Project management and co-ordination.
- Manual labour (through employee volunteer hours).
- Cash donations.
- Tender support.

By way of example, Dillon provided site engineering and design services to help Outflow Ministry develop a new 'Outflow Farm' in Kings County, N.B., to bolster the charity's efforts to assist people living in poverty. The firm's services supported the overall site layout, including tiny homes, cabins and a septic system, and offered a structural assessment for a barn in need of repair.

In another example, the farm-based charity Everdale asked for help in designing an approximately 10-acre 'good food forest' in Erin, Ont., that would eventually yield 250,000 lb of fresh, sustainable produce annually. Dillon provided landscape architecture, planning, hydrogeology and water resources services.

From strategy to policy

Dillon created a corporate sustainability strategy more than 10 years ago, which incorporates goals for improving the social well-being of employees and minimizing the firm's environmental impact. These goals include achieving and maintaining carbon neutrality and donating to external community and environmental organizations.

Since then, the strategy has evolved into a policy that guides Dillon's business operations. The firm signed the UN Global Compact in 2019 and committed to continue expanding the boundaries of its cor-



Employees contributed volunteer hours in communities across Canada.

porate sustainability practices.

In 2020, Dillon decided to dedicate its efforts on the UN's zero-hunger sustainable development goal (SDG), among others. Launching the Million Meals Campaign as a focus of community contribution, in the firm's 75th year of operation, would align with both Dillon's own policy and the UN's SDGs.

More than cash

The most basic cost of one meal for a Canadian ranges between \$2.42 and \$5.49. This meant Dillon would need to donate approximately \$5.5 million to ensure one million meals would be provided, using cash donations.

However, through discussions with not-profit organizations, the firm understood cash donations could only get them so far. Resources would also be needed to pay for technical assistance, such as engineering project support, to remove barriers ingrained in food security systems.

Dillon realized it could offer pro bono technical support to further deliver on its commitment. So, the firm leveraged its employees' volunteer time, by continuing to encourage staff to help out in their communities, with the support of corporate sponsorship for their time.

As well, the firm offered technical expertise toward larger projects, which required input from staff across the country. These sponsorship scenarios were referred to as 'cornerstone projects.'

Finally, Dillon challenged its staff to focus on not-for-profit food organizations when allocating the firm's annual environment and community impact fund, comprising more than 1% of its pre-tax profits.

When Dillon created the campaign, no one knew when the goal would be met. After its 1,000 employees rose to the challenge and helped communities across the country, the campaign provided its millionth meal in March 2022, just 18 months after the launch.

The support for more than 250 not-for-profit organizations across Canada has involved more than 1,100 hours of staff time on Dillon's sponsored pro bono cornerstone projects, plus more than 1,500 hours of sponsored staff time volunteering in the communities. Through these efforts, employees have established new connections and increased their understanding of food security issues across the country.

The solutions to the challenges faced by these organizations have not always been

obvious, but the campaign helped explore these challenges and collaborated with the organizations to deliver solutions with the greatest impact for their communities, improving food access for people in need.

Instead of a \$5.5-million donation, Dillon's multi-faceted approach helped deliver one million meals at a cost of just over \$700,000, with 38% of this value contributed by volunteer hours.

Following the initial campaign's success, Dillon decided to continue it through 2024 with an effort dubbed 'One Million Meals and Counting.' Again, the firm is not only trying to provide as many meals as possible, but also to help solve problems associated with the

root causes of food insecurity and transform systems to benefit future generations. As such, the campaign will specifically partner with community organizations for which the firm is best-positioned to support through its service offerings.

CCE

Million Meals Campaign, various locations across Canada.

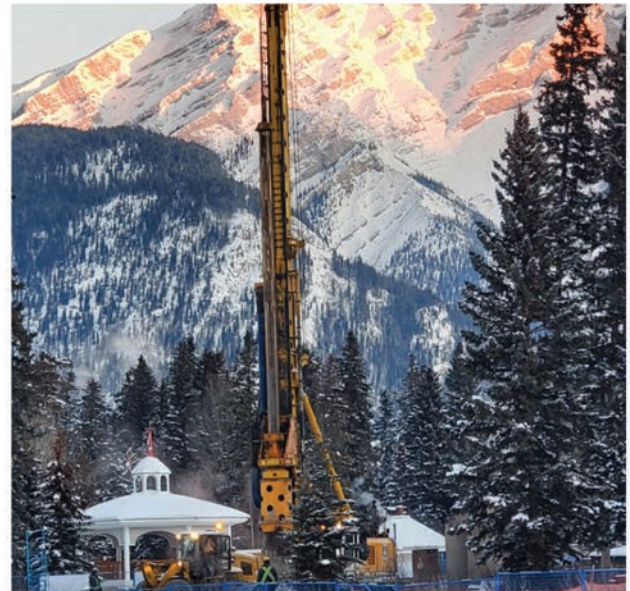
Award-winning firm (prime consultant): Dillon Consulting, Toronto, Ont. (Sean Hanlon, B.Sc., B.Eng., P.Eng.; Joe Muraca, MES, MCIP, RPP; Mychal-Ann Hayhoe, M.Sc., Ph.D., AIT; Crystal Cooper, PMP; Andy Blackmer, M.Sc., PGeo.; Darla Campbell, P.Eng., CSR-P, FEC; Rebecca Eldridge, M.Sc.).

Owner: Dillon Consulting.

Other key players: n/a.



Bauer Foundations was proud to be involved on the Nancy Pauw Bridge project.



CONGRATULATIONS

to StructureCraft on their award of excellence win for their Nancy Pauw Bridge project.

...

For more information visit www.bauerfoundations.ca



Award of Excellence

Nancy Pauw Bridge

StructureCraft

The aquamarine, glacier-fed Bow River traces its way through Canada's Rocky Mountains and the town of Banff, Alta., in one of the world's first national parks, which is visited by more than four million people annually. Today, the new Nancy Pauw Bridge spans the river right next to the town, fulfilling a 109-year dream.

Responding to demand for natural materials, StructureCraft designed and built an unusually slender 80-m clear span out of sustainable timber for this footbridge. The shallow high-thrust arch was designed to integrate well with its natural setting, without detracting from the scenery, and is expected to carry up to 10,000 pedestrians daily.

More than a century in the planning

Banff has long promoted walking and cycling. Across the river from the town centre are hot springs, natural attractions, the Banff Springs Hotel and a golf course.

As early as 1914, town planners had it in mind to locate a footbridge in Central Park, immediately adjacent to the town centre, to enable better connections. While this wish did not come true for more than 100 years, it was not for lack of trying.

In 2007, for example, an attempt was made to create a crossing, but the technical challenges were

deemed too difficult and the project was abandoned.

A new opportunity recently arose, however, from a private donation offered by the Wim and Nancy Pauw Foundation. The new bridge is thus named after the late Nancy Pauw, a long-time Banff resident and hiking/cycling enthusiast.

An unprecedented design

Numerous constraints demanded a very low-profile design. StructureCraft pondered the challenge for some time before designing the slender, shallow arch.

Such a shallow arch had never been attempted before. With a 5% maximum slope at the abutments and the required clearances, it could only have a rise-to-span ratio of about 1:20. Challenges included non-linear behaviour, potential for snap-through buckling, large abutment thrusts, susceptibility to unsymmetrical loading and difficulty with vibration characteristics.

The solution was unprecedented, particularly in timber, in its high reliance on the stiffness of supports at each end, both laterally and rotationally—laterally because a shallow arch creates enormous thrusts. A small lateral deformation at the support would result in large deformations and even the collapse of the span; and rotationally because the extremely slender timber arch is very sensitive to snap-through buckling and needed stiffening at the ends.



The dense sedimentary soils would need to be able to receive the forces with very small deformation. Large-diameter piles and thick pilecaps were key components of StructureCraft's solution. Extensive non-linear soil analysis was conducted to ensure the structure would be achievable.

Esthetics were also top-of-mind. The tapered arch design, with its slender glulam beams and weathering steel 'haunches' that stiffen the arch at the supports (much like the stone arches of the past), addresses the technical challenges and creates natural beauty.

Slender footbridges are very susceptible to excessive vibrations. To address both walking and jogging, StructureCraft designed a special tuned mass damper. This involved a simple carriage with weathering steel plates suspended by splayed cables from the bridge. It was fine-tuned on site and accelerometers confirmed performance, both before and after installation of the dampers.

Bridge decking consists of spaced Douglas Fir timbers. They were prestressed into 1-m wide removable panels using galvanized rods and rubber spacers.

"It's gorgeous, with art, technique, skill and design all coming together."
- Jury

PHOTO BY PAUL ZIZKA. COURTESY STRUCTURECRAFT.



controlling erosion and sediment, planning stream isolation, dewatering and removing cement-contaminated water during excavation and piling activities.

Indeed, environmental concerns significantly informed the footbridge's design. It needed a clear span to minimize impact on the river and minimal slopes and ramping to mitigate impact on park lands and ensure user accessibility. It needed to provide enough clearance for flood conditions along the glacier-fed river's low banks, while not altering the paths of the elk. Hence, an extremely low-profile bridge that appears natural and does not impose on the park and its pristine Rocky Mountains setting. **CCE**

Nancy Pauw Bridge, Banff, Alta.

Award-winning firm (design-build general contractor and lead structural engineer): StructureCraft, Abbotsford, B.C. (Gerald Epp, M.Eng., P.Eng., Struct.Eng., P.E., M.IABSE, F.IStructE, Leon Treder, Dipl. Ing., M. Sc.; Narong Ven, PMP, GSC).

Owner: Town of Banff, Alta.

Other key players: Thurber Engineering, Ground Cubed, Avens Consulting, Ram Consulting, Western Archrib (glulam supplier), Level Fabricators (structural steel supplier), I&J Metal Fabrications (stanchions and flashing), Bremner Engineering and Construction (civil), Bauer Foundations Canada (piling), Helms Construction (concrete and civil), Mammoet Canada Western (mobile cranes), Mike's Electric (electrical), Paulco Landscaping, Oskar Construction (masonry).

The guardrail system used galvanized steel stanchions and a series of stainless steel cables, pre-stressed to special anchor stanchions at the ends. Pre-stress forces were considered to ensure performance under the expected temperature extremes.

A natural solution

The Bow River is pristine and carefully guarded by the national park and the town. Parks Canada was a necessary gate-keeper for the approvals process. Thus, the town's brief focused on finding a low-impact, natural solution that beautified the surroundings. Environmental concerns would have to be addressed.

StructureCraft engaged both a wildlife ecologist and an environmental engineer to create a site-specific environmental protection plan. To bypass many issues with working in the river, the decision was made to not only clear-span, but also slightly over-span, to reduce the impact until negligible.

The town was also concerned about ensuring the bridge de-

sign would be in its character, which led to the selection of responsibly sourced timber for the span. The timber was also used in the most structurally efficient manner.

Further provisions were made to avoid preservative treatments; instead, low-volatile-organic compound (low-VOC) wood coatings were specified to help minimize maintenance. Monochromatic, dark-sky compliant, wildlife-friendly lighting was also incorporated.

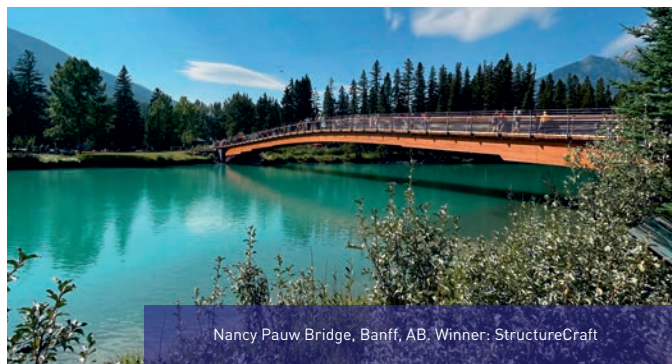
Another concern was the migration of elk along the riverbanks. The landscape needed to be 'permeable' to their movement around the bridge. This was accomplished by minimizing the abutments and ramps, as well as by 'berming' up to the abutments with a maximum slope of roughly 20%, enabling the animals to pass unperturbed.

During construction, measures were taken to virtually eliminate impact on the river and surrounding environment.

These included respecting nesting of migratory birds,



Tank Hill Emergency Restoration, Lytton, BC. Winner: AECOM



Nancy Pauw Bridge, Banff, AB. Winner: StructureCraft

Congratulations to this year's CCE Award recipients. Thurber Engineering Ltd. is pleased to have provided the geotechnical services for the Tank Hill Emergency Restoration and the Nancy Pauw bridge.

www.thurber.ca



Award of Excellence

Centerm Expansion

Hatch

Centerm is an inner-harbour container terminal that handles one-fifth of the goods shipped through the Port of Vancouver. The Vancouver Fraser Port Authority (VFPA) awarded a design-build contract to increase the terminal's capacity. Hatch was engaged to lead a design team to expand, reconfigure and add infrastructure to Centerm, in a complex operating environment.

