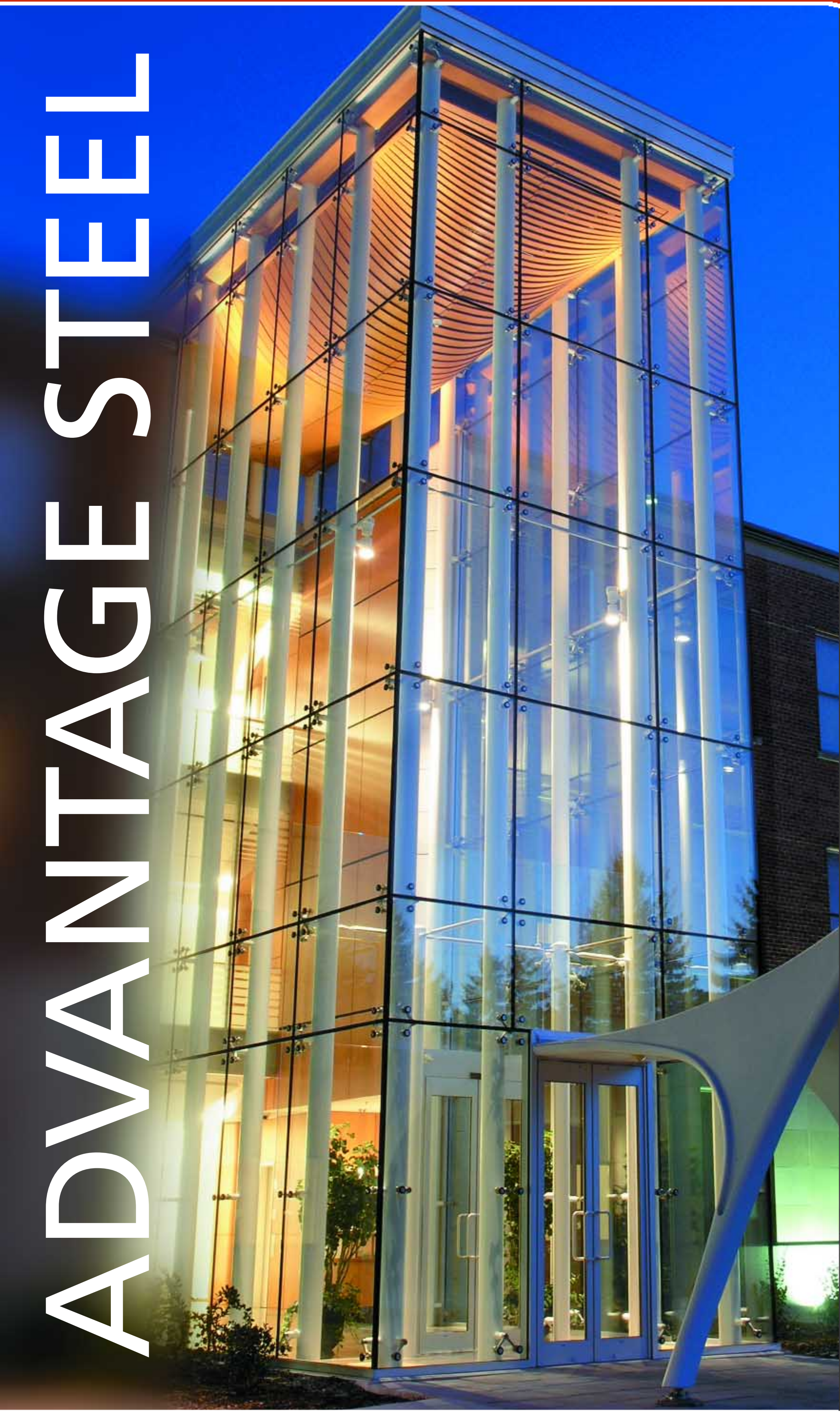
NO 29 SUMMER 2007

ADVANTAGE STEEL



STEEL AND OTHER MATERIALS
PART ONE – STEEL AND GLASS

RIVIÈRE-AUX-MULETS BRIDGE –
DEMOLITION AND
RECONSTRUCTION IN 11 MONTHS

AMALFI RESIDENCES –
A PROJECT CONVERTED TO STEEL

TRANSFORMATION OF THE LEVER
BUILDING INTO BMW SALES AND
SERVICE CENTRE

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CANADIAN INSTITUTE OF STEEL CONSTRUCTION

FROM THE EDITOR

Over 150 years ago, a gardener, Joseph Paxton, married metal to glass in the Crystal Palace for London's Great Exhibition. Today, steel and glass continue to excite architects and challenge engineers and fabricators. In Part One of a series on steel and other materials, John Leckie explores the role of steel and glass.

