NO 27 FALL 2006

ADVANTAGE STEEL

CASE STUDY ON STEEL RE-USE

PERFORMANCE BASED SOLUTION FOR CITADEL HIGH SCHOOL

UBC STRUCTURE STANDS SECURE WITH STEEL

A RELATIONSHIP AS STRONG AS STEEL

2006 STUDENT AWARDS AND SCHOLARSHIPS

WHAT'S COOL, WHAT'S HOT, WHAT'S NEW

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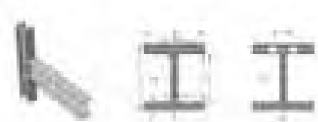

FROM THE EDITOR

Education marks the cornerstone of our civilization and, for our Canadian economy, is vital to its continual advancement and growth. In this issue, structural steel's role in education is illustrated with examples from sea-to-sea.

In Vancouver, the University of British Columbia's Nobel Biocare Oral Heath Centre illustrates that when there is a deadline to be met, steel can make the schedule work.

At the University of Alberta, a new and unique reaction wall has just been completed for the I.F. Morrison Structural Engineering Laboratory. A first ever use for a steel-plate shear-wall finds a home, where the technology was developed and refined to be the backbone of future steel research.

In Halifax, a performance-based solution for unprotected structural steel has been used for the new Citadel High School – a process made possible by the 2005 National Building Code of Canada.

Student awards, scholarships and competitions from coast-to-coast highlight Canada's bright minds in a new generation of steel designers.

The Angus Technopôle building in Montreal demonstrates that steel is always in fashion and its reuse contributes to a greener Canada.

If you are still looking for a solution to a steel question, make sure to check with Dr. Sylvie for answers.

Michael I. Gilmor
President CISC

IN THIS ISSUE

HEAD OFFICE
300-201 Consumers Road Willowdale, Ontario M2J 4G8
Phone 416-491-4552 Fax 416-491-6461 Email: info@cisc-icca.ca

ONTARIO REGION
300-201 Consumers Road
Willowdale, Ontario M2J 4G8
Phone 416-491-4552 ext. 106
Email sjohn@cisc-icca.ca

QUÉBEC REGIONAL OFFICE
2555, rue des Nations, bureau 202
St-Laurent, Québec H4R 3C8
Phone 514-332-8894 Fax 514-332-8895
Email sboulanger@cisc-icca.ca

WESTERN REGIONAL OFFICE
14172 - 28A Avenue
Surrey, British Columbia V4P 2H8
Phone 604-538-7594 or 1-8ONLYSTEEL Fax 604-538-7539
Email ptimler@cisc-icca.ca

ATLANTIC REGIONAL OFFICE
15 Eydie Drive
Rothesay, New Brunswick E2E 4Z2
Phone 506-849-0901
Email alock@cisc-icca.ca

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CHAIRMAN, CISC Ian Oulton, RKO Steel Limited
EDITOR Michael I. Gilmor, P.Eng.
ASSISTANT TO THE EDITOR Samantha Sampson
EDITING/TECH ADVISOR Sylvie Boulanger, P.Eng. Ph.D
PUBLISHER Richard Soren - *Design Print Media*
Tel 416-482-9339
E-mail designprint@sympatico.ca
DESIGN & FORMATTING Katherine Lalonde - *KLDESIGN*
E-mail katherine@kldesign.ca

Professional engineers, architects, structural steel fabricators and others interested in steel construction are invited to enquire about CISC membership. Readers are encouraged to submit their interesting steel construction projects for consideration for inclusion in this publication by contacting CISC.

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Canadian Institute of Steel Construction
201 Consumers Road, Suite 300
Willowdale, Ontario, Canada M2J 4G8

COVER PHOTO:
UBC Dentistry Building -
Exposed Brace Connections
at at Main Entry, by Janis Brass

PHOTO THIS PAGE:
2006 SSEF Architectural Student
Design Winner
Harmonic Chinook Bridge
Paul Schaefer, Lee Blanchard
and Andrew Martin
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5580 Kalar Road
Niagara Falls
Ontario, Canada
L2H 3L1

Telephone: (905) 356-8132
Toll-free: (800) 263-2547
Fax: (905) 356-6825
E-mail: hodgson@hodgsoncustomrolling.com
Website: www.hodgsoncustomrolling.com

U.S. Address:
M.P.O. Box 1526
Niagara Falls, N.Y.
14302 - 1526

HODGSON CAN HELP SOLVE YOUR PROBLEMS

Sylvie Boulanger, P.Eng. Ph.D - *Ask Dr. Sylvie is a column for Advantage Steel aimed at readers seeking technical information on steel structures. Questions are welcome on all aspects of design and construction of steel buildings and bridges. Suggested solutions may not necessarily apply to a particular structure or application, and are not intended to replace the expertise of a professional engineer, architect or other licensed professional. Questions for Dr. Sylvie, or comments on previous questions, may be submitted by e-mail to* ***sboulanger@cisc-icca.ca****.*

ASK DR. SYLVIE

WEB OPENINGS

Where can I find information on the design of beams with holes in the web, when the height of the holes are greater than 0.4 times the beam depth? – J.C.

You will find formulae applicable to beams of Class 1 and Class 2 sections with openings between 0.3 and 0.7 times the depth of the beam, and hole lengths up to three times the hole height in the Handbook (8th and 9th editions) starting on p. 5-168. Furthermore, there is an amazing amount of information on web openings, including multiple openings, reinforced and unreinforced holes, rectangular and circular holes, holes whose centreline is eccentric with respect to the web centreline, design examples, design tables and more.

The basic principle is to model the opening as a Vierendeel panel by resolving the local moment into tensile and compressive axial forces going through the web portions above and below the hole, usually modelled as T-shapes. We owe much of the development in this area to research by Richard G. Redwood from the late 1960s through the 1990s. One reference is Redwood, R.G. and Shrivastava, S.C. Design Recommendations for steel beams with web holes, *Canadian Journal of Civil Engineering*, 7(4), December 1980. Since this is an older publication, you need to order it through **cisti.info@nrc-cnrc.gc.ca**. Incidentally, you can search all the relevant CJCE articles in the technical resources section of our web site at **www.cisc-icca.ca/content/technical/abstracts.aspx**.

A classical reference in the area of composite construction is, *Web Holes in Composite Deck and Steel Beams*, which Richard G. Redwood co-authored with Patrick K. Wong in 1982. You can find this reference on our web site at **www.cisc-icca.ca/files/technical/techdocs/faq/webholes.pdf**.

AISC has also devoted *Design Guide 2* on the topic of Steel and composite beams with web openings, published in 1990, available at **www.aisc.org/design_guides**.

Architects should know that in a normal uniform loading condition, typical of a commercial office space, positioning holes in the centre is preferrable, or close to it as the shear forces are lowest. This has the advantage of minimizing deflections. Mechanical engineers should know that fabricators have no difficulty in providing holes when the positioning and sizes are specified before the pieces of steel make it to the site! Web openings are frequently unreinforced and coordination can go a long way to avoid conflicts during construction and integration of ducts, pipes or conduits. If many holes are needed, a designer should consider structural systems such as stub girders, trusses and open-web steel-joists. In composite construction, you might want to position the hole closer to the top flange since the neutral axis has now moved up.

And if you really want the **Hole Story**, come and join us at The Steel Conference (NASCC) in New Orleans, from April 18-21, 2007. This session will provide insight on holes in bolted connections, holes in beam webs, and the standard shear connection.

First, practical issues related to holes for bolted connections will be discussed. Questions such as *"Does it matter how the hole is manufactured: punched, drilled or thermally cut?"*, *"What are practical situations to consider the use of over-sized or slotted holes?"*, *"Should holes slightly larger than standard holes be used to accommodate galvanized coatings?"*, and other common questions will be answered. Second, a quick review of web openings in beams will be covered along with approximate methods for estimating the cost of the reinforced opening. Finally, a proposal for new shear connection standards will be presented along with the incentives for making this change. The session will include an all Canadian cast with Greg Miazga from Waiward Steel in Edmonton, Richard Vincent from Canam in Boucherville, and Peter Timler, CISC-Western Region, Vancouver, will moderate the session. This is such a great opportunity to get CEUs, to network and to shop around for a software or a new machine (at the exhibit). Mark it on your 2007 calendar now! **www.aisc.org/nascc**

LIMITATIONS ON BRACKETS FOR CRANE BEAMS

On page 21 of the CISC publication *"Crane-Supporting Steel Structures: Design Guide"*, item 3 states that brackets should not be used to support crane beams with unfactored reactions greater than about 250 kN. Can you give a brief explanation for this requirement? – P.T.

We asked the author, Robert A. MacCrimmon, to respond. And he did, from Australia! Bob says that this requirement has been in AIST (formerly AISE) *Technical Report No. 13 – Guide for the Design and Construction of Mill Buildings* for some time. His understanding is that historically, bracketed supports for heavier cranes can cause problems due to building frame deflections and failures of the bracket.

This publication is an important reference in the industrial building milieu. For more information visit **www.aist.org/publications/t64.htm**.