The project has provided an increase of more than 67% in throughput, from 900,000 to 1.5 million 20-foot equivalent containers (TEUs), while only increasing the terminal's footprint by approximately 15%.

A mandate to expand

The Port of Vancouver is an economic engine, providing access for more than 170 trading partners around the world. The expansion of its containerized services is key to VFPA's mandate.

The Centerm expansion involved upgrades to the existing 24-7 operating facility, including:

- Minor expansion of the terminal footprint by 15% through dredging and infill.
- Provision of shore power at the expanded berthing facility, to reduce greenhouse gas (GHG) emissions and air pollution.
- Reconfiguration of the yard for more efficient operations.
- Expansion and modernization of the intermodal railyard.
- Relocation, expansion and modernization of the truck gate facilities.



- Provision of new electric-driven gantry cranes.
- Reconfiguration and relocation of 11 existing refrigerated container receptacles (reefer towers) for perishable cargo.
- Complete refurbishment of the historic Ballantyne Pier shed as a new, centralized operations facility, to improve efficiency of container logistics.

Upgraded berthing facilities reduce in-harbour waiting times, to the betterment of supply-chain logistics. Rail and trucking services are improved through the expansion and modernization of associated infrastructure. And port-related traffic has been removed from city roads, reducing congestion and improving emergency access.

Solving challenges through innovation

Hatch was engaged on the design-build project from the pursuit phase, with its bid-design deemed innovative and technically well-developed. The team overcame many technical challenges in the execution of this brownfield development.

Foremost among these challenges, the terminal remained in operation throughout the construction, requiring complex staging and planning (such that compartmentalized areas of the terminal could be worked on sequentially), multi-party stakeholder engagement and co-ordination of phased deliverables.

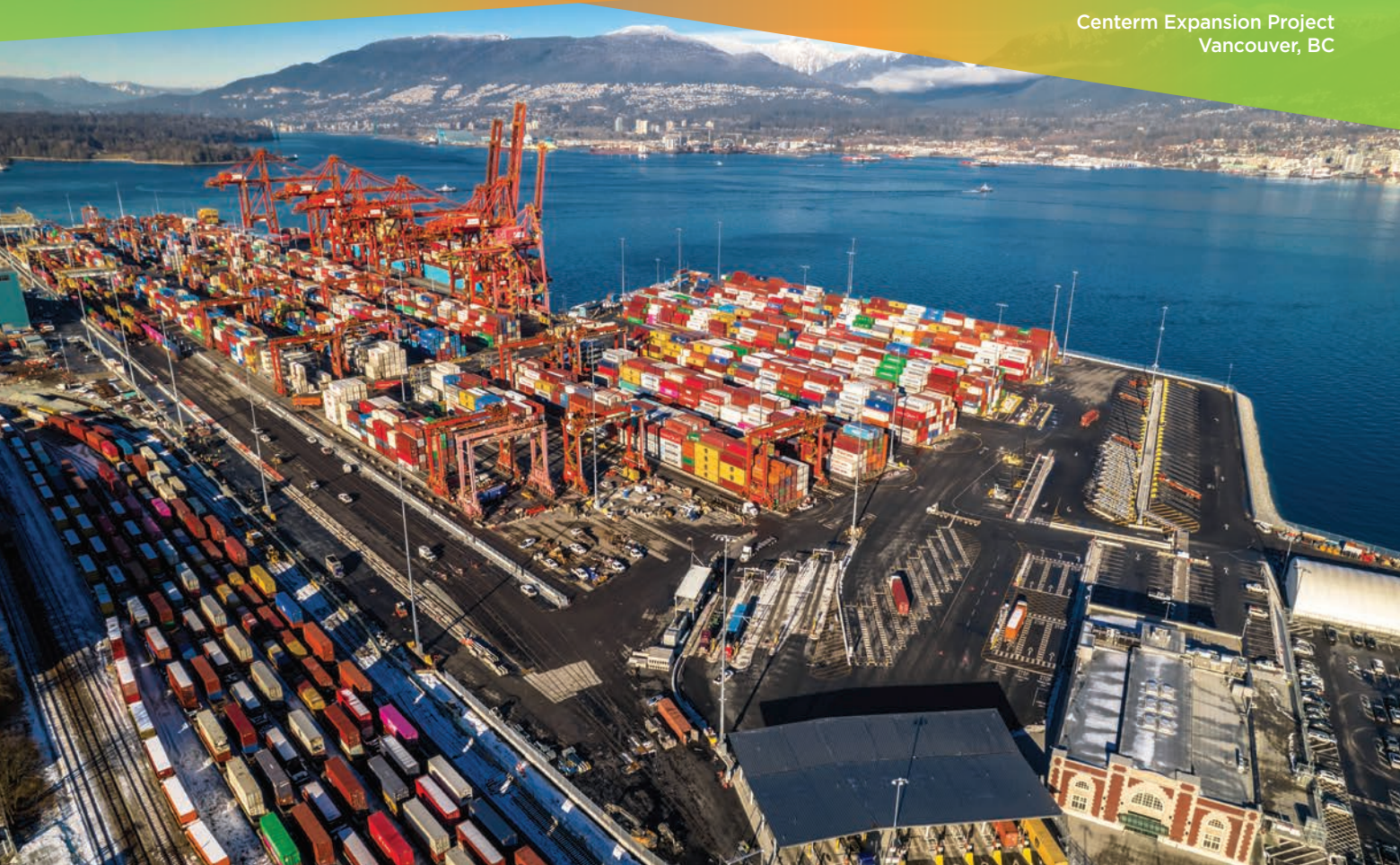
Hatch assembled a highly qualified design team for the demanding project. Beyond the owner and terminal operator, there were also many exter-

“The team took a comprehensive, overarching approach to the owner’s environmental sustainability goals.”
- Jury

PHOTOS COURTESY VANCOUVER FRASER PORT AUTHORITY.

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Centerm Expansion Project
Vancouver, BC



Engineer: Hatch LTD, Vancouver, BC | Photo: William Hans, wrjphoto.com



CPCI congratulates Hatch LTD on their
CCE Award of Excellence for the
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nal stakeholders—including other port tenants, public entities (such as FortisBC, BC Hydro and Metro Vancouver), railways, community businesses and residents—to be engaged and accommodated within the design.

Many other challenges were solved through innovation:

- The western berthface was extended by 78 m without the use of intrusive piledriving, by floating prefabricated concrete caissons to the site and then sinking them into place on an improved seafloor foundation.
- Micropiles were used extensively within the confines of the heritage building as it was repurposed as the new operations centre.
- The reefer towers underwent extensive structural and electrical upgrades to meet current codes and standards.
- Construction waste was reused, as per Envision sustainability guidelines, to minimize impacts to the facilities. Demolished concrete and clean dredgeate were used as fill material.

Safety was of paramount importance. This project was completed with zero lost-time incidents, a notable achievement. The design team contributed to this success through safety in design, constructability reviews, construction support, field attendance and assistance in the testing and commissioning of the facilities.

The project was completed on time, despite the many challenges that had to be overcome.

A focus on sustainability

VFPA's vision is to increase Canada's economic prosperity through trade while making the Port of Vancouver the world's greenest port. The Centerm expansion achieves these goals, providing significantly increased throughput with an only marginally



expanded footprint and reducing the GHG emissions associated with the terminal's operations.

During land expansion of the terminal, a marine works program was implemented to remediate and protect the environment:

- Fish salvage and relocation occurred prior to dredging and infilling works.
- Water quality was monitored to meet the Canadian Council of Ministers of the Environment's (CCME's) Water Quality Guidelines for the Protection of Aquatic Life.
- A silt curtain 'moon pool' apparatus isolated work areas for sediment control.

VFPA has pursued the Canadian Green Building Council's (CaG-BC's) Leadership in Energy and Environmental Design (LEED) Gold certification for the new operations centre, to be confirmed via ongoing verification following a rigorous application process. This will be a significant accomplishment in repurposing of an approximately 100-year-old heritage building into a state-of-the-art facility.

Across the project, the use of locally sourced materials reduced emissions associated with supply chain logistics. The culmination of

A heritage building was refurbished to serve as a new, centralized operations centre.

the project's environmental goals has been recognized by the Institute of Sustainable Infrastructure (ISI), which awarded its highest level of certification, Envision Platinum.


"We are very pleased to have achieved such remarkable recognition for our sustainability efforts during planning, design and construction of this critical project," said Gilles Assier, project director with VFPA. "It was made possible thanks to a concerted team effort." **CCE**

Centerm Expansion, Vancouver, B.C.

Award-winning firm (prime design consultant): Hatch, Vancouver, B.C. (Adam Neale, P.Eng.; Matthias Yu, P.Eng., C.Eng., MStructE; Byron Cline, P.Eng.; Jackson Bryla, EIT; Chadd Novich, P.Eng.; Gharandip Bawa, P.Eng.; Sara Fumagalli-Hui, P.Eng.)

Owner: Vancouver Fraser Port Authority.

Other key players: Moffatt & Nichol (on terminal engineering), VIA - A Perkins Eastman Studio (buildings design), EXP (geotechnical consultant), Ausenco (environmental consultant), Centennial Expansion Partners joint venture between Dragados Canada, Jacob Brothers Construction and Fraser River Pile & Dredge (client), AECOM (owner's engineer), WSP (owner's project management services) Trelleborg (marine fendering), Musco (high-mast light towers), Valmont (poles), Gantrex (gantry cranes), Trane (building air-handling units), Con-Force (precast bridge girders), Langley Concrete (precast concrete products), Schneider (shore power), Camco (gate equipment).



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Award of Excellence

Vendôme Station Entry and Pedestrian Link

AtkinsRéalis

The Vendôme intermodal hub project stemmed from the Société de Transport de Montréal's (STM's) universal accessibility policy, which provided a mandate to connect the metro station with an exo train station and the McGill University Health Centre (MUHC). As a result of this project, the Vendôme station is now certified Envision Gold—making it the first STM metro station to obtain such distinction.

The project originated when STM announced plans in 2015 to build a second entrance building for one of its busiest intermodal stations, to make it accessible to people with reduced mobility. This would also involve adding tunnel connections to Exo's station and the MUHC. AtkinsRéalis (operating as SNC-Lavalin at the time) would provide multidisciplinary engineering—including structural, civil, mechanical, electrical, automation, acoustical and vibration, air quality, traffic and urban engineering—and human health and ecological risk assessments.

Prior to the renovation, travel between the hospital and the station was a challenge, due to poor accessibility and safety issues. Today, the station is equipped with five elevators, enlarged motorized doors and swing gates that meet the highest standards of universal accessibility and provide a well-flowing link be-



tween the station and the hospital, thus improving the travelling experience for all users, but especially for those with reduced mobility.

In addition to improving accessibility, the project has improved evacuation and response time for the station in emergency situations, prioritized intermodality and pedestrian traffic flow to improve travel times and improved capacity to accommodate increased ridership.

A first-in-Canada technique

To limit train service disruptions, AtkinsRéalis' engineers took a different approach to constructability. A 12-m long, 9-m wide, 650-t concrete tunnel would be slid into place. The bottom slab of the tunnel was designed with a tapered geometry toward the front, resembling the tip of a ski, thus facilitating the sliding of the tunnel on the ground to its final position.

This specific sliding technique,

developed by Freyssinet, is called Autoripage and was a first in Canada. The reinforced concrete tunnel was prefabricated directly on-site, next to its final location, and was designed by AtkinsRéalis' team for the loads induced by the chosen construction technique, then pushed into place by computer-assisted hydraulic jacks. This operation was completed in less than 60 hours.

Due to a lack of space on the adjacent MUHC grounds (vehicle and ambulance traffic), poor soil capacity and time constraints (another 72 hours), the team designed the tunnel under the existing third track in four prefabricated sections, to be assembled on a steel beam mattress filled with grout to limit differential settlements.

Prior to the construction phase, the design team met specialized contractors after a call of interest, to collect risk management information regarding the challenging pro-

“Before they built this, it was a long trek to the hospital for a wheelchair user in the winter.”
- Jury

PHOTO © JULIEN PERRON-GAGNÉ, COURTESY ATKINSREALIS.

cedures and to validate the availability of skilled labour for the targeted period. This helped develop the 72-hour construction sequences in nine major steps. These detailed sequences would be the starting point for the main contractor's schedule.