Transforming an older steel structure on a brownfield site into a modern steel and glass sales and service centre for BMW is a story of reuse of an entire steel building. Being at the bottom of the DVP gives BMW a prime location to display its new models in a very innovative fashion.

Using structural steel framing for upscale condos is not most people's first thought, but Daria Kachi and Peter Kulba give a convincing argument for why they chose steel for the Amalfi Residences.

Infrastructure replacement is very topical and the demolition and reconstruction of the Rivière-aux-Mulets bridge is an example of a project that only steel could have solved in the time available.

Check out what is going on as there is lots of news to report. This is detailed, as usual, in What's Cool, What's Hot, What's New.

Michael I. Gilmor
President CISC

IN THIS ISSUE

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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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COVER PHOTO: Entrance Hall - General Administration - Sisters of Providence, Montreal, Quebec. Design by ABCP Architecture + urbanisme. Glass specialty engineering by CPA Structural Glass. *Photo by François Bastien*

PHOTO ON THIS PAGE: Amalfi Residences. *Photo by M.I. Gilmor*

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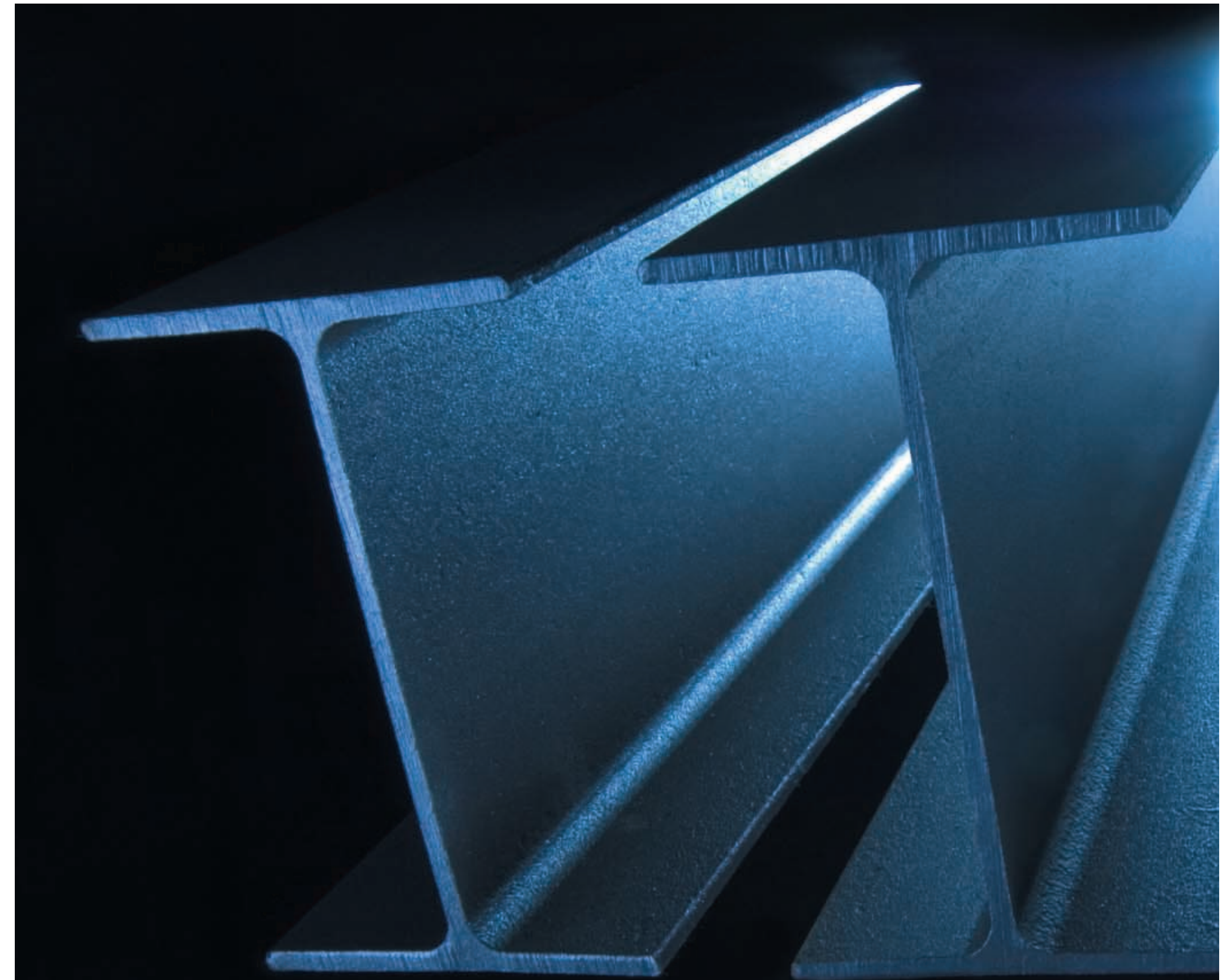