You probably already know that you can download the CISC Crane Design Guide publication in a PDF format for free from our web site. You can also order a hard copy for $40, or for a reduced rate if you are a professional member of CISC *(one of many membership incentives)*. Here's the link, just in case, **www.cisc-icca.ca/publications/technical/design/craneguide/**.

You may find additional information from AISC's *Design Guide 7: Industrial Buildings - Roofs to Achor Rods*, by James M. Fisher, which was revised in 2004.

FILLET RADII AND K_1 VALUE

I have been working with architects who needed to know the cross sectional dimensions and geometry of a rolled open steel section. For example what would be the radius of the tip of the leg of a 1.5"x1.5"x0.25 angle? I know you have an answer for every question. – C.C.Y.

The answer is *"it depends"*. It depends on whether you need the value for detailing, or whether you want to incorporate the value specifically as part of a design calculation. It depends on who produces it. It depends on the rolls that are being used in the hot-rolling process. It depends on whether it is at the beginning of a batch or at the end. So whatever you do, don't expect this number to be as precise as other dimensions that we publish in our Handbook. Or should I say, don't count on that dimension.

Charles Albert says that unlike the angle leg dimensions and thickness, the fillet radius at the intersection of the legs and the leg-toe radius are not standardized section dimensions. These dimensions will vary between producers and will depend on the rolls used in the hot-rolling process. Some steel mills do provide the fillet and toe radii in their product catalogs. Arcelor is one example, **www.arcelor.com/sections/Download/PDF/PV/11_L.pdf**.

We've come to think that steel is very precise, and it is. An exception is the value of k and k_1, which depeds on the fillet radius joining the two legs. You should tell the architect that k_1 has a range.

As you know, I rarely have the answer, I just have access to a vast network of great human resources!

SEISMIC CORNER

SLIP-CRITICAL CONNECTIONS

The S16 Standard requires slip-critical bracing connections for frames with R_d > 1.5. Should the slip resistance be checked for the factored loads (E) or the specified loads (0.667E)? – N.L.

Slip-critical connections are not normally required in buildings for wind or seismic load combinations (reference: CSA S16-01 Commentary, Handbook 8th Edition, Clause 22.2.2, pp. 2-97 to 98).

Pretensioning of the bolts (i.e. by the turn-of-the-nut method) provides energy dissipation under cyclic earthquake loading (see clause (b) in the above-mentioned reference).

Slip-critical connections are required in connections involving oversized holes, certain slotted holes, fatigue loading, or crane runways and bridges, but otherwise they are seldom necessary. Moreover, wind and earthquake loads are too infrequent to warrant design for fatigue.

Robert Tremblay mentions that the S16 Standard requires pretensioned bolts for frames with R_d > 1.5; however, their bolted connections need not be designed as slip-critical.

CANTILEVER COLUMNS

According to CSA S16-01 Clause 27.9(c)*, base connections for cantilever columns are designed to resist a moment of 1.1 R_y times the nominal flexural resistance of the column. In such structures, deflections at the upper end (usually due to wind loads) generally govern the column member selection and lead to significant overstrength. Is it permissible to limit the force transmitted to the foundation to a value based on R_d = 1.0 or 0.75 ? – N.L.

The answer is 1.0. But let's back up a few steps. The content of clause 27.9 is now part of Conventional Construction under clause 27.10 according to the most recent update of the Supplement (CSA S16S1-05). And almost in anticipation to your question, a value for R is now specified, or rather RdRo since the standard has integrated particularities of the NBCC 2005. In Clause 27.10.2c), a value of R_dRo = 1.0 is suggested. Robert Tremblay adds that this type of structure has little or no redundancy, so the aim is to have this column remain elastic under design seismic loads.

WHO SPECIFIES $2T_g$

In your last column, you refered to the use of $2t_g$ (where t_g is the thickness of the gusset plate) to provide ductility in the gusset. Who specifies this and where? – R.S.

Engineers need to *"indicate"* the requirement in some way on their design documents, either directly on the gusset design drawing or as a note specifying that the gusset plate must be able to accommodate this distance $2t_g$. Since it is also possible to provide this distance in a plate connecting the slotted HSS brace to the gusset, the note needs to be sufficiently detailed. On this topic, it will become increasingly important that a minimum set of information appear on design drawings, namely a set of co-existing forces (tension and compression) and the R_d value adopted in that part of the design.

**In CSA S16-01 Update No.3, this is now Clause 27.10.2(c).*

4 Photos: AEdifica Architects

STEEL RE-USE CASE STUDY

THE DEVELOPMENT OF THE ANGUS TECHNÔPOLE BUILDING IN MONTRÉAL, QUÉBEC

Carmel Sergio, Mark Gorgolewski

PROJECT SUMMARY

A former locomotive assembly plant in the heart of Montréal, Québec, previously used by the Canadian Pacific Railway (CPR), was converted into light industrial workshops and office spaces for community-focused businesses. The Angus Technopôle facility, designated the Innovation Centre of Montréal by the Québec government, provides a wonderful example of heritage steel and brick architecture. The facility was to be demolished, but thanks to the vision of the architects at Aedifica, it was converted into a unique facility featuring wonderful spaces and showcasing the historic steel structure.

Green strategies deployed in the conversion of the locomotive shop included reuse of the existing steel skeleton, exposing the open-web riveted structural members, and the use of existing exterior brick walls as screen walls. It is estimated that over 85 percent of all materials on site, including the majority of the steel, are from the old structure. Also, interior furnishings and fittings were reused and the aesthetic features of the building were retained.

BACKGROUND

The purpose of the Angus Technopôle building is to serve the urban community by establishing and promoting a working environment for community-focused companies that can support each other and provide employment and services to the neighbourhood. The sense of community is actively fostered within the facility and among local residents, who are informed of activities at the building through public meetings and publications. The companies occupying the building are themselves involved in servicing, manufacturing, and research and development, besides providing employment for neighbourhood. Over 500 people have already been employed at the site. By reusing the large brownfield site and renewing the historic landmark building in the urban core of the city, it is the community's intention to revitalize the social economy of the neighbourhood and provide 2,000 people with employment by 2008, as well as demonstrating sustainability in an industrial context.

DESCRIPTION OF BUILDINGS

The old industrial complex on the site at 2600 William-Tremblay Street in Montreal included 6.5 hectares of railway yards that are gradually being redeveloped into a business park. In addition, the site included huge steel and brick sheds containing extensive open spaces without columns, which accommodated the locomotives that were built there. The buildings were originally over 400 m (1,300 ft) long, built in phases over the first half of the twentieth century. The CPR activities on this site provided primary employment in the area, and the buildings also had a history as the focal point of the community. By the 1990s, however, they were no longer in use and were decaying.

The original intention of the client was to remove the old factory buildings and replace them with modern light industrial facilities. Some of the buildings were demolished in preparation for new construction. However, the architects for the Technopôle building realized the unique nature of the structures and their heritage value, and with grassroots support from the community, managed to persuade the client to save part of the buildings.

The first phase of the project, completed in September 1999, involved the conversion of about one third of the original building into the Technôpole Innovation Centre consisting of 12,500 m^2 of floor space, divided into units ranging from 350 m^2 to 1,500 m^2. These are occupied by offices and research spaces on the upper level and light industrial units on the ground floor, arranged around a central interior street flooded with natural light from above. The success of this first phase influenced the second and led to the conversion of another part of the old locomotive factory into a supermarket with an area of about 7,400 m^2, completed in the spring of 2001.

STRATEGIES

The architects and engineers made a strategic decision to maintain as much of the existing steel and brick structure as possible in their original state, with minimum intervention. During the first phase, some sections of the building, which is almost 200 m long and over 50 m wide, had to be removed to create parking and

loading areas. But even where roofs were removed, walls often remained as external screens. Where possible, the industrial heritage of the building has been highlighted, so huge riveted steel structures such as overhead rails and lifting cranes are exposed in the central circulation area and made into major features of the building.

The old industrial steel structure afforded the architects considerable flexibility in accommodating the new building's uses. New lightweight steel-frame additions were integrated within the huge spaces of the old building to house the office and workshop spaces. The new structures were designed to minimize their impact, both structurally and visually, on the old frame. Thus, there is minimal connection between old and new, and they are clearly differentiated, although the new structure does provide some strengthening and lateral bracing to the old frame. The old components maintain the aesthetic of the building's industrial heritage, featuring heavy steel sections riveted together to form large beams, girders, and lattice columns. In contrast, the new structure is lightweight and refined, with minimal dimensions of components.

The new structure had to be designed to minimize the use of new supports, so the designers developed a system for using the smallest possible number of new support columns and keeping them away from the existing structure. Furthermore, new foundations had to be strictly limited, to avoid undermining the old building and disturbing the poor soil below the ground slab. Thus, the existing ground slab was kept, and a new cover of concrete poured on it. This proved to be of economic benefit, since it saved excavation and disposal costs. Lateral bracing was also added by the introduction of several vertical circulation cores along the central circulation zone, away from the existing structure.

As part of the strategy for maximum reuse, the architects recommended that various steel and other components which were removed from the building should be reused on site. Some components were used in landscaping and to demarcate parking areas for cars, although this practice was not entirely successful, as it caused problems for snow clearance. Even the steel rails from the locomotive shop were reused as bollards and other architectural features, although only after a method was found to straighten them.