Satisfying stakeholders

The project involved many stakeholders in one of Montreal's oldest and most densely populated neighbourhoods, all converging at the Vendôme intermodal station. These included STM, the provincial ministry of transportation (which provided financing), exo (as commuter train operator), MUHC and an adjacent building at 5100 de Maisonneuve W. (where a new entrance would be partly integrated in the ground floor). The project's complexity lay primarily in respecting all of their requirements.

By way of example, the design team detailed a vibration monitoring program for the main contractor before and during the construction period, to avoid any impact on the stakeholders' nearby operations.

In addition to stakeholder specifications, the new structures within the Canadian Pacific (CP) right-of-way had to be designed in compliance with CP's standards and approved by its structural team. In further consideration of a future fourth track, AtkinsRéalis designed a 900-mm thick, 6-m high and 37-m long crash wall, thus protecting commuters in the new entrance building in case of derailment.

To support the local economy and reduce long-distance transportation, 40% of materials (by cost) were regionally sourced. More than 1,100 jobs were created during design and construction. Once the station is fully operational, eight employees will be working at the facility.



Earning Envision

To further support the client's approach to use by-products, gain experience for future projects and earn environmental points for Envision certification, AtkinsRéalis partnered with the research chair of Sherbrooke University and the City of Montreal in specifying concrete containing recycled glass powder for the totality of a new bus loop's pavement.

Other infrastructure elements used 50% limestone cement, for 50% less carbon dioxide (CO₂) emissions than a typical mix. Further measures that helped obtain Envision certification included recycling more than 75% of construction residues, managing contaminated soil, integrating a green roof and preventing pollution during construction.

Considering the impacts of climate change is also a key element of Envision. The civil engineering team 'oversized' the stormwater management design to help resist the heavier rainfall of a 100-year frequency stormwater event.

"This recognition reaffirms our commitment to sustainable development and our teams' expertise in implementing innovative solu-

The project has added tunnel connections to adjacent buildings for greater accessibility.

tions for major projects that benefit neighbouring communities," said STM board chair Eric Alan Caldwell upon the project's successful Envision certification. "Truly, everybody wins." **CCE**

Vendôme Station Entryway and Link, Montreal, Que.

Award-winning firm (prime engineering consultant): AtkinsRéalis, Montreal, Que. (Justine Mainguy, P.Eng.; Julien Doyon-Barbant, P.Eng.; Nikolay Kotchev, P.Eng.; Sébastien Berger, P.Eng.; Ivan Pramatarov, P.Eng.; Zilmara Volpe Grote, Tech.; Vincent Maffolini, P.Eng.; Audrey Cloutier Drouin, P.Eng.; Marc-Antoine Roberge, P.Eng.; Sylvain Lachance, P.Eng.).

Owner: Société de transport de Montréal (STM).

Other key players: MUHC (client), Exo/Réseau de transport métropolitain (client), Bisson Fortin (architect), Provencher Roy (architect), CRT Construction (general contractor), Freyssinet (specialized subcontractor), Research chair of Sherbrooke University (expertise for integration of glass powder in concrete), Groupe ABS (materials and geotechnical engineering), Lafarge (concrete supplier), Tricentiris (glass powder supplier), Béton Préfabriqué du Québec (tunnel prefabricator), Substructure expert-conseil (soldier piles and lagging walls), Preco-MSE (soldier piles and lagging walls).

Partnering for success

We are deeply grateful to receive four prestigious Awards of Excellence from the ACEC and Canadian Consulting Engineer magazine. This recognition honors our clients' success, our team's dedication and hard work and reaffirms our commitment to excellence in the field of engineering.

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**Port Saint John Westside
Modernization Project,
in New Brunswick**



**Centerm Expansion Project,
in British Columbia**



**Mosaic K3 Project, South Shaft
Headframe,
in Saskatchewan**



**Waaban Crossing (formerly
Kingston Third Crossing),
in Ontario**



Award of Excellence

Waaban Crossing

Hatch and Systra IBT

For many years, the City of Kingston, Ont., recognized a new, third crossing of the Cataraqui River was needed to connect communities on both sides and to accommodate regional growth. In 2018, with funding secured, the city implemented the project using an Integrated Project Delivery (IPD) model and signed a contract with Hatch, Systra IBT and Kiewit.

Together, despite the pandemic, this team completed the 1.2-km long bridge on time and under budget. It is Kingston's largest infrastructure project to date.

North America's first IPD bridge

The most significant innovation for the project was the IPD approach, which was wholeheartedly adopted by the city, the engineers (Hatch and Systra), the contractor (Kiewit) and its trade partners (Bauer and Walters Group). While IPD had been used for building construction, this was the first time it would be used in North America for a bridge.

In the IPD model, all parties—including owner, engineer and contractor—sign a joint contract that incentivizes them to set aside their individual interests and act as a team to make the decisions that are best for the project. The agreement achieves collaboration in several ways:

- All parties are fully involved in

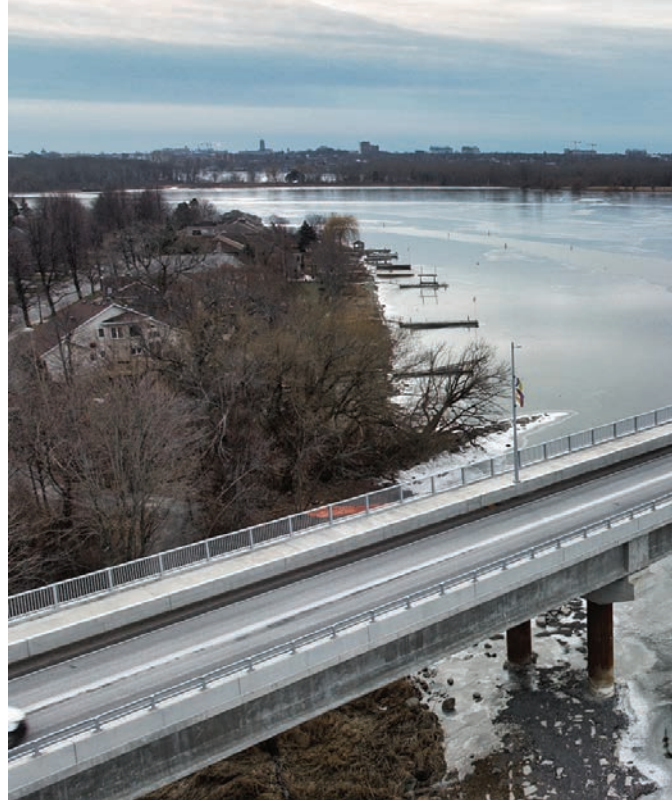
project development, design and construction.

- Project decisions must be unanimous between the parties and made in consideration of project outcomes.
- The agreement precludes the parties from submitting claims against each other.
- The consultant and contractor are paid all of their costs (excluding profit) by the owner.
- Profit is put at risk and earned by meeting project goals; e.g. meeting a timeline, obtaining approvals and permits or achieving local purchasing targets.

This approach let the team work together during the project validation period, from 2018 to 2019, to modify and refine the bridge design concept and construction methodology from those in an earlier environmental assessment (EA), with the goal of bringing the target cost within the budget of \$180 million.

Major cost-saving innovations were conceived during the validation period. The approach span substructure design was simplified from the V-piers proposed in the EA to modified conventional vertical piers and pier caps, with a less 'heavy' and more 'open' appearance.

The steel approach spans were replaced by 48-m long precast concrete Nebraska University (NU) girders. These were the longest girders that could be manufactured



(with minor modifications to the precast plant), delivered by road and lifted into place on-site. Indeed, they were the largest concrete girders ever produced in Ontario!

Since providing a temporary trestle in the river from which to construct the new bridge would represent a significant cost, a hybrid approach was selected instead, using a combination of a causeway in the shallow areas, a trestle in the deeper areas and a temporary lift-bridge over the navigation channel.

The resulting concept included the 1.2-km bridge with onshore approach roads providing connections at John Counter Boulevard on the west side of the river and Gore Road on the east side. A bridge deck cross-section width of 15.6 m would accommodate a two-lane roadway and a multi-use trail on the south side, separated from the roadway by a traffic barrier and widening out into two observation lookouts above the main span piers.

Local benefits

The city's vision was to provide an iconic structure that would give residents a sense of pride, attract tourism and respect the natural environment. The more specific

"One of the first integrated project delivery (IPD) undertakings outside buildings, this will be huge for people in Kingston."
- Jury

PHOTOS COURTESY HATCH.



benefits would be to connect communities on the east and west sides of the Cataraqui, improve emergency response times, accommo-

date future growth and promote active and public transportation alternatives.

Another advantage of the IPD approach was to allow the city to encourage local participation in construction, by setting goals that would benefit local businesses and residents. As a result, the project team procured more than \$22.7 million worth of locally sourced material and contracts, used more than 326,000 hours of labour from workers living within 115 km of Kingston (with more than 168,000 of those hours from those within 40 km), secured 93 contracts with local businesses, employed 38 staff members who moved to Kingston to work on the project, donated more than \$15,000 to local charitable causes and contributed more than

80 community service hours.

Addressing environmental concerns


The Cataraqui River, which divides Kingston, is part of the Rideau Canal system and is a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, a National Historic Site of Canada (NHSC), a Canadian Heritage River and a federally regulated navigable waterway. Environmental concerns regarding the construction and operation of the new crossing were significant.

To obtain approval from Parks Canada, a means of mitigating impacts was developed. To ensure such measures are successful, the city will monitor the river for several years after the completion of the

AWARD-WINNING EXCELLENCE IN THE CITY OF KINGSTON

A special thanks to our IPD partners at The City of Kingston, Kiewit and Hatch. Congratulations to all the CCE award winners and nominees!

SYSTRA IBT is proud to be a member of the Integrated Project Delivery team for the award-winning Wabaan Crossing (formerly known as the Kingston Third Crossing), recipient of a prestigious Canadian Consulting Engineering Award of Excellence.

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The project team's hybrid approach included a temporary lift-bridge over the Cataraqui River.

bridge's construction.

Further, the new crossing will encourage active transportation with its bike lanes and

walking paths, shorten journey times across the river by an estimated 40%, allow for expansion of transit routes, pro-

vide a potential emergency detour route for the provincial Highway 401 and improve access to services. The city estimates these benefits will reduce vehicular travel by 60 million km and greenhouse gas (GHG) emissions by 14,000 t per year.

The IPD approach also had environmental benefits. The slimmer pier design reduced the in-water footprint of the bridge by more than 50%. Parks Canada praised the lowered bridge profile because it fitted within the surrounding

UNESCO heritage site, rather than dominating it.

Working together

The city opened the new bridge to the public with a ribbon-cutting ceremony on Dec. 13, 2022, and named it Waaban Crossing. ('Waaban' is an Ojibwe term for dawn or morning light.)

"This is a moment to savour," said Bryan Paterson, the city's mayor. "This is a moment we have all earned by working together." **CCE**

Waaban Crossing, Kingston, Ont.

Award-winning firm (prime consultant): Hatch, Mississauga, Ont. (Biljana Rajlic P.Eng.; Geoff Bubbers, P.Eng.; Svezozar Majstorovic, P.Eng.; Arash Khoshghalb, P.Eng.; Radek Falar, P.Eng.; Rob Short, P.Eng.; Majella Anson-Cartwright, P.Eng.; Mark Armstrong, P.Eng.; Caleb Coughlin; Cody Presley; Adam Kolankowski, EIT; Philip Murray, P.Eng.).

Award-winning firm (consultant for main bridge span): Systra IBT, Montreal, Que. (Zac McGain, P.Eng.).

Owner: City of Kingston.

Other key players: Tulloch (geotechnical consultant), Moon-Matz (electrical consultant), Beam Architects (bridge architect), Kiewit (main contractor), Bauer Foundations (foundation contractor), Walters Group (steel fabrication and erection).



Bauer Foundations was proud to be involved on the Kingston Third Crossing (Waaban Crossing) project.



CONGRATULATIONS

to Hatch and SYSTRA IBT on their award of excellence win for their Kingston Third Crossing (Waaban Crossing) project.

...

For more information visit www.bauerfoundations.ca



The project used the largest concrete girders ever produced in Ontario.

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Award of Excellence

Tank Hill Emergency Restoration

AECOM

After severe storms hit southwestern British Columbia in November 2021, dropping a month's worth of rain in 48 hours, AECOM provided emergency assistance to the province's ministry of transportation and infrastructure to reinstate the Trans-Canada Highway at the Tank Hill underpass, where a road and rail grade separation was destroyed, near the village of Lytton, B.C.