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Sylvie Boulanger, P.Eng. Ph.D - *Ask Dr. Sylvie is a column for Advantage Steel aimed at readers seeking technical information on steel structures. Questions are welcome on all aspects of design and construction of steel buildings and bridges. Suggested 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

WINDING ROUTE TO CRANE LOADS

The route one takes through the Code [National Building Code of Canada] and Standard [CAN/CSA-S16-01] to arrive at the crane loading is confusing. Taking into account that CSA is a Standards Development Organization (SDO) and the NRC/IRC is a government agency (NBCC 2005 becoming the law once it is adopted by provincial statute), does the Guide supersede the NBCC and CSA-S16? - A.L.

Here is a historical answer. You know, the kind of answer engineers like to hear! We'll call it a *"work in progress"*. Indeed, your question generated a long thread of discussion between Alfred Wong, Bob MacCrimmon, Richard Vincent, Mike Gilmor and myself. I have tried to provide an answer that reflects the situation at publication time! Basically, the winding route starts at Paragraph 24 (Part 4 - Commentary A) of NBCC 2005 which refers to CSA-S16-01 for certain crane loading conditions. CSA S16-01 refers to Appendix C which is mandatory. Paragraph C2 of Appendix C refers to the *"Guide"* - CISC Guide for the Design of Crane-Supporting Steel Structures by Robert MacCrimmon – available as a downloadable PDF from our web site: **www.cisc-icca.ca/publications/technical/design/craneguide/**

Normally, one would expect all loads to be treated in the NBCC rather than in a material design standard, but crane-supporting structures require supplementary rules and that is one reason why they cannot be treated like other structures. Thus, S16 is probably the most appropriate place to address the issue, as almost all crane runways are designed using S16. In fact, much of the minimum requirements found in NBCC 2005 date back to NBCC 1953. Incidentally, these minimum requirements are those stipulated for impact factors and for the horizontal forces as a function of the lifted load and the crane trolley. Other important considerations outlined in Appendix C of S16 and the Guide are not addressed.

Alfred Wong recalls that in the last code development cycle, the CSA-S16 Committee recommended NBCC 2005 drop these requirements and reference S16 that would mandate the CISC Crane Guide that was in development. At the end, the dated requirements remained in NBCC 2005 as published. Because the NBCC's Part 4 Committee recognizes that this area needs attention, a task group, chaired by Richard Vincent, is looking into issues related to live loads, including crane loads. The Part 4 task group on Live Loads Due to Use and Occupancy has agreed in principle to refer to S16 for the load combinations involving cranes.

S16 has formed a subcommittee to study the load combinations including crane loads, and this subcommittee has prepared the following draft for Appendix C, Clause C2.