OTHER FEATURES

The original building consisted of huge spaces to house the industrial activity of its designated use. With the introduction of the new structure, the building now accommodates a series of small workshops and office spaces that can expand and adapt to the changing needs of the tenants. The flexible steel structure allows the addition of mezzanines and additional floors, if required. At the higher level, the roof structure is so deep that it is possible to add floor levels within the structural bays, with links between each bay through the old steel roof trusses. This can create unique spaces and views and allows the building to change and evolve with time.

The reuse of the building was accompanied by energy-saving measures selected to efficiently ventilate, cool, and integrate natural lighting into the various spaces. Daylighting levels are improved by the flexibility of the structure, allowing appropriate glazing to be integrated, and the central street is used to both provide lighting and as a ventilation flue. The envelope was significantly upgraded with roof insulation and superior insulation for all new outside walls, and fenestration with low-emissivity glass. The open design allows free cooling on summer nights by its integration of operable, louvered windows and air extractors with skylights, reducing the need for air conditioning.

The building was chosen as one of Canada's representatives in the international Green Building Challenge in 2000. As part of this process, a green assessment was carried out using the GBTool green rating system. The project scored well, particularly for materials use and site amenity.

CONCLUSION

Although this is an unusual project featuring a very large, and unique, industrial building, the work demonstrates the opportunities that are available for creative reuse of old steel-frame structures, even in very specific circumstances. The designers have used the aesthetic and structural features of the existing steel structure to create a building with distinctive spaces and flexible uses.

The following key aspects of the process have been identified:

- It is possible to keep industrial heritage buildings in place and find new uses for them while creating unique spaces with a high demand for tenancy.
- Reuse of much of the old building means that a large proportion of the materials for the new project come from what is already on site -- in this case, an estimated 85per cent of materials were already on site.
- New steel structures can be used to provide additional support and bracing, while remaining aesthetically separate from the heritage steel.
- A motivated and inspired project team is essential when innovative ideas are proposed.
- The process is helped if the client understands the benefits of sustainable design and sets an agenda early on for developing strategies for material reuse.

In conclusion, the reuse of steel in this building contributed significantly to improving its environmental performance, and offers a model for other projects where heritage buildings are involved.

FURTHER INFORMATION

For more sustainable steel information, case studies, resources, news and postings of 'available' items of reclaimed construction steel, visit **www.reuse-steel.org**.

This case study was prepared by Carmela Sergio and Dr. Mark Gorgolewski at the Department of Architectural Science, Ryerson University, with support from the Enhanced Recycling component of the Government of Canada Action Plan 2000 on Climate Change, Minerals and Metals Program and by the Canadian Institute for Steel Construction (CISC). The authors are grateful for the information provided by Guy Favreau of AEdifica and Jocelyn Charron of Géniplus, and images by Michel Tremblay.

CITADEL HIGH SCHOOL: A PERFORMANCE-BASED SOLUTION FOR UNPROTECTED STRUCTURAL STEEL

By Michelle Ponto

When it comes to designing buildings, fire protection is becoming a key component especially in Nova Scotia where they've adopted the 2005 Objective-Based National Building Code of Canada (as of September 1, 2006). For those who aren't familiar with the new Code, it offers architects and engineers the opportunity to create more innovative and cost effective building designs with the help of fire protection engineered analysis.

"Most building designs still follow the prescriptive-based design requirements as outlined in the previous National Building Code," says Roy Strickland, P.Eng., Fire Protection Engineer. *"But there is a strong demand from various design groups and developers to design sections of buildings, such as main entrances, atriums and other areas, using fire protection engineered analysis as an alternative solution."*

Strickland is with the Office of the Fire Marshal, Nova Scotia Provincial Government, Department of Environment & Labour (Public Safety/Fire Marshal Office), and worked with the architects and engineering team on a fire protection engineered analysis for Citadel High School. The school is currently under construction in Halifax and is using exposed steel beams and steel floor deck in the classrooms.

INCORPORATING THE NEW CODE

Citadel High School is a new 18,450 m^2 building. In addition to having enough classrooms to accommodate the 1,200 students, the school will also have an 800-seat performance theatre, a 480-seat cafeteria, laboratories and two gymnasiums — one for use by the community. But what makes this school special is that the architects used a number of features that deviate from the prescriptive Acceptable Solutions in the 2005 National Building Code of Canada (Division B).

"One of the features that make this school innovative is the use of exposed structural steel in the floor assembly fire separations throughout the classroom areas," says Ralph Bartlett, P. Eng. of RJ Bartlett Engineering Ltd. *"Traditionally, structural steel would require some form of passive fire protection such as spray-applied materials or gypsum wallboard encasement."*

RJ Bartlett Engineering Ltd. team of Ralph Bartlett and Ben Coles collaborated with the architectural firm of Fowler Bauld & Mitchell Ltd. and their consulting team to review the proposed design conditions. George Cotaras, Architect and Project Principal with Fowler Bauld & Mitchell says fire protection wasn't their first priority when designing the school. Instead he says they wanted to incorporate the use of exposed steel and wanted to find a way to make it work within the Objective-Based Code.

"We really wanted to not have a traditional ceiling in the classrooms," says Cotaras. *"The exposed beams and deck make the classrooms feel taller. Plus, there's a three foot savings from floor-to-floor adding a cost savings to the envelope of the building."*

Fowler Bauld & Mitchell's design also eliminates the need for horizontal ventilation ducting at each floor. Instead, vertical ducts drop into each classroom from a ventilation distribution system located in a spine running along the building's rooftop. This also reduces the cost of the construction.

Citadel High School is the second project where Fowler Bauld & Mitchell has used exposed beams. The Nova Scotia Community College in Stellarton that they designed in 2004 was a 5,575 m^2 renovation and expansion project (see Advantage Steel No. 23, Summer 2005). Similar to Citadel High School, exposed steel beams/steel decking were painted and lit with suspended lighting.

"Although Citadel High School uses some of the same structural design elements such as exposed beams, it is a much bigger project than the Community College," says Cotaras. *"Not only is it three-storeys instead of two, its also all new construction and not a renovation/addition. This is the first time exposed steel has been used in this way for a new building in Nova Scotia."*

Fowler Bauld & Mitchell's design for the school uses steel beams instead of joists. These will not only be stiffer, but will allow for a clean open-ceiling approach and a reduction in the overall height. According to the company, this will save cladding costs and helps justify the more costly beam approach.

At the end of October 2006, the project was 35% complete. The steel was 100% erected and consisted of 758 tonnes of structural steel fabricated by RKO Steel Limited, of which approximately 450 tonnes were used in the classroom areas. There was 20,910 m^2 of steel deck (roof and floor) and 124 tonnes of pre-fabricated joists by Canam Group Inc. (for auditorium, theatre and cafeteria roofs).

RESULTS FROM THE FIRE PROTECTION ANALYSIS

RJ Bartlett Engineering Ltd. conducted the fire protection analysis using the Society of Fire Protection Engineers (SFPE) publication, SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings (NFPA/SFPE, 2000). The evaluation included both Computational Fluid Dynamics (CFD) simulation software and traditional heat transfer calculation methods. The goal was to confirm whether or not the proposed design of exposed steel beams could maintain adequate structural integrity during a fire.

"All CFD simulations were conducted using Fire Dynamics Simulator (FDS)[1], which is software that models fire-driven fluid flow and can be used as a tool for evaluating various fire scenarios," says Bartlett.

According to Barlett, the FDS software was programmed to simulate a range of fires that could occur in the school and the classrooms. The data they collected measured the compartment temperatures, radiant heat fluxes and other conditions such as visibility and asphyxiating gases. They then applied the data to traditional heat calculation methods to determine the structural response of the exposed steel beams.

"We couldn't have done the project the way we wanted without RJ Bartlett Engineering Ltd. and the fire modeling," says Cotaras. *"Normally we wouldn't be able to have an exposed steel structure. We would have had to cover it with some form of passive fire protection."*

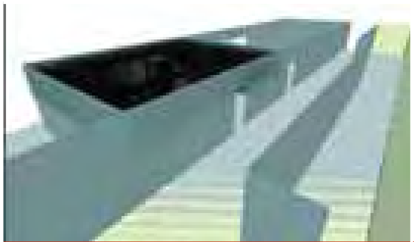
Instead of using open-web steel-joists, Fowler Bauld & Mitchell used W-shapes as they were more visually pleasing and provided better fire protection. Based on the occupancy, the construction required the school to have a one hour fire-resistance on the fire separations between the floor assemblies and a one hour fire-resistance rating on load-bearing walls and columns.