With funding from the federal government under the Disaster Financial Assistance Arrangements (DFAA) program, AECOM quickly and safely mobilized a team that worked around-the-clock in the coldest weather to hit the region in years. What would typically take months was successfully completed in eight weeks. The road reopened in January 2022.

An immediate response

The fierce rains on Nov. 14 and 15, 2021, caused extreme flooding and mudslides and, in turn, catastrophic destruction and road closures throughout the region. Among the extensive damage was the complete washout of a 100-m stretch on the Trans-Canada Highway at the Tank Hill underpass, which destroyed both road and Canadian Pacific (CP) rail infrastructure.

A portion of the roadway and much of the rail bridge fill east of the bridge were completely washed



“They had to make a lot of critical decisions quickly—and did so exceptionally well.”
- Jury

away. The railway overpass structure, however, stayed in place on what remained of the exposed and battered piles.

Following the storm, AECOM was called on Nov. 20 to provide emergency assistance to help reinstate the washed-out grade of the highway and to design an interim road and at-grade railroad crossing to replace the unsalvageable grade separation structure.

AECOM immediately began assembling its team and began design work by the following morning. By Nov. 22, AECOM staff were on-site. Soon, a diverse team of more than 70 specialists from 10 different offices was hard at work on repairing this vital road link between Vancouver and the rest of Canada.

On Nov. 23, the team presented two design options, complete with

plan and profile, ready for review by the ministry of transportation and infrastructure. By this time, on-site AECOM staff were already supporting the reconstruction and working collaboratively with multiple contractors.

AECOM's team was focused on developing an interim alignment for a functional highway and new at-grade railway crossing. This work involved highway geometrics design, geotechnical engineering, hydrology analysis and drainage updates, traffic engineering (including railway pre-emption timing for new highway signals), riverbank protection design and engineering services during construction.

Meeting the challenge

To meet the unusual demands of this project, AECOM mobilized a team

of specialists and senior staff from across Western Canada, with the specific skills needed to respond to on-site issues as they occurred, so as to reinstate the corridor as quickly and as safely as possible.

As the prime consultant, AECOM co-ordinated a team of seven subconsultants. The project evolved from emergency response to design to construction. While work progressed, challenges continued to emerge, including complex drainage and hydrology requirements, as well as the need to manage surrounding grade instabilities during construction. Also, access to the site was compromised by other nearby washouts.

Streamlined processes and emergency response guidelines were implemented to facilitate immediate review and resolution of such issues. Staff worked on-site in 24-hour shifts, seven days per week, through rain and snow.

The team included project managers, field staff, geotechnical and rock mechanics, road engineers, rail bridge engineers and other rail specialists from British Columbia, Alberta, Saskatchewan, Manitoba and Ontario. Hydrotechnical and climate specialists were also brought in from Manitoba and Quebec.

With the complete destruction of the roadway and railway infrastructure at the Tank Hill underpass, local travel in neighbouring communities and the movement of goods and services through the area—including to the Port of Vancouver—became extremely challenging, if not impossible. Quickly reinstating this portion of the highway and railroad crossing were critical to the well-being

of residents and workers.

The Tank Hill washout was only one of many that sliced through the Trans-Canada Highway, effectively isolating some communities from services at the larger hub of Kamloops, B.C. These same communities had been stricken by wildfires only months earlier; Lytton was virtually wiped out by a wildfire in 2021 and would suffer again in 2022.

AECOM's ability to quickly assemble and mobilize a team of specialists with the required expertise enabled the rapid response needed to get emergency road and railway repairs underway and promptly restore connectivity between communities.

Preparing for the future

As part of the design, the team incorporated sustainability and climate resilience elements to prevent potential issues and recurrence of similar devastation in future extreme weather events. The recent forest fires and floods in the area had changed the canyon's existing hydraulic flows and capacities, which directly impacted the runoff at Tank Hill. Enhancements were made to expand the culvert and hydraulic emergency capacity to better manage newly predicted flows.

The team also added a catchment system to prevent debris and other material from flowing down the mountain and blocking culverts. It was shotcreted to prevent rocks and trees from impeding water flow and to avoid any buildup that could potentially cause another washout of the roadway and railway tracks. AECOM's team recommended a water level monitoring system for the catchment basin, which was

implemented by CP Rail under a separate contract.

Reopening the route

The affected portion of the Trans-Canada Highway reopened on Jan. 14, 2022, just eight weeks after the washout.

"We all owe a huge debt of gratitude to all of the crews and staff who have put in long hours to make the repairs necessary to reopen Highway 1 through the Fraser Canyon," said Rob Fleming, British Columbia's minister of transportation and infrastructure, upon the reopening. "The construction and engineering accomplishments to get people and goods moving again after the highway sustained such heavy damage are nothing short of remarkable." **CCE**

Tank Hill Emergency Restoration, Lytton, B.C.

Award-winning firm (prime consultant): AECOM, Burnaby, B.C. (Pat Cruickshank, MBA, P.Eng.; David Smith, P.Eng.; Kulwinder Phul, Civil Tech; Eric Smith; Imran Gehlen, P.Eng.; Kenn Leonhardt, P.Eng., PE, PMP; Faris Alobaidy, P.Eng.; Kaz Eskoch, P.Eng.; Giovanni Jaya E.I.T.).

Owner: British Columbia Ministry of Transportation & Infrastructure.

Other key players: Tetra Tech (on-site ministry representative), Thurber Engineering (ministry geotechnical engineering representative), Great Northern Engineering Consultants (electrical engineering), Underhill Geomatics (survey and drone imaging), Ecotope (environmental and drone imaging), Van Bower (survey and site supervision), Northwest Hydraulic Consultants (hydrology monitoring), Brentwood Enterprises, Sacchetti Heavy Civil Construction, Dawson Civil, Formula Contractors.





Award of Excellence

Port Saint John Westside Modernization

Hatch and Dillon Consulting

Port Saint John proactively undertook the Westside modernization project to expand its container terminal and intermodal capacity. The port engaged Hatch and Dillon to develop scalable infrastructure while maintaining port operations in some of the highest tides in the world.

The objectives of the project were to both modernize the container terminal and increase its capacity to 650,000 20-foot equivalent units (TEUs). A second berth was built to accommodate bigger and deeper vessels. The intermodal yard, truck gate and container terminal were upgraded to facilitate growth for the entire operation. Project-specific innovations included extra-tall and environmentally appropriate caissons, a scalable rail yard and accommodating a crane track.

The project was built to meet the needs of the container terminal's operator, DP World. All major design decisions required significant collaboration with DP World to ensure they would meet operational requirements while building capacity to accommodate future growth.

Hatch and Dillon's technical expertise and mindfulness for social impacts drove the project and its successes, including lasting positive

impacts on New Brunswick's economy. In fact, Port Saint John has become North America's fastest-growing container terminal.

A unique port project

Westside's modernization was unique among port projects because of the size and complexity of building caissons on the site. It required major technical innovations, including the following:

- The design and construction of eight 27-m high concrete caissons—believed to be the tallest backfilled caissons in North America—to create a second container vessel berth for the facility.
- The design of a combination wall reinforcement for the existing wharf, to allow for dredging for the caisson mattress adjacent the existing piled structure.
- The design of a piled wharf to connect the new berth's caissons to the existing berth.
- The design and management of multiple dredging contracts to ensure a deeper and more accessible main channel, as well as preparing the foundations for the caissons.

Hatch and Dillon considered the long-term outlook for the project



and designed adaptable infrastructure, including a new 9,000-ft long intermodal railyard, which is scalable to meet future growth, with track spacing chosen to accommodate reachstackers and to transition to rubber-tired gantries in the future. A modernized truck gate for the terminal, meanwhile, would be fully automated to facilitate improved throughput.

Another unique requirement was for two existing cranes operating on the Rodney Marginal berth to be able to travel onto the new berth, which necessitated curved track, due to alignment constraints. The new berth had to simultaneously accommodate new 100-ft and existing 50-ft gauge cranes; not a common requirement for modern container berths.

A tall order

The tides, which can exceed 8 m, presented major design and operational challenges for the construction of a container berth at Port Saint John that could accommodate post-Panamax-sized vessels. In response, Hatch and Dillon designed the 27-m high caissons.

Caissons of this size had never been constructed in Eastern Canada before. Due to their size, a temporary mattress was constructed adjacent to

“The engineers’ ideas were key in facilitating the terminal’s growth.”
- Jury



the pier, so the caissons could touch down at low tide during the slip-forming process. All eight caissons were completed in one construction season and stored within the port's slip until the mattress was ready to facilitate their placement.

The harbour bottom had significant underlying soft soil and clay that needed to be dredged for the placement of a rock mattress to support the gravity-based caissons. Hatch and Dillon saw this challenge of dredging 600,000 m³ of soft soils as an opportunity for the project to reuse the soils for land reclamation.

This proved a very cost-efficient and environmentally friendly means of increasing the size of the container terminal. The project was designed and tendered so the dredge soils

The caissons were stored within the port's slip until a temporary mattress was ready to facilitate their placement.

could be placed in the slips behind the new wharf. This reuse of material created several acres of land, mitigated environmental disruption outside the project's footprint and saved costs.

Regional benefits

The project required significant lead time, from 2012 to 2019, to conceptualize, secure funding, confirm feasibility and gain stakeholder buy-in. Hatch and Dillon, who were involved from the beginning, completed pre-feasibility studies, prepared an appropriate budget and divided the work into 16 smaller packages, which enabled more local participation and competition, thereby meeting the goal of completing the project quickly and on-budget.

Port Saint John secured provincial and federal investments for the project and undertook studies of its social and economic impacts and benefits to the surrounding region. When the project was 50% complete, both New Brunswick's provincial government and the port realized economic growth was happening much more rapidly than expected.

In 2021, the government decided to get in front of this growth, to ensure the region was well-prepared for the finished project. By that point, the port had already had to hire operators for new reachstackers and cranes. The province partnered with employers, labour representatives

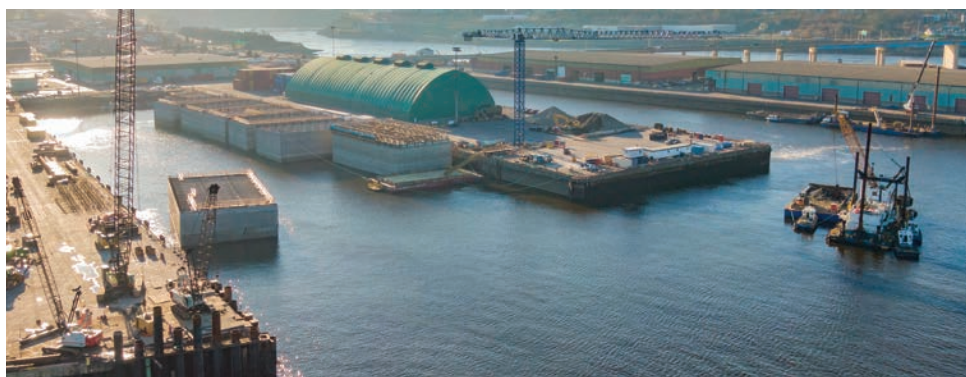
and others to maximize employment and economic development opportunities.

Hatch and Dillon also achieved social benefits by assisting in the project's consultation efforts with local First Nations. This process involved engaging communities by outlining the development of capacity agreements in support of continued relationship-building between the Port Authority and the First Nations, both throughout project construction and beyond.

As the environmental permitting process began in 2018, Hatch and Dillon supported the port and other federal authorities by consulting with the Wolastoqey, Mi'kmaq and Peskotomuhkati Nations of New Brunswick. This process helped federal authorities meet their duties under the Environmental Effects Evaluation (EEE) and the Fisheries Act Authorization. Hatch and Dillon worked closely with Indigenous communities to identify and advance fish passage improvement opportunities, aimed at offsetting the residual effects of the project on fish and their habitats, as required by the Fisheries Act Authorization.

Finally, Hatch and Dillon worked with the Wolastoqey Nation in New Brunswick (WNNB) to collect baseline environmental data for offsetting opportunities and conducted follow-up and monitoring activities.

CCE



Port Saint John Westside Modernization, Saint John, N.B.

Award-winning firm (prime consultant): Hatch, Halifax, N.S. (Lorne Flowers, P.Eng.; Jeff Theriault, P.Eng.; Serge Doucet, P.Eng.; Fanus Van Biljon, P.Eng.).

Award-winning firm (construction manager): Dillon Consulting, Saint John, N.B. (Darcy Harris, P.Eng.; Joe Cormier, P.Eng.; Kevin Walsh; Denis Marquis).

Owner: Port Saint John.