C.2 Factored Loads for the Ultimate and Fatigue Limit States
The factored load combinations shall be taken as follows:

CASE	PRINCIPAL LOADS	COMPANION LOADS
1	1.4D	
2	1.25D + 1.5C +1.0L	1.0S or 0.4W
3	1.25D + 1.5L + 1.0C	0.5S or 0.4W
4	1.25D + 1.5S	(1.0C + 0.5L) or 0.4W
5	1.25D + 1.4W	(1.0C + 0.5L) or 0.5S
6	1.25D + 1.0C_7	
7	0.9D + 1.4W	(0.5L + 1.0C) or 0.5S
8	1.0D + 1.0E	1.0 C_d + 0.5L + 0.25S
9	1.0D + C_1	

where C is any one of the crane load combinations defined in the *"Crane-Supporting Steel Structures Design Guide"*, Second Edition, to be published by the Canadian Institute of Steel Construction, C_d is the dead load of all cranes positioned for maximum effect, C_1 is the fatigue load, and C_7 is the bumper impact load.

And since I often have something to add, those who use both French and English versions of CSA S16-01 should note that the French version states that Appendix C is not mandatory, which is a mistake. Appendix C is mandatory.

GALVANIZING OF A490 BOLTS

I know that we are not allowed to hot-dip galvanize A490 bolts but can we use mechanical plating?

No. Clause 4.3 of ASTM A490-06 on Protective Coatings is quite clear: *"The bolts shall not be coated by hot-dip zinc coating, mechanical deposition, or electroplating with zinc or other metallic coatings."* One major Canadian bolt supplier tells me that many engineers do not know about this prohibition.

This prohibition exists due to concerns over possible hydrogen embrittlement: the *"sealing-in"* of the hydrogen (produced in the pickling operation) by the hot-dip process and may result in a delayed brittle fracture in service. It is not allowed for A490 bolts because the ultimate tensile strength is marginally close to the critical value where this behaviour is observed whereas the ultimate tensile strength of A325 bolts is considerably below this threshold. And don't think that this doesn't happen. There are threads of discussion where some people were proposing a *"baking out"* process to alleviate the problem, but it cannot be relied upon for structural applications.

In addition, many think that the mechanical deposition process should be allowed, as it does not involve the same process: ASTM A153 for the hot-dip galvanizing process and ASTM B695 for the mechanical plating process. Here, the Research Council on Structural Connections (RCSC) is our reference: *"The application of zinc to ASTM A490 bolts by metallizing or mechanical coating is not permitted because the effect of mechanical galvanizing on embrittlement and delayed cracking of ASTM A490 bolts has not been fully investigated to date."*

Perhaps with more research, more stringent requirements on the hot-dip galvanizing process and a more controlled upper limit on the tensile strength of ASTM A490 bolts, this restriction could be revisited.

We talked about not galvanizing A490 bolts. But if you want to galvanize A325 bolts, you need to know what you are doing! Although galvanizing A325 bolts does not have an effect on F_u and F_y, it does have an effect on the ability to tighten the fastener assembly, the nut stripping strength (depending on the over-tapping), the effort required for pretensioning (if needed) and the shipping requirements. ASTM A325 requires the fastener assembly to pass a capacity rotation test. In widening the Leaside Bridge in the 1960's, Dr. Laurie Kennedy discovered that stick bees' wax was the most reliable lubricant for the treads of hot-dipped galvanized A325 nuts and bolts. For more information, see page 7 of the *"Specification for Structural Joints using ASTM A325 or A490 Bolts"* published by the RCSC - a must for your library: **www.boltcouncil.org/2004 RCSC Specification.pdf**

SEAM STRENGTH OF HSS

I am trying to find information about the mechanical properties of the weld seam in hot-formed hollow structural sections without much success. Can you help? – M.C.