"The final results from the analysis indicated that the structural thresholds would not be exceeded under design fire conditions," says Bartlett. *"This demonstrates that the exposed steel members would meet the function and intent of the applicable Code."*

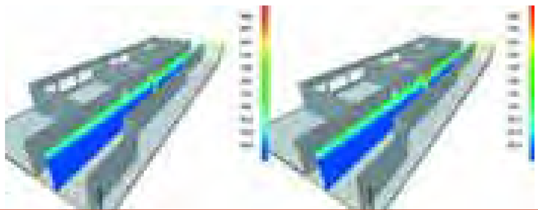
While the W-shapes (W200x22 and W310x28 used in classroom areas) were the architect's idea, the analysis proved the structural design of the project and that people could get out of the building if a fire did occur. The fire-protection analysis also showed that if the building was facilitated with quick response sprinklers, fire could be controlled to the immediate surrounding area and hot gasses could be cooled to temperatures below 760 °C, which is applicable to certain ductwork. In addition, the tests showed that even if the sprinklers failed to operate, the migration of smoke and hot gasses would not prevent the occupants from leaving the building based on the school's defined evacuation scenarios.

THE FUTURE OF STEEL USING OBJECTIVE-BASED SOLUTIONS

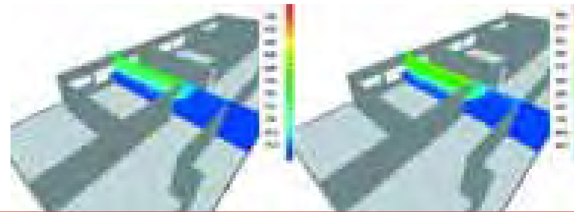
The 2005 National Building Code of Canada, combined with provincial code adoptions, is allowing for more alternative solutions when it comes to using steel as the material in structural fire protection. The new code lets fire protection engineers examine and apply innovative solutions using relevant technologies such as computer fire modeling to prove the effectiveness of their designs.



Shows smoke from a classroom fire emptying into the corridor. | Photo: Courtesy of R.J. Bartlett Engineering Ltd.



School hallway fire simulations – taken at 300 seconds (left image) and 1,200 seconds (right image). Measured in degrees Celsius. Photo: Courtesy of R.J. Bartlett Engineering Ltd.



Classroom fire simulations – taken at 300 seconds (left image) and 1,200 seconds (right image). Measured in degrees Celsius. Photo: Courtesy of R.J. Bartlett Engineering Ltd.

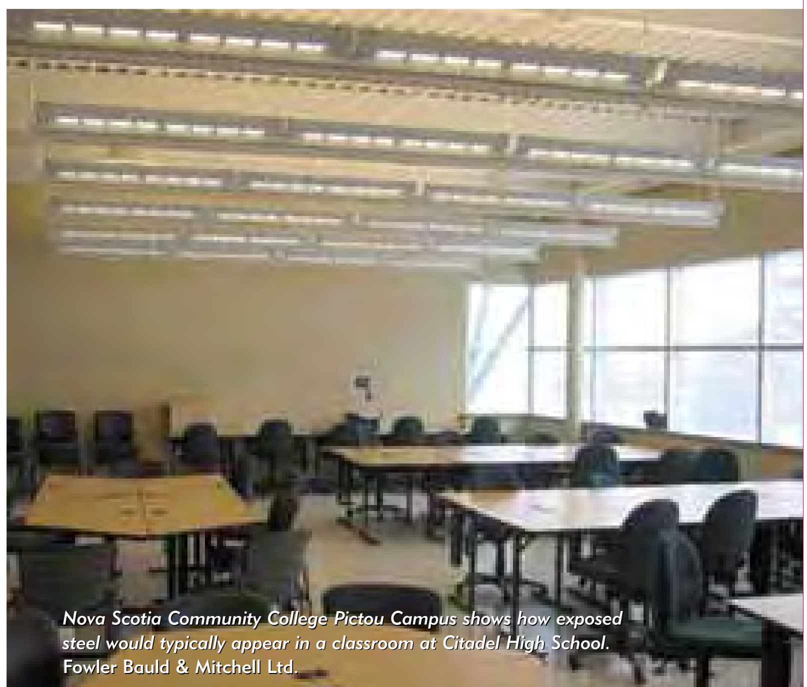
"As the Authority Having Jurisdiction for the performance-based analysis review, we [Office of the Fire Marshal] require the fire protection engineered analysis to follow all the steps," says Strickland. *"These steps are outlined in the 'SFPE Engineering Guide to Performance-Based Protection Analysis and Design of Buildings'"*.

Strickland says the guide will help ensure all safety goals, performance criteria, design fire scenarios are included in the analysis.

Fire protection has become an important design component in Nova Scotia. Traditional codes required the use of passive fire protection for structural assemblies, such as spray-applied materials on exposed steel. But with the release of the 2005 National Building Code of Canada and as more projects integrate the expertise of Fire Protection Engineers into their development process, architects and engineers will be able to explore the alternative solutions described in the National Building Code.

"The Fire Protection Engineers and the Fire Marshal's Office (Strickland) were the key to our success," says Cotaras. *"They were open to discussion and open to using the technology."*

If considering incorporating an innovative solution, in addition to the SFPE guide, a great source to research information on fire computer models is **www.firemodelsurvey.com**. The website identifies 168 computer-modeling programs for fire and smoke.



Nova Scotia Community College Pictou Campus shows how exposed steel would typically appear in a classroom at Citadel High School. Fowler Bauld & Mitchell Ltd.

REFERENCES

NFPA/SFPE (2000), SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings, 1st ed., National Fire Protection Association, Quincy, MA, USA / Society of Fire Protection Engineers, Bethesda, MA, USA.

[1]FDS is a CFD field model of fire-driven fluid flow developed by the National Institute of Standards and Technology (NIST). This software package numerically solves a form of the Navier-Stokes equation with an emphasis on heat and smoke transport from fires.

Cantilevered floor projection at Level 5 | Photo: Janis Brass

DENTAL STRUCTURE STANDS SECURE WITH STEEL - UBC DENTISTRY BUILDING

By John Leckie

The University of British Columbia set several precedents with its five-storey, 120,000-square-foot David Strangway Building.

The home of the Nobel Biocare Oral Health Centre, a state-of-the-art teaching dentistry clinic, is one of the first multi-use buildings on the Vancouver campus. It is the first of a series of buildings that will form a gateway community for the university, and the first campus building constructed with structural steel instead of concrete.

The exterior of the building features granite columns, metal panels and extensive glazing. Below ground is a one-storey concrete parkade. Eventually, there will be a connection to an underground transit hub for buses coming into the university, which is home to about 60,000 transit users a day. The first two storeys of the building form a podium extending south from the tower and connecting to the existing dentistry building. The dentistry clinic is located on the second floor.

The building was originally conceived in concrete and the architects — Hotson Bakker Boniface Hadden — and the structural engineers — Bush Bohlman & Partners — were well into the schematic design process before the decision was made to make the switch.

"We did an analysis of either concrete or steel early on in the process and, at that point, the decision had been made collectively to go with concrete," says architect Joost Bakker, the partner in charge for the project.

The choice was not surprising, since concrete has a significant hold on the Vancouver market in general and UBC in specific. As well, the construction manager for the project, PCL Constructors Westcoast Inc., does most of the concrete work on its projects with its own forces.

The project, however, took almost five years to get under way. It was first proposed in 1998 in the Faculty of Dentistry's master plan, which called for a new dental clinic of about 31,000 square feet. The project was put on hold in 2001, while the university considered its design for the University Boulevard neighbourhood, and not given the go-ahead until October 2003.

By that time, Vancouver's construction market was beginning to overheat, resulting in a lot of volatility in steel and concrete prices. When PCL took another look at the comparison, steel had a slight price advantage but, more importantly, had a strong advantage in schedule.

"In the end, schedule dictated", says PCL project manager David Laubach. *"Steel would be able to be designed quicker and erected quicker, and they had a deadline they needed to meet."*

Scheduling on any university project is unforgiving.

"Most buildings we do on campus are tied into the school year so, unless you have them finished by August, you might as well wait until the next August," says Joe Redmond, vice-president of UBC Properties Trust, the university-owned organization that handles major development on the campus.

In the case of the dentistry building, the fitting out of the second-floor clinic was a complicated construction project in its own right, and required the rest of the building to be completed by December 2005.

The switch to steel did not cause a great deal of concern to the structural engineers, Bush Bohlman.

"We hadn't gone very far down the road," says Clint Low, a principal with the firm.

Moreover, the firm had plenty of experience with steel buildings, having designed the steel structural systems for Vancouver General Hospital and the International Terminal Building at Vancouver International Airport.

The structural system selected consisted of wide-flange beams and girders supporting a composite concrete-slab-on-steel deck. Open-web steel-joists were used for the lower roof over the entrance.

The largest concern for the university, particularly the dentistry faculty, was to avoid the bouncy floors that go with some steel buildings.

"I assured them that I had engineered the VGH tower, which is a 500-bed acute care hospital," says Low. *"I asked if they would be happy with the same level of performance that we achieved there. When they agreed, we said that was the level we would shoot for."*

Making sure the building met that standard was a matter of tinkering with the thickness and the mass of the floor framing elements.

"You don't want to go overly deep because that pushes your floor-to-floor height up, and you don't want to get overly heavy because that increases the weight of steel you have to put in the building," Low says. *"It is a real balancing act."*

As an added precaution on the dentistry clinic level, the concrete covering of the deck is thicker than that of the upper floors. Seismic design is of major concern for any building constructed in Vancouver, a major seismic zone, and the dentistry building was no exception.