Award of Excellence

Woodworth Dam Optimization

BBA

The City of Prince Rupert needed to replace the aging Woodworth Dam on British Columbia's north-west coast, along with water supply lines. This 100-year-old critical piece of infrastructure has served as a reservoir and primary freshwater source for the community.

The municipal government turned to Austin Engineering, now part of BBA, to optimize the dam's redesign, help secure the multi-year project and develop a state-of-the-art freshwater distribution facility.

Prince Rupert had been under boil-water advisories in recent years, due to turbidity in the water system pumping from Shawatlan Lake. The completion and commissioning of the Woodworth Dam were celebrated on Oct. 14, 2022. Beginning in February 2023, for the first time in seven years, drinking water could be taken directly from the city's original supply in Woodworth Lake and transported—via high-density polyethylene (HDPE) pipeline—down and across the harbour, entering the city's water system. This has been a life-changing project for the community.

Getting the green light

In the initial stages of the project, there were successes; however, the challenges and costs associated with building a new dam in a remote region, with limited road access, tested its future. The firm's team

undertook a comprehensive value engineering review, optimized the initial design for the new dam and reduced the project budget by nearly 17%.

The budgetary reduction was achieved by using multiple three-dimensional (3-D) printed dam and CNC-routed riverbed models, which were tested in hydraulic flumes to confirm their flow characteristics. This analytic approach allowed the team to optimize the design to meet the specific project goals, a process which reduced rock anchor quantity by 40%, concrete volume by 25% and rock excavation volume by 18%. This was also a more sustainable solution.

Reducing costs would help get the 'green light' for the project, but the team's goal was also to incorporate the interests of the environment and of local communities. By way of example, reusing foundation rock saved 500 trips on the remote service road; the reduction in rock excavation limited the amount of debris entering the stream; and the team ensured special attention and care by protecting Indigenous ceremonial trees, traditional wetlands and other culturally significant features.

Implementing industry best practices ensured climate resilience and dam safety. Prince Rupert is known for significantly heavy rainfall, so a focus was placed on predicting and allowing for future



changes to 'flow regimes' within the river system as a result of climate change. The spillway capacity was oversized to allow for future flood flows and demand.

Site challenges

The site is located 7 km from a tidal barge landing. All equipment, concrete, rock, aggregate and other items for the project needed to be delivered by barge to this landing, which could only be accessed to load and unload equipment during high tide—a three-hour window each day. From there, the items needed to be trucked the 7 km up a single-lane forestry service road.

The discovery of weak shale rock above the north abutment meant slope stabilization was required before the team could fully access the dam site. Additional measures were taken to ensure safety during mudslides; while these are considered one-in-75-years to one-in-50-years rainfall events, they did indeed occur during the project!

Collaboration with First Nations

The project is located on Indigenous land. Local communities were involved throughout the project, in a collaborative effort that ensured special attention was given to respect their culture.

These communities hold traditional ceremonies using sections of cedar trees. So, the project team

"They've provided a sustainable source of clean drinking water where there wasn't one before."
- Jury

PHOTO COURTESY BBA.



carefully relocated the identified trees and returned them to their communities.

The project also included a joint venture (JV) partnership with an Indigenous community as the environmental consultant.

An investment in the future

The City of Prince Rupert's main priority was to provide access to safe water for its residents and ensure future generations would also enjoy a secure water supply. Replacing the 100-year-old infrastructure was both a priority and a major investment.

Not only did the team reduce costs to make the project possible, but it also successfully transformed the site into a state-of-the-art facility.

"The Woodworth Dam optimization project is an example of how we can successfully balance economic benefits with environmental and local community interests through innovation and collaboration," says Guneet Uppal, the city's engineering services manager. "It is an achievement we can all be proud of." **CCE**

Woodworth Dam Optimization, Prince Rupert, B.C.

Award-winning firm (prime consultant):

BBA, Mont-Saint-Hilaire, Que. (Roger Austin, P.Eng.; Tanzim Alam, P.Eng.; Ruth Keyes, P.Eng.; Matt Pommer, Field Inspector Tech).

Owner: City of Prince Rupert.

Other key players: L&M Engineering, Eiffage Canada.

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Award of Excellence

La Baie Landslide and Embankment Restoration

Englobe

During a regional state of emergency in 2022, the City of Saguenay, Que., sought to protect its residents from landslides. Englobe provided key geotechnical analyses and supervised emergency stabilization work, citizen evacuations, recovery of property, destruction of residences at risk and restoration of the damaged embankment.

A technical and human effort

In April 2022, as soon as the snow melted, several major landslides occurred in the greater Saguenay region. The City of Saguenay mandated Englobe to carry out an in-depth analysis of several embankments to detect further risks.

When the firm's team detected major cracks in an embankment in La Baie, aggravated by intense rains comparable to those of the 1971 Saint-Jean-Vianney disaster, it immediately recommended a preventive evacuation of eight residences and 30 inhabitants. From there began an investigation campaign, led by Englobe, the city and the Quebec ministry of transportation's geotechnics and geology department.

On June 13, 2022, a landslide occurred in La Baie and a regional state of emergency was declared, with the urgent evacuation of 21 additional

"The team used technical expertise and important human connections to control chaos. Their work directly saved lives." – Jury



residences. Englobe supervised the installation of concrete blocks to demarcate the sector at risk.

In less than 48 hours, the team orchestrated a constant watch of the damaged embankment with a drone, cameras and geotechnical experts. Along with piezocone drilling, this effort identified the presence of a highly sensitive layer of clay-like soil, capable of causing dangerous mudslides and additional landslides. The risk zone was enlarged.

Englobe next oversaw the emergency evacuation of 60 homes and 200 residents and continued to supervise emergency stabilization measures, including the installation of dikes and low walls and restoration and stabilization work on the damaged slope. This work was partly carried out with phytotechnology,

which is based on biomimicry and integrates concepts of civil engineering, forestry and agronomy to improve the safety, durability and socioeconomic value of treated soils.

As the team conducted risk analyses on 50 similar residential sites, its efforts helped comfort hundreds of worried citizens. The key was to remain agile and flexible to manage both the technical and human aspects of the project, from beginning to end.

Multidimensional challenges

Once the regional state of emergency was declared, the team had to temper social chaos and civic concern by very quickly marking out critical initiatives in a highly detailed project.

In close collaboration with—and support of—experts from the City of



Saguenay, the Ministère de la Sécurité publique du Québec (MSP) and the Ministère du Transport du Québec (MTQ), Englobe immediately mobilized a multidisciplinary team at the provincial level and organized their work according to specific project stages, subject to established contractual standards.

When working with municipal and provincial stakeholders, given their varied procedural velocities, it was difficult to use different administrative apparatuses to obtain all of the project components on time. By creating a robust operational chain, Englobe enabled privileged and rapid access to the decision makers and resources necessary to carry out the project.

Aggravating weather conditions made the mandate more complex. The arrival of ground frost, a significant supply of snow and rapid melting created a 'perfect storm' for the occurrence of additional potential landslides on a regional scale. Subject to the same state of emergency, Englobe had to manage similar events simultaneously and with extreme efficiency across the vast territory of Saguenay, in a very short time.

Given the high profile of the event, the team also had to minimize informational leaks. They centralized and homogenized information in a weekly log summary, while ensuring

the technical and administrative correctness of the interventions carried out by municipal officials within the crisis unit created for this purpose.

Saving lives

The first preventive evacuations carried out in April saved the lives of the residents of a house that was later destroyed in the June 13 landslide. And by significantly expanding the area at risk, Englobe's team carried out the total emergency evacuation of 83 residences, potentially saving 230 residents.

The project stabilized the unpredictable clay-like soil that had been weakened by heavy seasonal rains, relieving it of considerable weight. Englobe's supervision of work to strengthen the risk zone made it possible to secure municipal works, pharmacies, banks, supermarkets and a wastewater treatment plant, preserving local jobs, access to essential services and, above all, the normal daily life of the area's residents.

Englobe intervened on more than 50 sensitive site that presented similar risks during the same period and managed locals' concerns, the process of destruction and evacuation of residences at risk and mobilized the necessary human and material resources.

Homes in risk zones were evacuated and, in some cases, destroyed before further landslides could occur.

Restoring the ecosystem

Following the landslide's damage to La Baie, a classic method of soil stabilization by rock was initially used. Given Englobe's experience in phytotechnology, the team later improved upon this technique by integrating revegetation. This method not only improved and embellished the existing environment, but also was perfectly adapted to the particular, clay-heavy constitution of the soil.

In fact, the root network of the planted species not only restored and solidified the damaged slope, but also dried the soil more quickly following heavy rains, further reducing the risk of clay liquefaction that could cause dangerous mudslides. The durability of the damaged ground could be ensured while effectively preventing future similar incidents.

To restore the ecosystem to its original state while respecting it, it was essential to study it well. After this analysis, the team favoured the use of local native species, including white spruce, balsam fir, jack pine, ninebark and dogwood. Mixing civil engineering and agronomy, they restored the damaged environment and erased the vestiges of the disaster. **CCE**

La Baie Landslide and Embankment Restoration, Saguenay, Que.

Award-winning firm (geotechnical analysis and prime supervisor): Englobe, Laval, Que. (Mike Cormier, P.Eng.; Nouredidine Ghlamallah, P.Eng., Ph.D.; Stéphane Lavoie, P.Eng.; David Boily, P.Eng., M.Sc.; Nicolas Martel, P.Eng., M.Sc.; Émie Racine, CPI; Yannick Leblanc, Tech; Pierre Amyot, P.Eng.).

Owner: City of Saguenay.

Other key players: Municipalité de La Baie (contracting authority), MTQ (designer of measures and intervention plans), MSP (financial backer), Soleno (rainwater management system), IPEX (high-density polyethylene (HDPE) pipe manufacturer), Tuvico (concrete pipe manufacturer), Excavation J. Poulin (general contractor, heavy equipment).



Award of Excellence

Comox Valley Water Treatment Plant

Stantec

The Comox Valley Water Treatment Plant was completed in October 2022, marking the largest infrastructure initiative undertaken by the Comox Valley Regional District (CVRD) to date. The new system provides a vital source of clean drinking water for the communities of Courtenay, Comox and K'ómoks First Nation in British Columbia.

Stantec, as prime consultant to Aecon's design-build team, worked with CVRD and the community to deliver a new water treatment plant and conveyance system, which supplies 75 million L per day (MLD) of treated water from Comox Lake. The firm also worked with the K'ómoks First Nation (KFN) community to design the facility, which resides on KFN territory.

CVRD provides water to 50,000 residents. Since 2014, the unfiltered system had suffered through boil-water advisories relating to turbidity issues. To resolve concerns from the public and the provincial ministry of health, including meeting surface water treatment guidelines, CVRD planned for the design and construction of new facilities.

Built with future regional growth in mind, the new system provides flexibility to address raw water quality variations caused by climate change. Comox Valley communities now have access to a secure supply of reliable, high-quality drinking water for generations to come.



Multiple improvements

Improvements were made to components of the water treatment system with a multi-barrier approach from source to tap, which involved source protection, monitoring, reducing turbidity and removing the risk of viruses and bacteria, with three levels of treatment—filtration, ultraviolet (UV) and chlorination. This included a new lake intake (to access cooler water), lakeshore raw water pump station and transmission main, direct filtration water treatment plant and treated water transmission main.

To preserve the beauty of the surrounding area and mitigate noise concerns for residents, an underground pump station was built at Comox Lake. An intake tunnel was constructed to reduce impacts to the lakebed and fisheries. Energy conservation features were incorporated, including natural and LED lighting, energy-efficient residuals dewatering and high-rate filters to

reduce the footprint needed for the facility. All process water is recycled, including spent filter backwash water, enabling 99% of water coming into the plant to be processed with minimal wastage.

The new treatment facilities were delivered in 30 months from design to completion of construction, through the COVID-19 pandemic disruptions and hyper-inflation.

An accelerated schedule

The key challenge with this \$126-million project was the accelerated schedule to meet deadlines set by key stakeholders. When the province declared a state of emergency due to the pandemic, it presented restrictions that affected project completion, heavily impacting the labour force and the supply chain for major equipment and materials.

Deep collaboration and support from CVRD made the 30-month schedule achievable. The Stantec/Aecon integrated design-build team

"This project helps people understand where their clean water comes from."
- Jury

also worked closely with operations and maintenance (O&M) staff, KFN, BC Hydro and Island Health.

The design was completed six months after the notice to proceed through four formal stage gate reviews at 30%, 60%, 90% and 100% of design. Early work packages and major equipment procurement were issued concurrent with the design package to facilitate the start of construction. Stantec's multidisciplinary team fast-tracked design management, scheduling and risk and cost management.