To my knowledge, we consider the weld seam to have the same resistance as the rest of the material but that is probably not completely true. There are some papers that have looked at fatigue or the notch-toughness of hollow structural sections, such as this one:

Notch Toughness of Internationally Produced Hollow Structural Sections

J. Struct. Engrg., Volume 131, No. 2, pp. 279-286 (February 2005)

N. Kosteski, J. A. Packer, F.ASCE; and R. S. Puthli

I've asked one of the authors to comment! Jeff Packer of the University of Toronto confirms that the weld seam in **hot-finished** (hot-formed) HSS can be assumed to have the same mechanical properties as the material in the rest of the HSS. The weld seam in **cold-formed** HSS has not been found to have lower static or fatigue resistance.

However, there is a trend to develop a next-generation manufacturing specification for HSS that would contain more stringent or additional requirements than the present ASTM A500 or CSA G40.20/21 standards. They would include upper limits on F_y and F_y/F_u ratios, a Charpy toughness rating, larger corner radii, making it more apt for applications in which dynamic loads govern. Such a movement is not so dissimilar to what has happened to the W shapes, with the ASTM A992 being more stringent and better suited for high-performance dynamically loaded structures than the older ASTM A572 standard steels.

SEISMIC CORNER

Alfred Wong

I wish to use Limited-Ductility Plate Walls, in accordance with S16-01, as the Seismic-Force-Resisting System for a building project but I cannot find the identical description for this system in Table 4.1.8.9 of NBC 2005. Is this system referred to as Moderately Ductile Plate Shear Walls as tabulated in NBC? – R.B.

Yes, the Commentary to Clause 27.8.3 of S16-01 clarifies this inconsistency in description. In addition, the Commentary to other parts of Clause 27 clarifies that Tension-Compression Concentrically Braced Frames besides Chevron Braced Frames are referred to as *"Concentrically Braced Frames (having) Non-Chevron Braces"* in NBC.

photo: Terri Meyer Boake

Glass fins of the Caisse de dépôt et placement Capital Centre, Montreal

STEEL AND OTHER MATERIALS THREE-PART SERIES
PART ONE: STEEL AND GLASS

by John Leckie

Successful marriages of steel and glass have led to the creation of some of the most striking, visually appealing and spiritually uplifting buildings in the world.

The combination of slim, elegant steel structural elements with a transparent glass facade has long provided strong visual appeal. New technological developments have both increased the options available and reduced the difficulties in providing steel and glass buildings. For Ian Ritchie, architect, *"Their aesthetic values have been associated with the beauty inherent in precise machine-made elements and the importance of the connection, or joint, between the various parts"* – a high-tech architectural style that has been associated with an engineering renaissance.

HISTORY

Many of the early examples of metal and glass construction were greenhouses, where the slimmer and stronger metal elements were a major improvement on the heavy wood previously used and allowed a greater expanse of glass which allowed more light to reach the plants inside. It was hardly coincidental that one of the first metal and glass buildings to catch the public fancy—London's Crystal Palace—was designed by a gardener, Joseph Paxton. Paxton's design was selected for the Great Exhibition of 1851 in Hyde Park. Despite its public appeal, the building had to wait until the mid-20th century before it became fully accepted as an architectural breakthrough.

In more recent years, the breakthroughs have involved using glass as a structural element in the buildings. An early example is the design of the glass facades of the greenhouses at Parc La Villette in Paris, constructed in 1986. Glass panes butt against each other, supported by cable trusses for wind loading. Special glass supports are used to secure the facade, maximizing the transparency. The Kempinski Hotel in Munich took the process several steps further, using a single-layer, prestressed cable net to provide the structural support with the glass facade secured at nodes rather than by bolts through holes in the glass. This system provides greater transparency with minimal intrusion from the structure. It also exhibits significant deformation during heavy wind loads, which some find disconcerting.

Some current Canadian examples include the pyramidical skylights of Edmonton City Hall (1992), BCE Place in Toronto (1992), the CDP building in Montreal (2002), and the Vancouver Convention Centre scheduled to open in 2009! In the last decade, most airport expansions across Canada are also unique illustrations of steel and glass structures.