"Probably half our design effort goes into detailing seismic systems," Low says.

There were two major goals for the dentistry building, keeping the amount of bracing to a minimum to provide maximum flexibility for interior spaces, and keeping the bracing away from the perimeter because of the exterior glazing.

"We chose to go with a highly ductile system, which allows you to reduce the force that you have to design the bracing for and, consequently, reduces the amount of bracing you need," Low says.

Greg Ciura, the project engineer for Bush Bohlman, says the advantage of the eccentrically braced framing system used to resist lateral loading is that it provides good energy dissipation while providing good overall stiffness at the same time. It does this through the use of yielding links, between one end of the brace and the other, or between the end of the brace and the column.

"We located the braces mostly around the cores — the stair and elevator cores — but we also added two lines of moment frames at two perimeters of the building," Ciura says. *"That was to control torsion and drift under seismic loading."*

The engineers used a software program, RAM Structural System, to analyze, design and create a three-dimensional model for the structural system.

"First we checked if we had enough bracing in the building and after we determined we were okay, we applied different sizes to the members until we had limited the drift to the code requirements," Ciura says. *"The other thing we have to watch when we design this kind of system is the link rotation – as the frame moves laterally, the link that yielded in shear, in this case rotates and it can rupture. We have to make sure this link rotation is low enough so there won't be any collapse."*

Because the current program does not design the members for the Canadian code, that had to be done manually.

"We detailed the members, the braces, the columns following capacity design principles," Ciura says. *"All other members besides the links need to be stronger than the links that yield."*

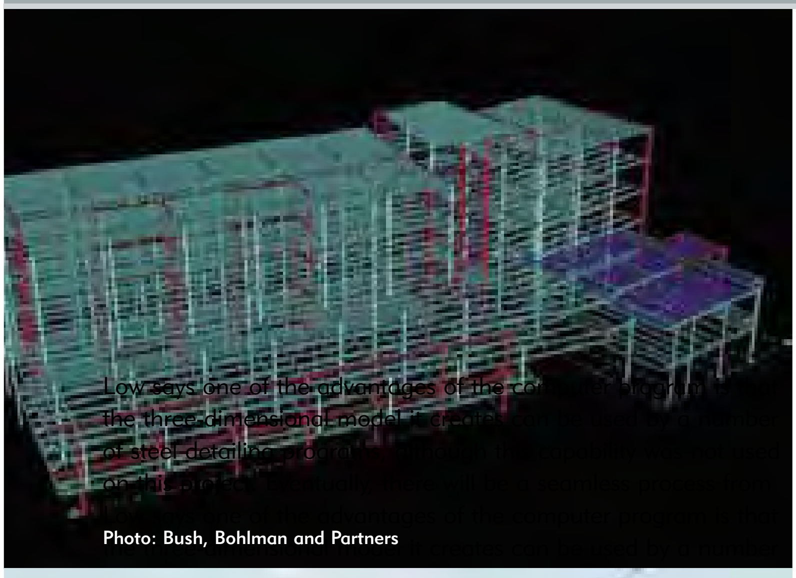


Photo: Bush, Bohlman and Partners

Dentistry Building, The University of British Columbia, Vancouver, B.C. | Photo: Janis Brass

Low says one of the advantages of the computer program is that the three-dimensional model it creates can be used by a number of steel detailing programs, although this capability was not used on this project. Eventually, there will be a seamless process from the design to the detailing by the fabricator, saving the fabricator the need to create its own model of the building.

The model also makes it much easier and quicker to make changes in the design, Low says.

For the moment frames, reduced beam connections, so-called *"dog-bone"* connections were used. This has become a much more common connection since the 1994 Northridge earthquake in California, which exposed the weaknesses of the moment connections used at the time. With the dog-bone connection, the flanges are cut out slightly in a circle shape. In the event of an earthquake, the reduced section will yield, protecting the welded connection to the column.

In order to meet the tight construction deadline for the project, a fast-track, sequential tendering process was followed. The steel portion of the project was on the street 10 months before the architectural drawings were completed.

Canron Western Constructors submitted their bid May 13, 2004, were awarded the contract July 15, did the connection, design, shop and erection drawings, and started fabrication of the 800 metric tonnes of steel immediately after getting the job. Steel erection began in November 2004 and was completed February 2005.

While the building is relatively straightforward, the tolerances were tight because of the glazing and the mullions, says Canron's project Manager, Harold Roberts.

"On a typical five-storey structural steel building, the tolerance would be three-quarters of an inch," Roberts says.*" On this building, the tolerance was only one-sixteenth of an inch. We did a lot of work on the site rather than in the shop, so we were able to trim things off and reset them using piano wires."*

A secondary problem for the fabricator was the extremely tight site and the requirement for no traffic disruption on the campus while loads were being delivered or offloaded by the crane. All the obstacles were overcome. The steel portion of the project was completed on time and on budget, as was the entire project.

The fast-track process created some problems for members of the design and construction team. Of necessity, there were a lot of change orders on the job as the design changed. Low says it was sometimes necessary to gently remind people that the changes were not because they had not done a good job in the first place, but because 95 per cent of their job was completed before the architectural drawings were done.

For the architects, the problem was more the timing of the switch from concrete to steel. Because the building was conceived in concrete, there were some changes in proportion when the switch was made to steel.

"To my eye, the proportions are slightly off," Low says. *"I think the building still looks good, don't get me wrong, but from an ideal perspective, I would have done things slightly differently."*

That would entail going back to the original conception of the building starting with steel in mind. Something that was not possible given the construction schedule.

For PCL's Laubach, the biggest challenge was coordinating the trades at the edges of the building envelope, where everything comes together.

"We realized this was going to be a problematic area so, even before we had the architectural drawings, we had envelope meetings with the contractors — the curtain wall guys, the metal panel people and the steel fabricator — to talk about how we were going to handle those details," recalls Laubach. *"A lot of these details look fantastic on paper but, when you get out in the three-dimensional world, you need a little help."*

"The team approach on the job worked well," Laubach says. *"There was never any finger pointing. It was always, 'Hey guys, we have a little problem here, let's fix it.' I think it came together very well."*

"I'm quite proud of this building," Laubach says. *"I think this was a very successful job and I think everybody did well. They can stand back at the end of the day and say, 'Nice job.'"*

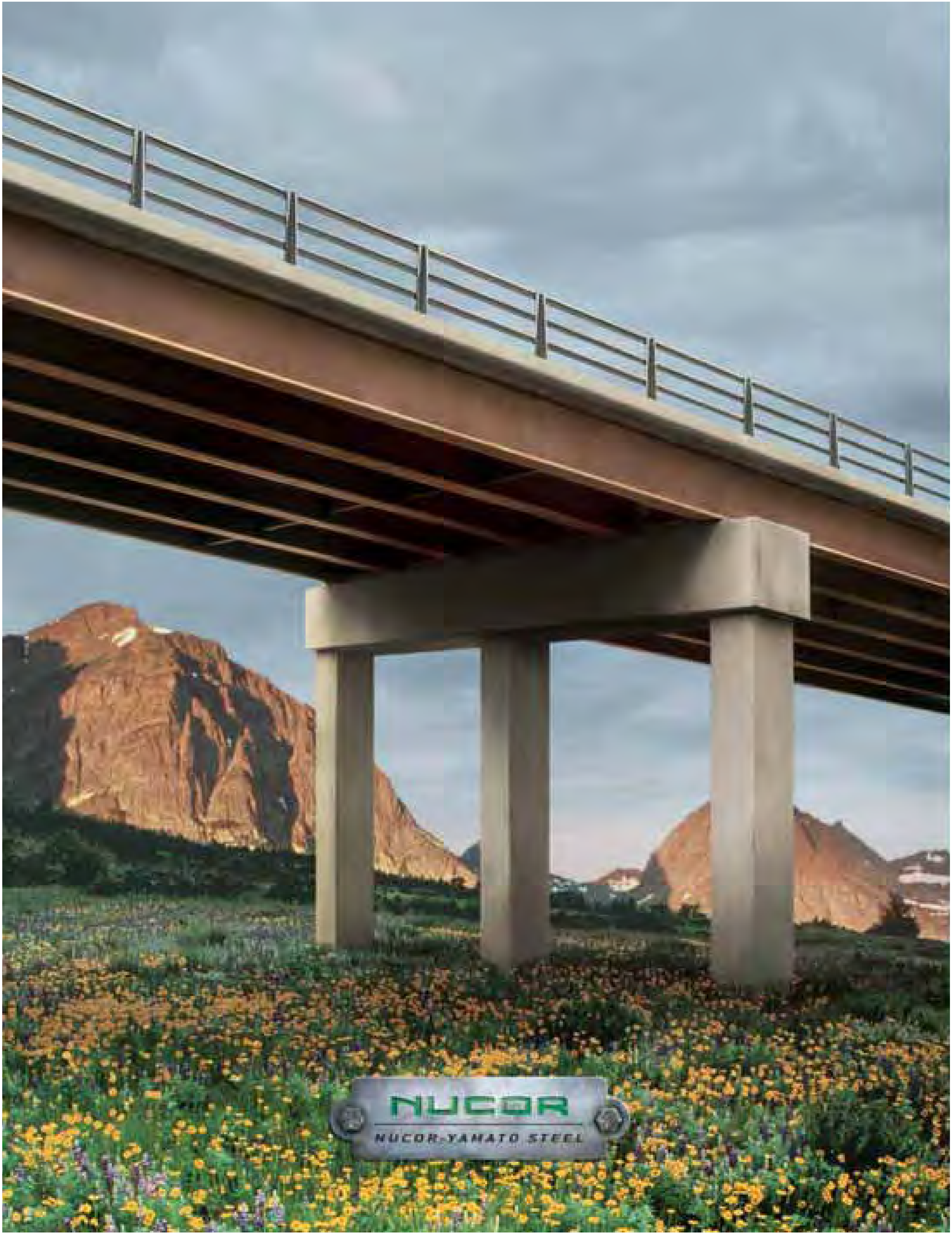

NUCOR
NUCOR-YAMATO STEEL

Photo by: AFFUSION

A RELATIONSHIP AS STRONG AS STEEL:

EDUCATORS, CONSULTANTS, AND FABRICATORS COLLABORATE ON LABORATORY REACTION FRAME

By Samantha Sampson

Thanks to co-operation among educators, consultants, and steel fabricators, the I.F. Morrison Structural Engineering Laboratory at the University of Alberta is now home to a structural steel reaction frame of record proportions. The process started in the fall of 2005, when Dr. Robert Driver and Dr. Gilbert Grondin of the Structural Engineering Group in the Department of Civil and Environmental Engineering faced a significant challenge. The team's exceptional research advancements on steel plate shear walls, which provide a means of bracing buildings against the forces of wind and earthquakes, had outgrown the equipment available in the lab.

Armed only with some seed money from U of A Professor Emeritus Dr. Laurie Kennedy, they developed an idea to construct a massive steel reaction frame for use in testing large-scale steel-plate shear-wall specimens. The two professors contacted Dr. Jeff DiBattista at the Edmonton office of Cohos Evamy, a national firm of architects and engineers, to assist with the design of the reaction frame.

Cohos Evamy has enjoyed a long history of co-operation with the U of A Structural Engineering Group, funding graduate scholarships, offering guest lectures, and sponsoring the fourth-year structural design competition.

U of A Reaction Wall Model Diagram

"We recruit almost all of our Edmonton structural engineers from the U of A graduate program," says DiBattista. *"Teaming up to work on the reaction frame was another great opportunity to strengthen our long relationship."*

That relationship started back in the late 1970s when Dr. Geoff Kulak, now Professor Emeritus with the U of A, worked with Dr. Jim Montgomery to develop a modern approach to designing steel-plate shear-walls using thin, unstiffened webs. Montgomery later went on to found the structural department at Cohos Evamy in Edmonton in the 1980s

After working with Drs. Driver and Grondin to develop an initial concept for the reaction frame, Jeff DiBattista contacted Paul Zubick, Manager of Sales and Contracts for Waiward Steel Fabricators in Edmonton.

"I was impressed by how quickly Paul obtained approval to donate $90,000 worth of materials and labour to construct the wall," recalls Jeff. *"Dwayne Hunka, Paul Zubick, and the entire Waiward team should be commended for their generous enthusiasm."*

When you consider the future benefits to steel design and construction, both Cohos Evamy's design work and Waiward's fabrication were provided at a small fraction of actual cost. Waiward views the U of A as a leader in structural steel teaching and research in North America. The company believes that its ongoing support and involvement with the University's structural engineering program is extremely valuable in many ways.

"We want the bright young structural engineers to think steel," says Paul Zubick. *"Once they are thinking steel, we want them to think Waiward."*

Like Cohos Evamy, Waiward considers graduating structural engineers a vital resource to the sustainability of their business. Beyond attracting young engineers to study and work in the steel industry, it is important to educate students about the merits of structural steel, for steel to maintain its place as the material of choice for designers and contractors.

"Industry support for research like this is vital to generating findings that are practical and applicable to current design and construction methods being used by the steel industry today," says Dr. Robert Driver. *"We find solutions to pertinent issues."*

The U of A Structural Engineering Group has always prided itself in maintaining close contact with the steel industry. This is a prime example of how strongly the industry also supports educators and students in return.

"I'm amazed at how willing Waiward and Cohos Evamy were to contribute generously to this project," recalls Dr. Driver. *"It would simply not have been possible otherwise. Our new reaction wall will be a legacy for our lab that will dramatically enhance our capabilities for conducting large-scale experimental research."*

SCHOLARSHIPS AND AWARDS

G.J. JACKSON MEMORIAL FELLOWSHIP AWARD


2006 Jackson Fellowship Winner – Michael Gray and Stig Skarborn

Mr. Geoffrey James Jackson was a leader in the Canadian structural steel fabrication industry. It was through his vision and dedication, that the Steel Structures Education Foundation (SSEF) was established. In his honour, SSEF developed a prestigious national award, rightfully called the G.J. Jackson Memorial Fellowship Award. It is presented annually to a Canadian post-graduate engineering student in structural engineering, with major emphasis on steel structures. In addition to receiving this honourable accreditation, the winner is also given a scholarship in the amount of $15,000.

The committee was once again impressed by all the applicants' remarkable academic achievements, strong recommendations from their professors, and proposed research topics.

After careful deliberation the committee concluded that the 2006 Jackson Fellowship recipient is **Michael Gray,** who recently began his second year of graduate studies at the University of Toronto. He will study under the joint supervision of professors Jeffrey Packer and Constantin Christopoulos. Michael was presented with his award at the annual convention for CISC this June in Niagara Falls.

Michael has had extremely high grades indicating superior academic abilities. In his letter of recommendation it was stated that Michael has *"an un-natural ability and aptitude for steel structures"*, *"he has a genuine love of the topic"* and *"it seems that there is nothing that he does not already know"*. He has worked as a teaching assistant in, what else, *"steel structures"*. In this current year he was awarded the NSERC industrial postgraduate scholarship, in collaboration with an Ontario steel fabricator. His career goal is to become a leader in the steel construction industry. He is well on his way.

This year's judging committee was composed of Joe Schneider and Stig Skarborn, members of the SSEF Board of Governors, and David MacKinnon, SSEF staff representative.

CISC also offers a number scholarship award programs and initiatives for students across Canada. Funded through regional efforts, these initiatives are offered to students conducting studies in the field of structural engineering, and are designed to help promote structural steel studies at Canadian education institutes. The following awards have been presented in the Atlantic, Ontario, Alberta, Central and British Columbia Regions in 2006.

2006 SSEF ARCHITECTURAL STUDENT DESIGN COMPETITION


2006 SSEF Architectural Student Design Winners – Paul Schaefer and Lee Blanchard

This year's 5th annual competition was entitled Crossing the Divide, and asked students to design a pedestrian bridge. 46 entries from across Canada were received for the 2006 competition, and the winning team consisted of three third-year architecture students from the University of Calgary. Congratulations to Paul Schaefer, Lee Blanchard and Andrew Martin!

The team was chosen as this year's winner based on their bridge design entry entitled, *Harmonic Chinook Bridge*. They were presented with their $1,500 prize at the 20th SSEF Annual General Meeting in Niagara Falls in June. Gary Mundy, the competition's faculty sponsor at the University of Calgary will receive $3,000. Two Honourable Mentions were also awarded to teams representing McGill University (Jessica Thatcher, Jennifer Thorogood, Melissa Ouellet, Yunlu Shen parrainées par Peter Sijpkes) and University of Waterloo (Bi-Ying Miao et Jane Wong parrainés par Terri Meyer Boake et Vincent Hui).

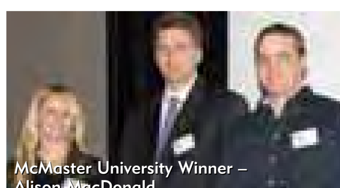
The jury consisted of Chris Adach, M & G Steel, Steve Benson, Benson Steel, John McMinn, University of Waterloo, Sean Stanwick, Farrow Partnership Architects, and Ian Chodikoff, Canadian Architect.

ATLANTIC REGION


James McInerney, 2005 Atlantic Region Scholarship Winner

The Atlantic region's scholarship program was expanded into two $2,500 awards for 2005. The award recipients were **Melanie MacCormick**, a Dalhousie University student in her second last year of Civil Engineering, and **James McInerney**, a final year student at the University of New Brunswick. James is continuing research on composite deck-slab details under the supervision of Dr. John Dawe. Both students are using the funds to help in their senior year structural engineering projects and each of them have secured summer employment with local steel fabricators.