Showcasing local talent

In addition to clean drinking water, the project provides access to community facilities, art, trails with potable water

taps and lake water supply for a new hatchery project.

The project was 100% designed by local technical experts and employed a workforce almost entirely (99%) local to Vancouver Island. Employment opportunity goals for First Nations people, apprentices and underrepresented people were far exceeded, in most cases doubling, tripling or quadrupling the targeted hours.

Environmental integration

The architectural design incorporates a glue-laminated (glulam) wood roof structure and beams in the operations building. The result is an esthetically pleasing facility that integrates with the natural environment.

The site incorporates landscaping, porous pavers to control runoff. Water from the plant is supplied to a local trailhead interpretive centre for public use.

Low-carbon concrete was used to reduce the project's environmental impact. Natural light with light tubes and LEDs reduces the need for electricity. Energy efficiency was also emphasized in the selection of process equipment, including the low-energy press dewatering system, which reduced energy needs by 96% in comparison to other dewatering options, such as centrifuges.

All process water is recycled from the treatment system. The process design was also optimized to reduce the need for chemicals for water coagu-

lation. Heat recovery was incorporated into the HVAC systems, to reduce both operating costs and emissions. **CCE**

Comox Valley Water Treatment Plant, Courtenay, B.C.

Award-winning firm (prime consultant): Stantec, Burnaby, B.C. (Reno Fiorante, P.Eng., P.E.; Miles Yi, Ph.D. P.Eng.; Tony Brcic, P.Eng.; Shaun Gill, P.Eng.; Steven Cho, P.Eng.; David Harding, Architect AIBC, OAA; John Netzel, P.Eng.; David Law, P.Eng.; Al Ghanam, P.Eng.; Shaun Swarbrick, P. Eng.).

Owner: Comox Valley Regional District (CVRD).

Other key players: Aecon Water Infrastructure (client), Anthratech Western (filter underdrain system), Trojan Technologies (UV disinfection system), FKC (screw press dewatering system).



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Award of Excellence

Caribou Falls Block Dam 2 Reconstruction

KGS Group

Ontario Power Generation (OPG) retained KGS Group to design and supervise the reconstruction of the Caribou Falls Generating Station Block Dam 2, which had sustained unexpected slope movements. It is one of four earth dams that contain the reservoir (Umfreville Lake) for the station.

Advanced techniques, innovative materials and sound engineering judgment were applied to construct a new earthfill dam. The dam and its generation capacity were restored within budget and schedule, while preserving the pristine natural surroundings.

Optimizing the solution

Situated in the rugged Canadian Shield in Northwestern Ontario, Block Dam 2 contains the reservoir for OPG's Caribou Falls Generating Station. Built in 1958, the station and dams were operating reliably when, after 60 years of service, significant movement suddenly occurred on the upstream slope. For dam safety purposes, OPG partly lowered the reservoir level, reducing power generation capacity.

OPG retained KGS for investigations, design (conceptual through to detailed), contract administration and dam performance monitoring for the project's construction and post-construction phases.

KGS used several investigation



“A good example of engineers’ ability to innovate and adapt to site conditions.”
- Jury

techniques to characterize the site, including a seismic refraction geophysical survey and seismic cone penetrometer testing (SCPTu). The latter allowed the firm to quickly obtain data from probes across the site, providing a dense spatial array of foundation soil information in a relatively short time frame.

A focused analysis of this data allowed the design team to optimize the new dam's geometry to resist potential earthquake-induced instability, rather than incorporate traditional, expensive ground improvement methods.

The solution involved building a replacement cement-bentonite (CB) wall core dam on the downstream side of the original dam, while maintaining it as the construction cofferdam. Once the new embankment was rebuilt close to full height, the core trench was excavated while a slurry of water, ce-

ment and bentonite were continuously added, to prevent the sand trench walls from collapsing.

Once cured, the slurry-filled trench became the new water-retaining core of the dam. The relative ease of the granular fill embankment construction followed by slurry trenching, which could be undertaken in almost any weather conditions, minimized the project's vulnerability to seasonal restrictions and delays. Also, the CB wall's slender footprint allowed for the new dam to be built immediately against the downstream slope of the old dam, to fit within the confined project boundary and minimize the amount of material needed.

To ensure the slurry trenching machines wouldn't get stuck in the deepest, densest section of the foundation, the contractor equipped long-reach excavators with three custom interchangeable imple-

PHOTO COURTESY, KGS GROUP.

ments that could tear through dense gravel and pluck out boulders.

Hazard potential

When Block Dam 2 sustained slope movements without warning, part of the crest dropped 1.5 m, exposing internal earthfill materials and potentially compromising the integrity of the core. Maintaining the dam was crucial, as it retains Umfreville Lake.

Ontario's ministry of natural resources and forestry rates Block Dam 2 'extreme' under its Hazard Potential Classification System. This classification, along with the unexplainable movement, compelled OPG to expedite the complete replacement of the dam.

The foundation across the

entire site was dominated by a unique, altered type of Lake Agassiz clay. An inadequate understanding of the strength and mechanical behaviour of this material has historically been the root cause of instabilities for other water-retaining structures.

To address this issue, KGS implemented a multi-pronged approach for stability and seepage control measures, including construction of the CB wall core, shear key, chimney drain, filter blanket and a toe berm.

During construction, highly irregular bedrock with a fracture zone was encountered that could cause significant leakage. The team reacted immediately, optimizing the dam alignment and narrowing the core to avoid the irregular sur-

faces. A bedrock grouting program was also designed to make the fracture zone watertight.

Every effort was made to prevent an uncontrolled release of water from Umfreville Lake. Such an event would have both safety impacts and catastrophic environmental consequences.

OPG held regular review sessions with its dam safety expert panel of internationally recognized engineers, whose input was incorporated at key stages of the project, from preliminary design through construction.

The replacement dam was designed to meet modern standards, augmented with instrumentation and telemetry to support OPG's dam safety monitoring and sur-

veillance program.

Goals accomplished

The project was completed a month ahead of schedule, allowing OPG to proceed with raising the reservoir back to normal operating levels, restoring the generation station's power production capacity. **CCE**

Caribou Falls Block Dam 2 Reconstruction, Caribou Falls, Ont.

Award-winning firm (prime consultant): KGS Group, Winnipeg, Man. (Dami Adedapo, P.Eng.; Jon Friesen, P.Eng.; David Kurz, P.Eng.; Kelly Fordyce, P.Eng.; Jacqueline MacLennan, P.Eng.; Colin Mohr, P.Eng.; Moises Alfaro).

Owner: Ontario Power Generation.

Other key players: Peter Kiewit Sons (contractor).

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Award of Excellence

Pellet Plant Biofuel

BBA

Mining company ArcelorMittal wanted to reduce the greenhouse gas (GHG) emissions generated by its iron oxide pellet production processes in Port-Cartier, Que., so it decided to incorporate pyrolysis oil—a local, carbon-neutral biofuel made from logging waste—to replace some of the fuel oil in its operations.

The project would be the first in the world to use pyrolysis oil in its processes on a regular basis and at such a scale. In fact, it would represent the largest consumption of any fuel made from forest biomass.

BBA was brought on-board to carry out a feasibility study. The firm based its analyses and recommendations on standards and requirements from the National Fire Code of Canada (NFC), Québec's Regulation Respecting Occupational Health and Safety, Québec's Clean Air Regulation (CAR), the Canadian Standards Association (CSA), the American Petroleum Institute (API) and the National Fire protection Association (NFPA).

Ensuring viability

BBA's mandate was to ensure the quality and consistency of the iron oxide pellet firing process could maintain and even increase the plant's output.

The firm performed the study to ensure the viability of converting the plant's fuel oil systems to pyrolysis oil. BBA also ensured the pyrolysis oil facilities were safe and met industry standards, requirements and best practices for workers' health and safety and



for the environment while iron pellet production and quality remained optimal.

The team helped to review the physicochemical properties of pyrolysis oil and its components, identify the points of emission of flammable (explosive) or odorous vapours, develop a summary of exposure, explosivity and emission threshold standards to comply with applicable regulatory requirements in Québec, analyze the facilities to help make recommendations and issue recommendations for potential system expansion.

The technology is helping decarbonize the heavy-industry sector while using a local resource. It is also a solution that can be transferred to other types of furnaces and kilns; indeed, it is already attracting interest from other industrial players.

A different kind of fuel

Pyrolysis oil does not behave like standard hydrocarbons, so it was important for the experts from BBA's advanced fuels and chemicals team to understand the nature of this biofuel.

After interpreting the product's physical properties, they adapted systems to bring the pellets to their ideal burning point, which would help prevent equipment from clogging through polymerization. Given the mechanical properties, they also modified the piping design to maximize fluid pumping. Finally, they selected metallurgy and instruments that were adapted to the oil's corrosive nature.

The oil would come from Bio-Energie AE's restarted plant. To get this facility up and running, ArcelorMittal committed to consuming its minimum biofuel production

"Lots of people talk about solutions like this, but they actually did it, at scale."
- Jury

during the feasibility study.

This meant converting an additional area of the pellet furnace to pyrolysis oil, with a system used in 2015 pilot tests. Reusing this system allowed BBA's design team, in conjunction with ArcelorMittal's operations and maintenance (O&M) teams, to observe some of the issues and opportunities for improvement when designing permanent facilities.

Adapting to the region

By using pyrolysis oil, ArcelorMittal is providing an outlet for local forestry professionals, who have had limited options for managing their wood waste since the Baie-Comeau paper mill shut down in 2020. The Arbec sawmill in Port-Cartier will be able to increase production capacity and no longer have to suspend operations because of waste storage management problems. ArcelorMittal and BioEnergie AE's production line now allows the forestry company to operate seven days a week.

The success of the feasibility study has opened the door to a detailed engineering project for the construction of a complex-wide pyrolysis oil system. Ultimately, the plant will use more than 32 million L of pyrolysis oil per year, representing the entire output of the BioEnergie AE plant.

This will allow ArcelorMittal to cut its annual use of heavy fuel oil and coal by 23% and reduce its CO₂ emissions by 57,600 t. And despite the fuel switch, almost all of the site's infrastructure can be reused and no modifications were made to the furnaces, thus extending the life of existing equipment.

Progress to date

BBA completed its project on time and on budget, providing a multidisciplinary analysis to ArcelorMittal with an overview of the state of the client's facilities, having verified more than 50 items in relation to industrial safety, air quality, control systems and pellet furnace instrumentation. Subsequently, the feasibility study determined the final design of the permanent system and evaluated how much it would cost to implement it in the pellet plant.


Since June 2022, two out of nine areas of the plant—with a total of five burners—have been operating with pyrolysis oil, using more than 10 million L. Following the feasibility study, ArcelorMittal decided to accelerate work in other areas to further expand its use of pyrolysis oil. The bidding process began in April 2023. **CCE**

Pellet Plant Biofuel, Port-Cartier, Que.

Award-winning firm (prime consultant): BBA, Mont-Saint-Hilaire, Que. (Stéphane Charest, P.Eng.; Émile Claveau, P.Eng.; Jérôme Pilon, P.Eng.; Olivier Bertrand, P.Eng.; Zied Oueslati, CEP; Frédéric Lacroix-Tremblay, CEP; Guillaume Picard, P.Eng.; Jim McCann, P.Eng., M.Eng.; Vincent Brunelle, P.Eng.; Caroline Le Page, biologist).

Owner: ArcelorMittal.

Other key players: Ensyn, BioEnergie AE.



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Award of Excellence

Espace Montmorency Energy Loop

gbi

The contractor Consortium MGS—comprising construction company Montoni and the Fonds de solidarité FTQ development capital fund—awarded a mandate to gbi to provide engineering for the construction of a new four-tower multi-purpose building in Laval, Que., and to study the feasibility of implementing an energy loop.

Modelling highlighted the benefits of the loop, which would allow energy to be harvested and shared between Espace Montmorency's towers and relieve the hydroelectric network during peak periods.

A growing mandate

The initial mandate for gbi was to carry out the engineering for the construction of two rental towers, a hotel tower and an office tower on a common base, with a commercial section distributed on the ground floor and second level of all the towers, for a total area of 1,360,000 sf.

Then, the feasibility study was carried out to assess the possibility of adapting existing energy-sharing loop technology to a large-scale complex in a transit-oriented development (TOD). Modelling energy needs by hour over the course of a year made it possible to compare the annual requirements of a traditional system to a loop that would allow energy to be recovered and shared between the towers, with relation to peak hours of consumption and the different space occupancies.



The study demonstrated the energy loop would provide many benefits, including the reduction of power requirements for the systems installed at the thermal power plant and, thus, a reduction of operating costs.