THE OTHER MATERIAL: GLASS

These recent designs would not be possible if Alastair Pilkington had not invented the float glass process in the early 1950s. This process, in which the melted raw materials for glass are floated on a bed of molten tin to produce a ribbon of glass, dramatically reduced the cost of producing high-quality flat glass. Added to that were developments in tempering glass by heating it to 650-to-700 degrees C and rapidly cooling it so the centre retains a higher temperature than the surface. As the centre cools, the resulting contracting induces compressive stresses at the surface and tensile stresses in the core which can produce a pane of glass four or five times stronger than annealed or float glass. Protection against breakage can be enhanced by lamintated units where multiple layers of glass are bonded by a layer of plastic sheet material.

Benoît Cloutier of CPA Inc. in Montreal says the combination of different layers improves post-breakage behaviour of the glass, which gives designers and building owners more confidence to use it in larger applications.

CHALLENGE AT THE INTERFACE

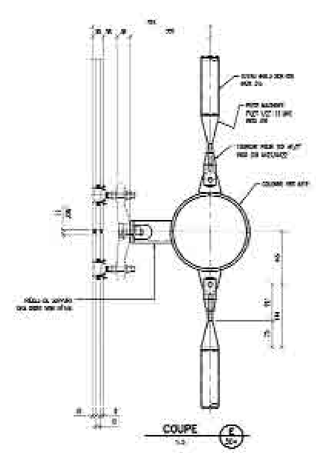
Many of the steel and glass structures now are signature elements of a building, making up a portion of the overall structure while the rest of the building tends to have more conventional structural systems and facades. The steel interface elements of these signature structures transfer portions of the wind loads to the steel super-structure, hence the interface elements are generally small but a much higher emphasis is placed on their visual appeal. The steel fabricator retained must be familiar with architecturally exposed structural steel (or AESS) as the finishes and interface tolerances are more stringent than standard structural steel.

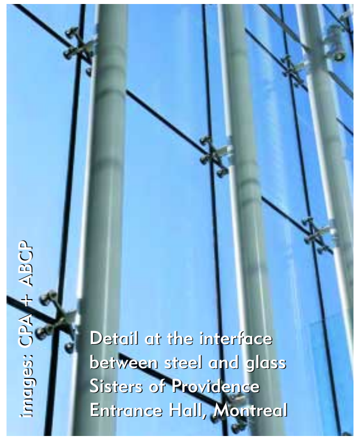
Welding

Precision in the welding of the steel elements is particularly important. *"Any welding will cause distortion,"* Cloutier says. *"When you weld, it heats up the surface and when it cools down it tends to shrink. When you have a long piece and you are always welding on the same side, you can soon wind up with a banana effect on the whole piece. You are forced to make the piece straight again or live with the distortion."*

photo: Schlaich, Bergermann und Partner

The Kempinski Hotel, Munich





images: CPA + ABCP

Detail at the interface between steel and glass
Sisters of Providence
Entrance Hall, Montreal

"Care during the initial welding process can minimize the distortion," he says.

One of the problems of working with steel and glass is the relative tolerances in producing the materials. Glass requires higher precision with tolerances of ±2 millimetres while the tolerances for steel are ±5 millimetres. The differences have to be accommodated during the installation in order to keep the glass panels properly aligned. And, because the glass panels tend to line up with the steel elements, poor alignment will be quite apparent.

Connections

There are a number of methods of connecting the glass panels to the structural supports. Cloutier's firm favours a spider bracket which has one to four arms coming out of a central hub. Bolts through the glass panels are secured to the arms and the brackets are attached to the support structure. Angle brackets, single brackets, pin brackets or clamping devices are all alternatives that are used on occasion. The panels are usually secured at the four corners with an additional pair of bolts in the middle of each side for larger panels. In Europe, particularly, bolted systems are slipping from favour and designers there are tending to use a clip system where the panels are supported on the side, removing the need to drill holes in the glass.

DESIGN PROCESS

To carry out the design of these structures, a new type of specialized engineering firm is developing. These specialists will bring their focussed engineering skills to the project to work in collaboration with the architect and the structural engineer to ensure the design vision is upheld while a structurally sound system is installed. In essence, this is what Cloutier's firm has become (see inset).