ONTARIO REGION


McMaster University Winner – Alison MacDonald


Ryerson University Winner – Jiang Shao


University of Western Ontario Winner – Johnathan Hagan

The Ontario Regional Committee awarded eight scholarships to students from Universities in Ontario in 2006. Chosen recipients were selected based on input from their professors at each respective institution. The 2006 recipients include:

- **Richard Michels, Carleton University** – studying under the direction of Professor Gil Hartley, sponsored by Dymin Steel & M & G Steel
- **Alison MacDonald, McMaster University** – studying under the direction of Professor Mike Tait, sponsored by Walters Inc. & Telco Steel Works

- **Jiang Shao, Ryerson University, Engineering** – studying under the direction of Professor Khaled Sennah
- **Jonathan Pascaris, Ryerson University, Architectural** – studying under the direction of Professor Vera Straka
- **Kelly Anne Buffey & April Wong, University of Toronto, Architectural** – studying under the direction of Professor Ted Kesik, sponsored by Mariani Metals & Spec-Sec
- **Davis Doan, University of Toronto, Engineering** – studying under the direction of Professor Peter Birkemoe, sponsored by Telco Steel Works & Mariani Metals
- **Johnathan Hagan, University of Western Ontario** – studying under the direction of Professor Mike Bartlett, sponsored by Spec-Sec & Dymin Steel
- **Jesse Pauls, University of Waterloo** – studying under the direction of Professor Lei Xu, sponsored by M & G Steel and Walters Inc.

These awards provide each recipient with $2,000 in scholarship funding. The applicants must be undergraduate students who excel in the steel design course during their third year and who also selected a steel elective in their final year. The eight award presentations were made to the students at the Ontario Region's Spring Reception on May 17, 2006.

ALBERTA REGION

The Alberta Regional Committee offers civil engineering students from the University of Alberta (U of A) an opportunity to participate in a cooperative employment placement program. The program selects a group of outstanding third year students based on their submissions, and places them into a working environment with a CISC Alberta region steel fabricator. This is the fourth year this program has been offered to engineering students at U of A, and the following four were chosen for the 2006 program. The CISC steel fabricator employer is also listed.

- **Elizabeth Robertson** (Empire Iron Works)
- **Vicki Ng** (Supreme Steel Ltd.)
- **Michael Pyra** (Supreme Steel Ltd. - Bridge Division)
- **Brendan Cardiff** (Collins Industries)

G.L. KULAK SCHOLARSHIP AWARD

In 2004, CISC's Alberta Regional Committee established a scholarship award in honour of Dr. G.L. Kulak, Professor Emeritus at the University of Alberta, to recognize his outstanding contributions to the engineering profession, education and to the Canadian steel industry. There was not a recipient for this award in 2006.

Funded by the Alberta Regional Committee, this scholarship award provides financial assistance to Canadian steel engineering graduates who are pursuing an advanced degree in steel structures research. Applicants must be Canadian citizens, and entering their second year of graduate studies in structural engineering at the University of Alberta, with major emphasis on steel structures research. Students enrolled in a Masters or Doctoral Degree program are also eligible to apply provided they are committed to furthering their education in steel structures research and have intentions on maintaining effective relationships with the steel industry.

Applications should include an explanation of the chosen area of steel research and the long term economic impact on the steel industry; an indication that the individual plans to maintain effective relationships with the steel industry; an official transcript of their undergraduate and post-graduate record to date; and a recommendation from their supervisor or other member of the steel structures research group. All applications must be received by February 15 of the year in which the scholarship will be awarded, and should be forwarded to Peter Timler, P.Eng., CISC Western Regional Executive Director.

CENTRAL REGION

The Central Regional Committee has established an annual scholarship award in the amount of $1,000, which is presented to a student enrolled in the College of Engineering at the University of Saskatchewan. There was no recipient awarded in 2006, and the Central region is currently reviewing the option of increasing the dollar figure for this award for future winners.

BRITISH COLUMBIA REGION

The BC Regional Committee has offered a Fabricator's Engineering Apprentice program for the past seven years. The program formally integrates a UBC student's academic studies with work experience in co-operative employer organizations, for a four-month work-term working with both a CISC fabricator and structural engineering consultant. Congratulations to the following students who were selected to participate in the 2006 program.The CISC steel fabricator employer is also included. These students will receive a certificate award at BC Region's 2006 Innovative Steel Structure Awards in Vancouver.

- **Kelsey Van Steels** (M3 Steel)
- **Seyed Ali Nayeri** (Solid Rock Steel & Canron.)
- **Payam Memar** (Empire Iron Works)
- **Benny Siu Kwok** (Wesbridge Steelworks)

PIZZA AND POP PRESENTATIONS

The Atlantic Regional Committee has recently initiated a new presentation concept to showcase and discuss the benefits and merits of working with structural steel and within the steel industry, to Universities and Community Colleges in the Atlantic region. Two meetings have been arranged to date, one with the students and professors at Dalhousie University and another at the University of Moncton with similar attendance.

We bring the lunch, the people and the content! These meetings can be arranged with students and/or professors onsite at the campus. CISC's Atlantic Regional Director, Alan Lock will facilitate the meeting and bring along a local CISC steel fabricator(s), and an industry consultant, as well as representatives from a local steel erector or steel detailer to enhance the presentation, if possible. This is a great opportunity for senior civil engineering students to view and discuss the latest industry drawings and pictures, and hopefully increase their knowledge and interest in working with structural steel.

So far, the results have gone exceptionally well, and two students have applied for work with steel fabricators.

For more information about these education initiatives or to find out how to apply for an award, please contact your regional director or visit our website at www.cisc-icca.ca.

WHAT'S COOL, WHAT'S HOT, WHAT'S NEW

COURSES

In response to a series of substantial technical changes introduced by the National Building Code of Canada (**http://www.national-codes.ca/nbc/index_e.shtml**), CISC offered two, one-day courses to provide understanding on design theory and the rationale behind code provisions this past Fall. The Steel Framed Commercial Building Design course, and Seismic Design of Steel Framed Buildings course were both well received and well attended in each region across the country.

The Winnipeg and Saskatoon courses have been postponed and will be rescheduled to take place in Spring 2007. Watch our website for upcoming details **www.cisc-icca.ca**.

LOOKING FOR A DYNAMIC, CHALLENGING POSITION?

CISC is looking for an outgoing, self-motivated structural engineer with a Master's Degree and from 5-10 years experience in steel design preferably in the ICI sector. For more information, please reply in confidence to Bob Carro at bcarro@tscgroup.ca or 416-494-6868.

AWARD WINNING STEEL IS FEATURE TOUR AT PEARSON'S TERMINAL 1

CISC's Ontario Region hosted its Annual Fall Tour of *"Lester B. Pearson International Airport - Terminal 1"* on October 25. The event began at the Toronto Congress Centre with a reception and detailed project presentations from Airport Architects Canada* and Halcrow Yolles, followed by guided tours of the structure.

Earlier this year, the *"Terminal 1"* project was recognized by the American Institute of Steel Construction (AISC) and received an IDEAS2 Award. John Cross, Vice President of AISC Marketing presented the project team with their award during the event presentations.

The new Terminal 1 structure at the Lester B. Pearson International Airport features large, open, and light-filled spaces that will guide travelers with ease and direction throughout the building. Using highly designed and fabricated structural steel along with natural light, the building offers a harmonious series of spaces, featuring plenty of exposed long-span steel arch members and linear sky-lights. The design not only exposes the main support members, but defines load transfers and connections as exceptional design elements, expressing the nature of the supporting and bracing elements. This 3.6 million square foot terminal will be the center-piece of all new development at the airport, and is expected to accommodate approximately 29 million passengers annually by 2015.


Photo: Tim Hurley

**Joint venture of Skimore Owings & Merrill, Adamson Associates, and Moshe Safdie Associates Ltd.*

Living Steel Announces 2nd Competition

Living Steel recently announced its 2nd Annual International Competition for Sustainable Housing. The *"Call for Expressions of Interest"* to participate in the competition has commenced, asking architecture firms around the world to take up the challenge to design sustainable housing for Brazil, China and the United Kingdom. The deadline for submitting a Call for Expressions form is January 12, 2007.

For more information, please visit: **www.livingsteel.org/new-competition**

CWB GROUP APPOINTS A NEW LEADER

Mr. G. Lever, P.Eng., Chairman of the Board of Directors of the CWB Group – Industry Services is pleased to announce the appointment of Douglas R. Luciani as President and Chief Executive Officer.

Mr. Luciani graduated from the University of Western Ontario with a Bachelor of Science Degree in Mechanical Engineering and a Masters of Business Administration from the University of Western Ontario, Richard Ivey School of Business.

Mr. Luciani joined the Canadian Welding Bureau in May 1991 and has held positions of increasing responsibility leading to his most recent appointment as General Manager of the Canadian Welding Bureau.

