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A building to remember

Tech talents
shine in Canadian
War Museum
construction

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Tech talents shine in Canadian War Museum construction



Photo: OMM/Bill Kent

“This building is an architectural marvel,” says Peter Richard, C.E.T., B.Eng., of the museum being built on the shores of the Ottawa River at LeBreton Flats, two kilometres west of Parliament Hill. The new Canadian War Museum is dedicated to the preservation and remembrance of Canada’s military history.

Almost 1,500 people have been involved in the design, construction and commissioning of the museum. Some of these dedicated professionals are certified engineering and applied science technologists, such as Richard, an estimator for Univex, the electrical contractors for the project; Lee Keeley, C.E.T., T.P., Ivan Elliott, C.E.T. and David Coyle, A.Sc.T. They’ve all worked behind the scenes, yet their work is crucial to bringing the architect’s vision to life.



by Donna Papacosta

o remember

If you've been to Ottawa, you may have visited the old War Museum, crammed into the Public Archives building on Sussex Drive. Unlike that site, the new building will feature greatly expanded exhibition space, including room for the display of large military vehicles and artillery pieces; a gallery for Canadian war art; outdoor spaces for ceremonies and events; classrooms for workshops; a theatre for performances and films; improved research and library facilities; and climate-controlled storage space to protect artifacts.

The \$135-million facility, housing 45,000 square feet of exhibition space is expected to attract 300,000 visitors a year. The museum will open in May 2005, as the Canadian War Museum marks its 125th anniversary.

REGENERATION BY DESIGN

The innovative museum design by Raymond Moriyama of Moriyama & Teshima Architects, in a joint venture with Alex Rankin of Griffiths Rankin Cook Architects, reflects the theme of regeneration. It will remind visitors not only of the impact of war on the land, but also nature's ability to regenerate and recover from the devastation of human conflict.

The building and landscape architecture, reminiscent of the bunkers of Vimy Ridge during the First World War, express the regeneration theme. A key feature is the gently sloping green roof that appears to emerge out of the Ottawa River and helps to blur the distinction between the landscape and the building itself. A walkway over the building and across the roof offers a stunning view of the Peace

Tower and a link to the riverfront.

The designers have taken many steps to minimize the building's impact on nature. For example, they use recycled fly ash in the concrete, the building's main construction material, noted for its high-energy efficiency.

The species of tall, self-seeding grasses that grow naturally along the riverbank also cover the green roof, one of the largest in North America, making it a sustainable ecosystem requiring minimal maintenance. It is also an effective and economical solution to storm water management and it provides insulation too, reducing the transfer of heat through the roof in summer and decreasing the demand for mechanical cooling.

River water will be drawn for the cooling systems and for non-potable uses such as toilets.

The new Canadian War Museum, unlike its predecessor, will feature all of the amenities of a modern museum, including underground parking, a dedicated group entrance with a bus drop-off area, a restaurant, boutique and quiet areas for rest and reflection.

C.E.T.s AT EVERY STEP OF THE WAY

Crossey Engineering Ltd. is the company in charge of engineering and designing the lighting systems, security and fire alarm systems. Ivan Elliott, C.E.T., Crossey's electrical site supervisor, serves as liaison between his company, the contractor and the architect.

"I keep an eye on how the contractor is implementing the designs," he says. "If there are problems, I go to the engi-

neers for answers. With a large project like this, co-ordination is essential.”

Lee Keeley, C.E.T., T.P., the field representative for The Mitchell Partnership Inc., mechanical engineers for the project, is responsible for day-to-day review of the construction, design adjustments, and change co-ordination for heating, ventilation, air conditioning, fire protection, plumbing and the automated control systems. He works alongside the architects and other consultants to help fine-tune the design as needed during construction.

“I’ve been here every day since April 2003,” says Keeley. “It’s not a common practice to have an engineering rep on site at all times, but this building’s design is unique and takes us to a whole other level. I don’t think this project would have been as successful without the design team being here alongside the construction workers.”

Keeley is also the author of the commissioning process for all mechanical and related electrical systems. The 800-page commissioning process manual took about four and a half months to write.

“It’s like an owner’s manual for the building,” Keeley says, “because it enables the building operators to understand how

it functions, and shows how we verified that the construction meets the specifications.”

He crafted the commissioning document using standards developed by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and the Associated Air Balancing Contractors (AABC) Commissioning Guidelines, among others.

COMMUNICATION IS KEY

“A big part of my role is communication,” says Keeley. “Some of the contractors were not expecting to see the detail we built into the commissioning process, and they were surprised when I gave them a six-inch binder.”

To put them at ease, Keeley says he walked them through the process and explained it was like a checklist.