"Before we finalize the details on any drawing, we usually have discussions with the erector to determine if it is appropriate or efficient to do it that way," Cloutier says. *"Sometimes the erector will come back with a better idea or something that will better suit his equipment or the way he sets up the geometry in his shop."* It often works better when people who have worked together on previous projects are involved because everyone knows the capabilities of the other members of the team.


photo: Terri Meyer Boake
Edmonton City Hall

"For these projects, the detailed engineering has to be part of the price of the job," Cloutier says. *"On our jobs now, we bill the architect and the client to develop concepts or to establish a feasible project. The detailed engineering, basically the shop drawings of the specialized facade and the supporting steel elements, will come at the time the order has been given."*

"Because the glass and steel stucture is likely the signature element of the building, something the architect has had to fight for through budget cuts and constraints, the architect tends to be a strong ally when choices have to be made between saving money and retaining the design intent of that part of the project," Cloutier says.

CASE STUDY: THE CDP BUILDING

One project Cloutier's firm worked on was the Caisse de Dépôt et du Placement Capital Centre in Montreal. Working for the curtain-wall contractor, CPA provided a portion at the base of the building's atrium which was designed as a glass fin system, where the glass fin served as the backbone for the structural elements of the facade.

"It was a suspended system, meaning that the glass fins that are resisting the wind load are hanging from the top portion to a steel beam," Cloutier says. *"At the base, the fins are only sliding up and down into a square shoe-box-like element so the fin is free to move vertically but is blocked laterally. That allows it to accommodate thermal movement in the building."*

When the steel was erected, CPA ensured it was installed according to plan and made adjustments for any variations. The system the firm designed had to be flexible enough to handle these adjustments as well as allow for the changes in loading that would occur as the project advanced. Once the panels were installed, silicon was used to fill the gaps between panels.

BEST PRACTICES

"There are several keys to success in this type of project," Cloutier says. *"Good communications is a must. The architect, structural engineer, specialty engineer, glazing contractor, steel fabricator and steel erector all have to know what is happening with that portion of the project. There also has to be a commitment to quality from all members of the team in order for the project to work."*

"Fortunately," Cloutier says, *"this type of project tends to attract firms and individuals who are looking for a challenge, something a little more difficult than routine construction."*

Europe tends to be leading the way in innovative uses of steel and glass in buildings.

"That is not surprising," Cloutier says, *"because the attitude there is less to receive a quick return on investment than to build something that will last for more than 50 years. As well, higher energy costs provide greater incentive to develop energy efficient buildings."*

Although it is true that much is possible with glass construction, it is dependent upon the steel superstructure. Glass continues to be very brittle and sensitive to local stress concentrations. Hence, much attention has to be spent designing the interface between glass and steel to resolve issues of material compatiblity, and reach the desired aesthetic objective.

THE FUTURE

Where are these structures headed? There is ongoing experimentation with glass as a structural element in the buildings. Double facade structures, with up to a metre of air space between the two glass facades have been built and there has been some use of photovoltaic panels.

At present, steel and glass contribute elegant and striking design elements to a number of buildings but the potential of the combination of the two materials has not been fully tapped, particularly in North America. Future developments could both increase the energy efficiency of our buildings and provide new aesthetic choices for building design.

CPA STRUCTURAL GLASS INC.

When CPA Structural Glass started in 2000, it was a subsidiary of Cloutier Powney and Associates, a consulting engineering firm. At the time, CPA was licensed as a glazing contractor by the Régie du bâtiment du Québec and was capable of providing a full turnkey solution. The firm would do the detailing for the project but would also hire the steel fabricator and supervise the erection process. In 2004, Cloutier Powney merged with Saia, Deslauriers, Kadanoff, Leconte, Brisebois, Blais and Associates and CPA dropped its involvement in the construction process. That involvement proved valuable, however, because the firm has gone through many of the problems encountered onsite, and that has provided greater insight into the problems faced by installers. By designing with that in mind, the firm can avoid many potential problems. CPA has been involved in a wide range of projects, from small signature projects to large high-profile projects such as: the CDP building, les Soeurs de la Providence, la Maison Simons in Laval and Le Windsor.