EVENTS

Pacific Structural Steel Conference 2007
March 13 – 16, 2007
Wairakei, New Zealand
www.pssc2007.com

NASCC (North American Steel Construction Conference), incorporating the 2007 Annual Stability Conference
April 18 – 20, 2007
Ernest N. Morial Convention Center, New Orleans, Louisiana
www.aisc.org/nascc

2007 CISC Annual Convention
June 6 – 9, 2007
Grand Okanagan Lakefront Resort
Stay tuned for details!

9th Canadian Conference on Earthquake Engineering
June 26 – 29, 2007
Fairmont Château Laurier, Ottawa, ON
www.carleton.ca/9ccee/

Legend: *sales office only B-buildings Br-bridges S-structural P-platework J-open-web steel joist

ATLANTIC REGION

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www.metauxspec.ca

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www.acierrobel.com

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www.trimaxsteel.com

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Les Industries V.M. inc. S
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(Grating, metallizing, paint)

Jet de Sable Houle Sandblasting Ltee
Montréal, Québec (514) 881-2400
www.houlesandblast.com
(Preparation et finition de surface metallique par projection d'abrasif et rejetement anti corrosif liquide)

La Corporation Corbec
Lachine, Québec . (514) 364-4000
www.corbec.net
(Supplier of hot dip galvanizing only)

Lincoln Electric Company of Canada LP
Toronto, Ontario (416) 421-2600
www.lincolnelectric.com
(Welding equipment and welding consumables)

Marmon Keystone Canada Inc.
Langley, B.C. (604) 857-9844
www.marmonkeystone.com
(Hollow Structural Sections, A106 Seamless Pipes)

Micron Coatings Inc.
Edmonton, Alberta (780) 432-4519
www.microncoatings.ca
(Protective coatings)

Midway Wheelabrating Ltd.
Abbotsford, B.C. (604) 855-7650
www.midwaywheelabrating.com
(Wheelabrating, sandblasting, industrial coatings)

NSF - ISR Canada
Kitchener, Ontario (519) 650-7707
www.nsf-isr.org
(ISO 9001 Quality Management System Registration services; ISO 14001 Environmental Management System Registration Services)

Peinture Internationale
(une division de Akzo Nobel Peintures Ltée.)
Dorval, Québec (514) 631-8686/1-800-361-2865
www.internationalpaints.com
(Protective coatings, corrosion-resistant paints)

Pipe and Piling Supplies Ltd./
Tuyaux et Matériel de Fondation Ltée.
St. Hubert, Québec (450) 445-0050
www.pipe-piling.com
(Hot Roll-Wide-Flange-Bearing Pile Beams)

Price Steel Ltd.
Edmonton, Alberta (780) 447-9999
www.pricesteel.com
(Structural, plate, bars, HSS tube, grating, pipe)

Pure Metal Galvanizing,
Division of PMT Industries Limited
Rexdale, Ontario (416) 675-3352
www.puremetal.com
(Custom 'Hot-Dip' Zinc Galvanizing; Pickling and Oiling)

Red River Galvanizing Inc.
Winnipeg, Manitoba (204) 889-1861
www.redrivergalvanizing.com
(Supplier of hot dip galvanizing only)

Reliable Tube (Edmonton) Limited
Acheson, Alberta (780) 962-0130
www.reliable-tube.com
(HSS Tubing, ERW Tubing, CDSSM Tubing)

Reliable Tube Inc.
Langley, B.C. (604) 857-9861
www.reliabletube.com
(Hollow structural steel tube)

R.P. Richmond Industrial Contractors
New Westminster, B.C. (604) 521-7922
(Wheelabrating & Priming)

Samuel, Son & Co. Ltd.
Chomedey, Québec (514) 384-5220
Winnipeg, Manitoba (204) 985-6600
www.samuel.com
(Structural Sections incl. Bar, angle, shapes and plate)

Salit Steel (Div. of Myer Salit Ltd.)
Niagara Falls, Ontario (905) 354-5691
www.salitsteel.com
(Beams, tubing, angles, channels, flats, rounds, squares, rebar, plate, sheet)

Selectone Paints Limited
Weston, Ontario (416) 742-8881
www.selectonepaints.ca
(Paint primers, fast dry enamels, coatings)

Sherwin-Williams Canada
Ville d'Anjou, Québec (514) 356-1684
www.sherwin.com
(Specialty industrial coatings)

Silver City Galvanizing Inc.
Delta, B.C. (604) 524-1182
(Custom 'Hot-Dip' Zinc Galvanizing; Pickling and Oiling)

S.N.F. Quebec Metal Recycling (FNF) Inc./
S.N.F. Québec Métal Recyclé (FNF) Inc.
Laval, Québec (514) 323-0333
www.snf.ca
(Ferrous and nonferrous metal recycling)

Tri-Krete Coatings Company
Bolton, Ontario (905) 857-6601
(Sandblasting; protective coatings; metallizing)

VARSTEEL Ltd.
Lethbridge, Alberta (403) 320-1953
Delta, B.C. (604) 946-2717
www.varsteel.ca
(Beam, angle, channel, HSS, plate, Sheet, Grating, expanded metal, pipe, flats, rounds, etc.)

VICWEST Corporation
Oakville, Ontario (905) 825-2252
Edmonton, Alberta (780) 454-4477
Surrey,B.C. (604) 590-2220
Moncton, N.B. (506) 857-0057
www.vicwest.com
(Steel Metal floor/roof deck, wall and roof cladding)

Vixman Construction Ltd.
Milton, Ontario (905) 875-2822
www.vixman.com
(Roof and Floor Deck)

Western Industrial Services Ltd. (WISL)
Winnipeg, Manitoba (204) 956-9475
www.wisl.ca
(Abrasive Blasting & Painting Services)

Western Studwelding Supply
Edmonton, Alberta (780) 434-3362
(Stud Welding Equipment and Supplies; Sales, Service, Rental)

Wilkinson Steel and Metals,
A division of Premetalco Inc.
Edmonton, Alberta (780) 434-8441
Vancouver, B.C. (604) 324-6611
www.wilkinsonsteel.com
(Misc. structural shapes, hot rolled bars and plates)
(Structurals - angles, flats, beams, channel, plate)

X-PER-X Inc.
Montréal, Quebec (514) 255-1679
www.xperx.ca
(Steel product inspection services, metallurgical laboratory)

MILL MEMBERS

Algoma Steel Inc./ Acier Algoma Inc.
Sault Ste. Marie, Ontario (705) 945-2351
From Ont., Atlantic & Qué. 1-800-387-7850
* Calgary, Alberta (403) 263-4102
* Burlington, Ontario (905) 331-3400
www.algoma.com 1-800 387-7850

Atlas Tube
Harrow, Ontario (519) 738-3541
* Niagara-on-the-Lake, Ontario (905) 468-4972
www.atlastube.com

Dofasco Inc.
Hamilton, Ontario (905) 544-3761
www.dofasco.ca

IPSCO Inc.
Regina, Saskatchewan (306) 924-7700
* Surrey, B.C. (604) 596-3361/1-800-644-3361
* Toronto, Ontario (416) 321-4949/1-888-576-8530
* Calgary, Alberta (403) 543-8000
www.ipsco.com

STEEL SERVICE CENTRES

Acier Leroux Boucherville, Div. De Métaux Russel Inc.
Boucherville, Québec (450) 641-4360
www.acier-leroux.com 1-800-241-1887

Acier Pacifique Inc. (514) 384-4690
Laval, Québec 1-800-361-4167
www.pacificsteel.ca

A.J. Forsyth, A Division of Russel Metals Inc.
Delta, B.C (604) 525-0544
www.russelmetals.com

Dymin Steel Inc.
Brampton, Ontario (905) 840-0808
Abbotsford, B.C. (604) 852-9664
www.dymin-steel.com

Russel Metals Inc.
Lakeside, N.S. (902) 876-7861
Mississauga, Ontario (905) 819-7295
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www.russelmetals.com
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www.russelmetalswinnipeg.com

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* Port Robinson, Ontario (905) 384-9700/1-800-471-1887

HONORARY MEMBERS

Arcelor International Canada
Burlington, Ontario (905) 634-1400/1-888-634-1471
* Port Moody, B.C. (604) 461-6714/1-888-464-6714
www.arcelor.com

Chaparral
Midlothian, Texas 1-800-779-1291
www.chapusa.com

Corus International Americas
Schaumburg, Illinois 1-800-542-6244 / 1-847-619-0400

Nucor-Yamato Steel Company
Blytheville, AR (870) 762-5500
www.nucoryamato.com

INDIVIDUAL

William J. Alcock, P.Eng, N. Vancouver	604-986-0663
Jonathan B. Atkins, P.Eng., Toronto	416-489-7888
Avnash Banwait,P. Eng., Surrey	604-543-8044
Gordon D. Barrett, P.Eng., Fredericton	506-455-9937
F. Michael Bartlett, P.Eng., London	519-661-3659
Leonard G. Basaraba, P.Eng., Vancouver	604-664-5409
Dominique Bauer, ing., Montréal	514-396-8944
Marc Bélanger, ing., Val-Brillant	418-742-3111
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Gordon J. Boneschansker, P.Eng., Fredericton	506-452-1441
Gordon D. Bowman, P.Eng., Gloucester	613-742-7130
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Pow Technologies, Div. of PPA Engineering Technologies Inc., Ingersoll	519-425-5000
R.J. Burnside & Associates Ltd., Collingwood	705-446-0515
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TECHNICAL-INDIVIDUAL

Rick Ellis, Surrey	604-582-3933
Robbie Fraser, Halifax	902-421-7241
George Graham, C.E.T., Winnipeg	204-943-7501
Allan Kathrens, Edmonton	780-465-7788
Kristopher Maurice, Gaspé	418-368-3077
John McCaughey, Calgary	403-256-1635
Kevin Neustaedter, Burnaby	604-451-6933
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