By emphasizing optimization of the building's energy consumption, gbi convinced the client to try to integrate the development's imposing infrastructure with an energy loop. As this technology is normally used in projects of a much smaller scale and for single-purpose buildings, it had to be uniquely adapted for the Espace Montmorency project, so it could meet specific needs at different times for each of the four towers.

How it works

The energy loop reaching the building's various space occupancies is connected to a single thermal power station, to which have been added an electric boiler and two aerothermal modules, among other systems.

The centralization of the main equipment was advantageous to the client in respecting budgets and deadlines. There was no delay in the delivery of the equipment and the residential tower was successfully commissioned in June 2022.

The project uses a water loop, with temperature varying from 55 to 110 F, allowing heat to be exchanged between uses. Any unused energy 'rejected' by the office towers and

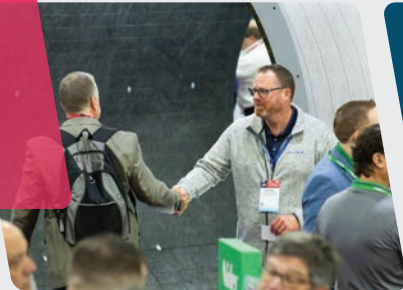
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The energy loop required larger-than-normal pipes.

commercial spaces is conversely injected into residential towers to heat them.

The 'neutral' temperate water allows all users to take or dispose of the energy they need. Thanks to these exchanges and the recovery of energy between uses, the loop reduces energy consumption, costs and, by the same token, greenhouse gas (GHG) emissions.

There were many technical challenges in adapting an energy loop and thermal power plant system for the outsized dimensions common to large, multi-purpose buildings. First, it was necessary to evaluate each square foot according to its use and occupancy, which varied between zones, including residential (717 housing units), hotel (198 rooms) and office and commercial areas. The gbi team succeeded in maximizing the integration of systems and equipment, such that optimal energy efficiency was ensured for all occupants while minimizing the loss of usable space.

It was also necessary to take into account the weight and diameter

“With a big scale-up of technology typically used for smaller projects, the engineers became agents of change for future projects.”
- Jury

(12 to 16 in.) of the larger-than-normal pipes and specific issues for the installation of this equipment during the design of the network. Given the diversity in the use of spaces, both expertise and creativity were called upon to enable the necessary equipment to be integrated.

Given the size of the site, particular attention was also paid to building services. Sanitary and water services were split for each tower, while the stormwater network was directed toward a common retention basin for the entire site. The 25,000-V electrical input common to the building supplies one main electricity room in each of the towers.

Finally, it was important to plan for the flexibility of the system to meet future needs. Its capacity and system controls were designed such that it can be adapted over time and eventually bring energy to other new buildings.

Reducing consumption

With the project situated above the Montmorency metro station, one of

its purposes is to densify and thus save on resources by sharing them, from public transportation to air conditioning. As this approach is increasingly common in urban areas, Espace Montmorency can serve as a reference for others.

If one of the towers has more need and another less, the loop redistributes energy accordingly. There is very little effect from variations in outdoor temperature (which are certainly not negligible for other forms of energy consumption in Quebec).

The reduction of consumption is entirely to the advantage of Consortium MGS and the building's occupants. In addition to reducing operating costs, subsidies available for the implementation of energy efficiency measures have been profitable for the project owner.

Espace Montmorency became the first project in Quebec to obtain the Canada Green Building Council's (CaGBC's) Leadership in Energy and Environmental Development (LEED) v4 quality assurance (QA) Gold certification for neighbourhood development. Next, Consortium MGS aims to achieve LEED Platinum and Gold certification for the core and shell of the towers. **CCE**

Espace Montmorency Energy Loop, Laval, Que.

Award-winning firm (building mechanical and electrical engineer):

gbi, Montreal, Que. (Elie Maillé, P.Eng., LEED AP BD+C; Maxime Boisclair, P.Eng., LEED AP BD+C, RCx; Serge Beaudoin, P.Eng.; Jean-Michel St-Georges, P.Eng.; Brittany Garneau, LEED Green Associate, WELL AP; Laurence-Audrey Châte, Tech.; Jonathan Héту, Tech.).

Owner: Consortium MGS.

Other key players:

Sid Lee Architecture (architect), Marley/EnviroAir (water towers), Laars/Kalterra (condensing boilers), Trane (aerothermal module), Patterson/SERL (network pumps).



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Award of Excellence

Calgary Cancer Centre Phases 1 - 3

Arup

Arup was the bridging consultant on the Calgary Cancer Project (recently named the Arthur J.E. Child Comprehensive Cancer Centre), a 127,000-m² facility with 160 inpatient unit beds, more than 100 chemotherapy chairs, 15 radiation therapy vaults, patient exam rooms, specialized research labs and five levels of underground parking. It will replace the Tom Baker Cancer Centre, which was constructed in 1980, renovated in 2000 and reached capacity in 2003.

The client, Alberta Infrastructure, sought on-time and on-budget delivery of a world-class comprehensive cancer care facility. Arup provided multidisciplinary consultancy services throughout the project, including developing requirements, supporting design-build procurement, managing compliance through design and construction, conducting site inspections, certifying payments, administering contracts and providing technical advice. The resulting socioeconomic benefits include health outcome improvements and job creation.

The \$1.4-billion design-build project was delivered in three phases: pre-procurement; procurement; and design and construction. Substantial completion was achieved in November 2022.

Complex co-ordination

Hospitals are complex facilities and this project was especially so, as a



“They closed a very complex hospital project on time and on budget—amazingly, during COVID-19.”
- Jury

specialist centre that brings together health care, research and education. There are 63 departments, each with its own stakeholder group. There were also approximately 60 separate building systems that needed to achieve integration and interoperability standards.

Arup’s Calgary team managed and co-ordinated a multidisciplinary team of more than 100 people from the firm itself, along with many more from 12 subconsultant teams.

The firm developed a 1,200-page requirements document over seven months and five iterations, for which stakeholder reviews generated 1,000-plus comments. A tracker document recorded these comments. This audit trail proved invaluable downstream in providing a record of the history of the document, which Arup continually updated as

change orders were issued. The same approach was used throughout lengthy design package, room mock-up and construction submittal reviews.

Room data sheets were submitted by the design-builder, outlining such requirements as medical gases, pressurization, air change rate and electrical connections. The 15-day review period for more than 5,000 rooms would have taken over nine months manually, but Arup instead designed an automated process to extract the requirements for each room and match them against the design-builder’s building information modelling (BIM) identification (ID). This only took three days, including checking for any identified discrepancies that needed to be reviewed manually.

The new facility was constructed over five-and-a-half years on a busy

PHOTO COURTESY ALBERTA INFRASTRUCTURE.

hospital campus. The need to keep the project going through the COVID-19 pandemic added an extra challenge. Arup successfully introduced remote site review innovations, such as holding pre-review briefings with specialists unable to travel to site to confirm what they needed to see and the use of on-site resource, photography and post-review virtual meetings.

Remaining accountable

Alberta Infrastructure was accountable to the provincial government for delivering the project on time and budget for the client, Alberta Health Services, but had limited experience with the design-build approach. Arup provided advice and training sessions for stakeholders about what to expect, their roles and how the approach might differ from their previous experiences.

The firm worked with both owner and client to balance performance-based and prescriptive specifications in the requirements. Quality standards were achieved by diligently reviewing compliance throughout design and construction, identifying any non-compliances and ensuring they were rectified by the design-builder.

Arup's work supporting the change management process, including reviewing and challenging the design-builder's proposed scope and estimates, contributed significantly to keeping the project on-budget. At substantial completion, costs remained within 1% of the original contract price.

Going for gold

During Phase 1, Arup took a holistic approach to writing

sustainability requirements. Specific contractual requirements were included in dedicated LEED, energy usage and sustainability sections of the requirements document, while additional requirements were included throughout other sections.

The discipline-specific requirements led to such installations as high-efficiency condensing boilers to minimize the facility's energy usage. Overarching principles also drove the inclusion of views of and access to green spaces.

In 2006, the provincial government promised all new capital projects it funded and supported would achieve LEED Silver certification at minimum. The corresponding section of the requirement document encouraged the design-builder to exceed this commitment by setting a target of LEED Gold.

The design-builder was required to consider whole-life costs over a minimum 50-year service life, including design, construction, operations and maintenance (O&M), repairs and replacements. The requirements document also laid out detailed energy modelling requirements to ensure realistic predictions of consumption during various design phases.

The project recently became the first hospital in Alberta to achieve LEED Gold certification.

Room for innovation

In Phase 1, Arup supported the inclusion of innovations in the request for proposals (RFP), including an automatic guided vehicle system (AGVS). The successful proponent also proposed dynamic glass and, as previous noted, targeting LEED

Gold beyond the government mandate of LEED Silver. All these elements were accepted as requirements in Phase 2.

In Phase 3, as innovations proposed by the design-builder naturally had no dedicated section in the requirements document, they simply became part of the contractual designs. Since their descriptions did not equate to a fully defined set of requirements, Arup helped the client and owner understand how the existing sections for architectural, structural, mechanical, electrical and hospital technology systems applied to these innovations.

As design and construction progressed, Arup's engineers undertook compliance checking of the innovations with the requirements document and the reviewed design packages, ensuring all as-constructed and commissioned systems met the design-builder's contractual obligations and the owner's expectations.

As a major health-care project, the Arthur J.E. Child Comprehensive Cancer Centre will contribute great social and economic benefits. It will support integrated and comprehensive care and serve as an academic

research hub for the provision of services in southern Alberta, with the goal of improving patient outcomes and increasing cancer survival rates.

The project is also one of the largest job creators in Alberta, yielding more than 8,770 construction and related jobs for the region during Phase 3. **CCÉ**

Calgary Cancer Centre Phases 1 to 3, Calgary, Alta.

Award-winning firm (bridging consultant): Arup, Calgary, Alta. (Mike Durntall; Ashok Natarajan; Ross Griffiths, P.Eng.; Thilo Willems, P.Eng.; Jack Johnson, P.Eng.; Marcus Jennings, P.Eng.; Ed Poon, P.Eng.; Mladen Nikolic, P.Eng.; Peter Preston, P.Eng.)

Owner: Alberta Health Services.

Other key players: Alberta Infrastructure (client), Metafor (architect), HKS (health-care architect), Colliers Project Leaders (design-build advisory, payment certification, scheduling), Ground Cubed (landscape architect), MJ Medical (furniture and equipment consulting, health-care planning), Value Management (business services), CMCK Public Art (art consultant), SMP Engineering (electrical engineering, medium-voltage distribution), Teegor Consulting (infection prevention and control construction), 1862455 Alberta (SharePoint developer).



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Award of Excellence

CHUSJ Phase 2 Redevelopment

CIMA+

CIMA+ offered complete project management services to the Centre Hospitalier Universitaire Sainte-Justine (CHUSJ), a major pediatric centre in Montreal, for the redevelopment and modernization of spaces left vacant following the relocation of certain departments to a new specialized unit building.

Since the project was launched in 2017, the firm has worked in partnership with the health-care institution to provide functional spaces better-suited to current medical practices.

Growing up healthy

Phase 2 of CHUSJ's 'growing up healthy' program involved the transformation of some parts of an aging building into modern premises, providing the infrastructure necessary to better meet the needs of mothers and children.

The program involved the redevelopment of more than 11,000 m² over a five-year period, at a cost of nearly \$100 million, for a total of nearly 400,000 hours of on-site work. The pharmacy, blood bank, orthopedics and teaching services units underwent a complete redevelopment, while the mother-child care unit was modernized. New mechanical rooms were added to support the installations and ensure systems' reliability.

CIMA+ oversaw planning, procurement, control and monitoring of costs and schedules, risk manage-



ment, construction management, health and safety management, equipment logistics management and transfer to operations.

The facility was built in the 1950s, which made it complex to carry out the project, particularly in terms of meeting environmental control requirements and co-existing with major asset maintenance work. With the building being occupied, the work needed to be phased and temporary systems installed to maintain care activities and respond to unforeseen site conditions.

CIMA+'s project management team ensured the work was completed on time and budget. Despite many unforeseen events, they delivered the program with a cost variance of only 2.82%. Completing the demolition phase before finalizing drawings and specifications reduced the risk relating to those unforeseen events, while the phasing of the project—co-ordinated upstream to

minimize the impact on clients—allowed for more competition among contractors.

Sustainable development

While respecting the physical integrity of the existing structure, CHUSJ wanted durable, low-maintenance materials similar to those used in its new building. Therefore, all construction documents were drafted to meet the same standards as for the expansion phase, which had earned Leadership in Energy and Environmental Development (LEED) Gold certification from the Canada Green Building Council (CaGBC) in 2016 for the specialized unit building.