“We have to ensure that the client receives everything they asked for. It’s just the same as when you take delivery of a new car,” he says. “You want to be sure it has all of the features you requested — colour, air conditioning, ABS, power locks, security and so on.”

Keeley emphasizes that effective co-ordination and commu-

Behind the design

The mandate of the new Canadian War Museum is to educate, to preserve and to remember, says Raymond Moriyama of Moriyama & Teshima Architects of Toronto, who with Griffiths, Rankin, Cook of Ottawa, designed the new building.

“For architectural inspiration, our team of architects and designers first looked to the people of Canada,” he says.

They pored over images and stories of war involving Canadians.

“Over and over, we saw photographs of heroic Canadian soldiers fighting in devastated foreign landscapes: ordinary Canadians accomplishing extraordinary deeds, seemingly modest and gentle, but capable of great unselfish feats in times of hardship,” he says.

The second source of inspiration was the diversity and beauty of the Canadian landscape. Imagery of landscapes ravaged by wars was yet another source of inspiration.

“What is astounding is how the landscape has regenerated, gently healing the rifts in the earth (and burying unexploded munitions) with green vegetation,” he says. “Yet the six-foot-deep trenches and bomb craters, like the memories of destruction and despair, can never be completely erased.”

That was the concept that suggested the cen-

tral idea for the new Canadian War Museum facility: nature may be ravaged by human acts of war, but inevitably it survives, hybridizes, regenerates and prevails.

Memorial Hall

Located in the Lobby, the Memorial Hall is a place of quiet remembrance and reflection, says Moriyama.

“Its walls are incised with a grid pattern that is proportioned after First World War Canadian grave-stones — a sombre reminder of Canadians left behind,” says Moriyama.

On Remembrance Day (November 11) at 11 a.m., the Memorial Hall will be the site of a special solar event. Carefully positioned at the intersection of the view corridor to the Peace Tower and the location and angle of the sun each November 11 at 11 a.m., the Memorial Hall permanently links the Peace Tower and Remembrance Day — both of great significance to Canadians — with the sun.

Regeneration Hall

Regeneration Hall is a place of rest: sublime and subdued, solemn and quiet, dramatic and memorable, says Moriyama. Visitors enter the dramatically vertical space of Regeneration Hall at its upper, mezzanine level.

Subdued lighting slows the pace, forcing visitors to pause as their eyes adjust. Straight ahead is a triangular window, soaring through the full height of

the space and offering a tightly framed view of the Peace Tower, silhouetted against the sky.

A staircase leads visitors down between two expansive walls to the main level. The north wall of Regeneration Hall is soft and smooth, with a warm-coloured finish that resembles Venetian plaster. The surface is animated by shifting sun spots spelling out “Lest we forget” and “N’oublions jamais” in Morse code.

As visitors descend the stairs, the perspective shifts, and the view of the Peace Tower is lost — just as peace can so easily be lost. Instead, a compelling sculptural figure comes into view. The original plaster maquette of Walter Allward’s sculpture Hope floats in front of the window. The glass behind is translucent, providing a quiet backdrop and obscuring the view outside.

The structural module

Wartime references provided inspiration for the entire 430,000-square-foot building — even the structural system. The architects’ research revealed that soldiers on land travelled in a single line because their lives depended upon a nine-metre band: 4.5 metres (30 feet) to their left and 4.5 metres to their right. Anything outside the nine-metre band was considered a “no man’s land”. Thus, the structural module for the Museum is nine metres by nine metres. Even the Memorial Hall measures exactly nine metres by nine metres.



LEFT: Certified engineering technologists Peter Richard and Ivan Elliot stand in the main telecommunication room, left.
INSET: David Coyle, A.Sc.T., stands between the heating boilers.

nication are essential.

“Contractors bid on a job based on their interpretation of the documents. If that differs from the intent, we work with the contractor to provide what will meet the intent and sometimes we may have to fine-tune the design,” he says.

“Also, at the end of the day, what engineering put on paper may not work as designed, so we may need to tweak it. Those changes must be sent to the building operators to show how it works.”

Nothing is simple on a project like this!

Keeley isn't the only person devoting time and energy to communication.

David Coyle, A.Sc.T., building systems coordinator with PCL Constructors Canada Inc., deals with technical issues related to equipment or its installation, and has been busy at the construction site since July.

“Every morning I talk with the trades to make sure everything is going smoothly,” says Coyle. “We deal with any electrical or mechanical problems that arise.”

Overall, Coyle's job is to ensure that problems are resolved so that construction can stay on track. And the museum project is on schedule.

The work keeps Coyle on his toes.