CIMA+'s team provided two new modern mechanical rooms to support the existing infrastructure and new spaces and to allow for future redevelopments. The efficient equipment for these rooms has enabled CHUSJ to optimize its energy consumption on an annual basis,

PHOTO COURTESY CIMA+

while the envelope used for these mechanical rooms has still preserved the historical, symbolic and heritage nature of the building.

To reuse as much of the existing infrastructure as possible, complex work was required to remove asbestos from the premises, including the mechanical ducts. CIMA+ minimized the disruption to operations that would have been caused by major demolition and secured spaces for the future by removing hazardous materials.

Project management dimensions

In 2019, the team launched a pilot project to use digital data from three-dimensional (3-D) models for validating and monitoring costs and to plan and monitor the work from a model. The pilot focused on aspects of building information modelling (BIM), including duration, schedule, planning, estimating, monitoring and budget analysis.

The pandemic put an end to the pilot, but the initiative demonstrated the potential for better control of costs and project schedules through the effective collection and use of data. A 3-D physical model of the entire hospital building, including

“Respecting the historical appearance of the building, they didn’t just demolish everything—they used what they still could.”
- Jury

all aspects of the project and their impact, also facilitated understanding of the improvement work needed for each department.

To facilitate resource mobilization, CIMA+’s team developed a more visual, effective and efficient interpretation of the traditional manual or project management plan, as recommended by the Project Management Institute (PMI). Throughout the program, the team continued to look for simple, agile solutions to meet the changing needs of the program and solve problems that arose.

Turning a vision into reality

Implementing the ‘growing up healthy’ modernization program made it possible to realize a vision and ensure the sustainability of care for mothers and children in Quebec. The design was based on the most recent data from academic institutions for pediatric and family-centred care and related specialties.

The aging infrastructure of the pharmacy, located in the same building since 1957, had hindered the development of pediatric pharmaceutical care and limited the health-care team’s productivity. This was at odds with the innovative

clinical vision of the newer building and jeopardized its regulatory certification.

Today, the new facilities significantly improve conditions for mothers and their families after childbirth, while the addition of mechanical rooms ensures greater reliability, safety and quality of care.

CCE

CHUSJ Phase 2 Redevelopment, Montreal, Que.

Award-winning firm (program manager): CIMA+, Montreal, Que. (Yves Roland Mondou, ing.; Marc Savard, ing., PMP; Isabelle Feng, ing., MBA, MGP, PMP, RMP).

Owner: Centre hospitalier universitaire Sainte-Justine (CHUSJ)

Other key players: Approgestion (procurement), Lemay (architect), Jodoin Lamarre Pratte (architect), Brière Gilbert et Associés (architect), De Montigny Métivier Hébert Fortin Martin (architect), BPA (electrical/mechanical), Stantec (electrical/mechanical), NCKS-SDK Consortium (civil structure), McKesson Canada (medical equipment), Phillips Health (medical equipment), Global Life Science Solutions (medical equipment), Haemonetics Canada (medical equipment), Lucinda Technology Solutions (medical equipment).

CIMA+ Engineering for people

Sustainable engineering and innovation:

Elevating healthcare institutions for future generations

CHUSJ’s “Growing up Healthy” program
Photo: Stéphane Brügger

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Award of Excellence

Digital Acceleration Initiative

WSP

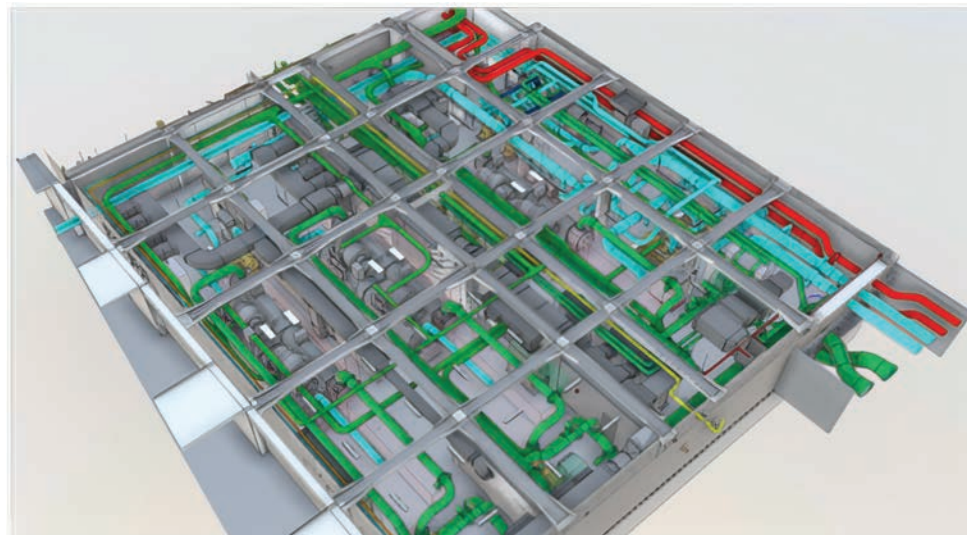
Digital project delivery has become critical to achieving successful project outcomes while adapting to the changing needs of the consulting engineering industry. In 2020, WSP's leaders in the property and buildings sector—more specifically, in the structures, mechanical and electrical subsectors—launched a strategic initiative to advance technology, offer digitally integrated services and advise clients on digital asset management and decarbonization objectives.

The key steps included baseline training in building information modelling (BIM) and automation for all staff; the standardization of templates to ensure all are working from a common base on all projects; the mentoring of 'champions' in each business region and sector; and the development of custom workflows to enhance efficiency and quality.

Dedicated teams

WSP formed a digital solutions team, which would be dedicated to executing the 'digital acceleration' initiative.

With more than 760 employees and 22 offices across the country, the creation of a standard approach to BIM and custom tool development involved gathering one key leader from each region and agreeing on the standard for project delivery, including a BIM execution plan, level of development matrix, draw-



ing standard and workflow, all in two languages.

The most impactful innovation to result from the process was a connected approach to project data, with a centralized database for all of the various software platforms needed to execute a project. This serves as a single source of the data stream, is intuitive for a non-software engineer to use, saves thousands of hours and improves quality.

WSP also formed 10 internal focus teams to work with key clients across the country, who in turn would provide the voice of industry. The teams would share WSP's plans so clients could validate them and provide feedback on the direction for digital twins, decarbonization and automation.

The purpose of this approach was also to promote industry-wide tools and set a common language for digital solutions.

***"An important project in terms of advancement of the industry and the direction of the tools we use as we move toward the next generation of construction."* - Jury**

Measuring progress

In addition to creating a standard baseline for project delivery that would be common across Canada and offer a 'launching pad' for automation, it was also important to measure the progress of WSP's digital transformation.

Given the size of WSP's property and buildings practice and its structures, mechanical and electrical businesses, a focused approach to change management was necessary to mobilize everyone to participate. This involved creating small teams of individuals across the business with similar day-to-day activities to select one or two 'wildly important' goals to achieve in their work by leveraging and adopting technology.

The challenge of covering a vast range of sectors, regions and project typologies with a standard project delivery approach was overcome by gathering experts in each sector and

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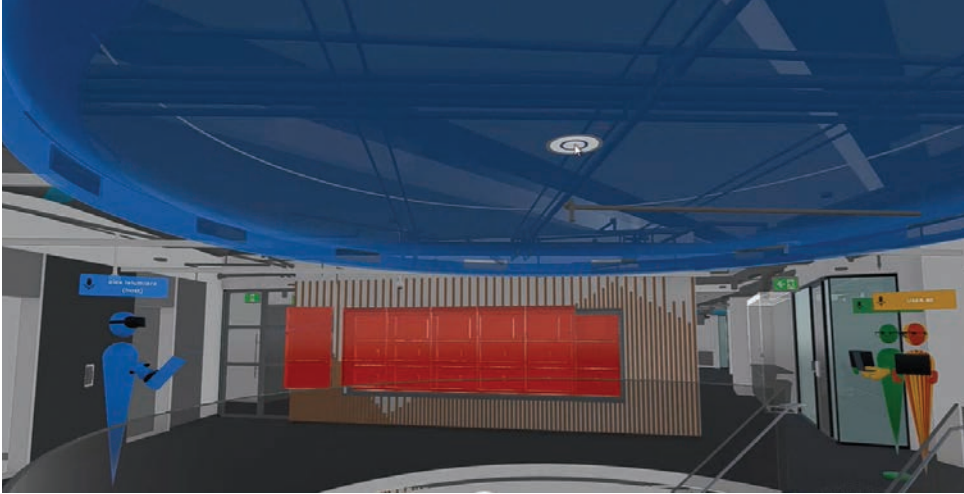
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Virtual reality (VR) has become a harmonized tool across sectors.

region to make key decisions and focus on the creation of content to be used on projects.

The bulk of the effort on the initiative was handled by the centralized digital solutions team. Removing key experts from major projects to focus on a non-billable strategic initiative took the commitment of leaders to acknowledge it would ultimately pay back to all involved. Without such a commitment from leadership, it is doubtful software platforms—such as those used nationally for reality capture, viewing of point clouds and scan-to-BIM—could be harmonized across the sectors.

Key performance indicators (KPIs) were implemented, such as efficiency improvements and time spent by production staff in Revit versus AutoCAD. By the end of 2021, the efficiency improvement metric—as measured by an overall direct labour multiplier—increased by 4.8%.

It was estimated a passive approach and lack of investment would lead to margin erosion of 10%. This erosion was not experienced, further indicating the value of the investment.

Further, the adoption metric of time spent in the aforementioned platforms flipped from 40% Revit and 60% AutoCAD at the end of 2020 to 60% Revit and 40% Auto-

CAD at the end of 2021. This result helped convince management to continue to invest in the program.

Through the encouragement of staff to be innovative and leverage the tools at their disposal to work more efficiently, WSP saw a marked increase in the number of modellers using Dynamo to perform parametric design tasks and streamline their work in Revit. In fact, the firm's number of Dynamo scripts grew by 334% in October 2022 compared to the previous January.

This shift, along with the impact of three-dimensional (3-D) co-ordination in the design environment prior to issuing for construction, had economic and social benefits in freeing up time for project teams to focus on ensuring quality in the final designs and reducing wasteful changes during construction.

Supporting decarbonization

With the drive toward decarbonization across the architectural, engineering and construction (AEC) industry, WSP's property and buildings leadership teams recently committed to reducing carbon emissions from the firm's designs, with the aspirational goal of achieving net-zero operational carbon by 2030 and net-zero embodied carbon by 2040.

With this commitment and the digital acceleration initiative in mind, the project team for a major

historical building retrofit successfully created a custom application in an automated fashion to match a database of steel beams slated for removal with the new steel beams required in the retrofitted areas in an automated fashion, diverting the old beams from the waste stream.

Without the digital acceleration initiative's baseline BIM standards, creation of a culture of innovation and focus on modified design approaches to suit decarbonization, the retrofit project's waste diversion opportunity would either have been tackled in a manual fashion, which could have become cost-prohibitive, or simply missed altogether.

By leveraging the data from its models, WSP has been able to benchmark its past designs for hundreds of projects from a carbon-intensity perspective and to construct dashboards that report on their levels of embodied and operational carbon. From this type of benchmarking, consulting engineers will be able to identify trends and influence design decisions for new projects.

Using such data at schematic stages will allow consultants to better act as advisors to clients, offering valuable insights on how to reduce the carbon intensity of a building when it can be most heavily influenced, at the beginning of a project. **CCE**

Digital Acceleration Initiative, Edmonton, Alta.

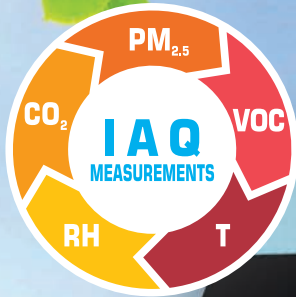
Award-winning firm (project leader):

WSP, Montreal, Que. (Tom Stevens P.Eng.; Michael Jackson, P.Eng.; William Johnston, P.Eng.; Ian Shrimpton, P.Eng.; Ziad Hanna, P.Eng.; David Carnovale, P.Eng.; Tom Komon; Laura-Lee Moran; Mecale Wallenda; Lucas de Jong; Maz Karimipour, P.Eng.; Neda Karbasioun; Fred Bisson, P.Eng.; Luis Otero; Shekhar Madheshiya; Gabriel Langlois; Moughit Bouchaara).

Owner: WSP.

Other key players: n/a.

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