“Sometimes, services shown on the drawings conflict with one another in reality,” says Coyle. “Or a change to one necessitates changes to others. This particular building presents challenges because of all the different systems and the unique design, coupled with the river water intake.”

Coyle had to pay special attention to the commissioning of

the air-handling systems to ensure that they provide the proper humidification and climate control for museum artifacts. “That's a large focal point of this job,” he says.

To do their work, the certified engineering/applied science technologists on the museum project need to be able to interpret high-level engineering documents and convey information to contractors.

“The job requires constant communication with the contractors and the engineers, including the ability to negotiate compromises,” says Keeley. “There is more than one way to achieve a certain result, but the ultimate decision must meet the intent of the design.”

COMPLEX COMMISSIONING

The very design and engineering wonders that make the museum unique add complexity to its construction and commissioning, says Keeley.

“With this building, we haven't reinvented construction, but we have challenged the norm,” he says.

For example, using river water for cooling is not common. “We had to get approval from the local, provincial and federal authorities and we had to install a series of separators and strainers to prevent particulates and even zebra mussels from prematurely wearing out the mechanical systems,” Keeley says.

They also installed a hydroburst system. It blows air back down into the intake piping to keep the intake filtration screens clear. The main foyer ceilings that run in many different angles, plains and axis also complicate the design and installation of

By the numbers

Construction and concrete

- Amount of concrete to create walls, floors, ceilings and roofs: 32,000 cubic metres, weighing 80,000 tonnes
- Most concrete poured in one day: 1,200 cubic metres/200 truck-loads/1,200 buckets
- Average angle of walls: 11 degrees (range 3 degrees to 31 degrees)
- Construction hours (estimated total for project): 1.25 million
- Construction workers on-site at peak time: 350 to 400
- Amount of reinforcing steel (rebar): 3,750 tonnes
- Hours to build and strip forms: 180,000

Breakdown by size

- Size of site: 7.5 hectares
- Footprint: 19,000 square metres
- Size of building: 40,860 square metres
- Height at peak of building: 24.5 m
- Grass-covered portion of roof: 10,672 square metres
- Permanent exhibition space: 5,756 square metres
- Special exhibitions space: 700 square metres
- Large artifact open storage space: 3,274 square metres
- Memorial hall: 81 square metres, 9 m by 9 m
- Theatre: 390 square metres
- Ateliers (4): 470 square metres
- Library and archives: 1,000 square metres

Groundbreaking for the new Canadian War Museum took place in November, 2002. Excavation continued over the spring and workers raised concrete forms in the summer of 2003. The assembly of the structural steel, instrumental in holding the glass curtain wall, began in December 2003. Over the winter, the concrete structure was completely enclosed and work moved indoors. Steel work also began for the Regeneration Hall. Indoors, work began on the facility's mechanical systems — heating and air conditioning, plumbing, electrical and other systems.



Lee Keeley, C.E.T., T.P. in the building chiller plant: "There is more than one way to achieve a certain result, but the ultimate decision must meet the intent of the design," says Keeley.

sprinklers, duct work and electrical systems.

Peter Richard of Univex, conducted the estimating of time, cost and materials for the lighting, dimming and low-voltage controls and heat tracing for the new building.

Once the estimating and design were complete, Richard focused on communication with the engineers and contractors.

"We are given the basic specs and then put together a list of everything required. For example, laser-optimized fibre optic cabling in the museum links everything from phones to vending machines to computers," he says. "This type of cable is capable of bandwidth up to 10 gigabits."

When using cutting-edge technology, manufacturing lead times can be longer.

"Not all of the materials we needed were readily available," he says, "so we had to be creative, sometimes putting together a temporary solution, which might not be aesthetically pleasing, and then making it right later."

Changing specs were a constant challenge. "The lighting specs were modified several times, and there were missing dimming systems in the original design," says Richard, "so we had to do it later."


Museums often employ sophisticated dimming systems that lower the lights when no one is in the room to protect artifacts from damage.

Protecting those artifacts means that Canadians and visitors to our country will be able to appreciate our military past for many years to come.

In May, when the first museum visitors walk through the halls and examine the displays, will they have any idea of the labour that made this building possible?

Probably not.

But now you know how professionalism, teamwork and communication — and the dedication and talent of certified engineering and applied science technologists — helped to coax this magnificent building to rise from the shores of the Ottawa River.

Peter Richard puts it best: "I have been very impressed with the abilities of the C.E.T.s on this project. Without their contribution, this building wouldn't be the marvel it is today." 

Donna Papacosta is a freelance writer based in Oakville, Ontario. For more information, visit www.warmuseum.ca