Ministère des Transports du Québec

One of the two concrete bridges on Rivière-aux-Mulets constructed in 1963 on Autoroute 15, at Sainte-Adèle in the Laurentians, has been demolished and replaced with a brand-new steel-frame structure. This challenge was met in less than 11 months by the Ministère des Transports du Québec (MTQ), Génivar, Pomerleau, Structal-Bridges and Construction Euler.

Ministère des Transports du Québec

RIVIÈRE-AUX-MULETS BRIDGE: A DEMOLITION-RECONSTRUCTION COMPLETED IN 11 MONTHS

by Frédéric Simonnot

In 1963, the erection of these prestressed reinforced concrete bridges, built by successive cantilevering of cast-in-place wedges, was innovative. However, due to major degradation attributed to water infiltration, and despite major repairs performed in the 1980s, the MTQ considered that replacement of the bridge farthest west had become inevitable. Meeting the strictest seismic standards, the new structure is at least as innovative, especially since the work was performed between January and November 2006.

This specific bridge, because of its schedule, seismic restrictions and dimensions (216 m long in three spans, 16 m wide and 18 m high) was designed by the engineers of the Design Service of the Structures Division of the MTQ, specifically Jocelyn Labbé and Sylvain Goulet.

Demolition presented its own challenges. It was necessary to literally dismantle the old bridge piece by piece, recapturing the construction steps in reverse order, to minimize the impact of the project. In particular, it was necessary to ensure that vibrations produced did not exceed certain limits, to avoid damaging residences located nearby and the parallel northbound bridge located 10 m to the east.

The new structure had to be harmonized with its neighbour's slender appearance, which was the reason why the designers wanted to minimize the number of piers. The bridge thus has 3 spans (61.25 m, 80.00 m and 61.25 m) consisting of 5 continuous composite girders 3000 mm deep, spaced 3225 mm apart with a slab 225 mm thick. The piers of the central span were built in almost the same alignment as those of the other (three-pier) bridge, nearly at the same location as the old piers.

In environmental terms, it was imperative that the bed and shores of the watercourse be fully protected. Another major and predominant restriction was the schedule. The old bridge had to be demolished quickly due to the observed degradation and rebuilt faster due to the importance of the road.

WHY STEEL?
Steel was an automatic choice. *"A bridge consisting of a deck with steel girders and a thin reinforced concrete slab represented the most economical, fastest and most suitable option. In any case, for long-span bridges, steel is a very economical solution,"* Jocelyn Labbé points out.

Because this bridge is located on a highway, it is classified as an *"emergency-route bridge"*, which means that it must remain usable to all traffic after a major earthquake. Given the soil conditions, a light bridge was necessary. *"The seismic stresses and the height of the piers also induced me to lighten the weight of the deck as much as possible,"* Jocelyn Labbé points out. *"Each pier rests on a shallow footing anchored with 64 anchors injected with grout into the granular soil, since the bedrock was too deep,"* his engineer colleague Sylvain Goulet adds.

CUSTOMIZED BRIDGE BEARINGS
The bridge bearings also required innovation. *"One of the major challenges was the complexity of the bearing design, given the loads they had to bear and the movements they had to allow. They had to be customized,"* points out Marie-Claude Janelle, ing., project manager at the Direction territoriale Laurentides-Lanaudière of the MTQ.

"The new confined elastomeric bearing for the piers were designed to prevent the bridge's longitudinal movement while providing a very good vertical restraint against uplift, which is a first in Québec for such high uplift loads", says Jocelyn Labbé.

Among other special features, almost all are related to the desire to minimize costs, delays and complexity of details. For example, to enhance symmetry, the cross slope of the steel superstructure has to be 3.5% upstream and downstream, as opposed to the slab, which varies longitudinally from 2% to 4.6%. Also, the maximum elevation of the steel structure does not correspond to that of the top of the concrete slab. *"Structural symmetry simplifies and accelerates fabrication, and reduces shop drawing preparation time. For this particular project, this was achieved by varying the haunch depth between the slab and the girders."*

A SUPERSTRUCTURE OPTIMIZED FOR LIFE
The steel superstructure weighs about 1000 tonnes. It is made of highly durable CSA G40.21-350 AT grade weathering steel, the grade most frequently used by the MTQ, which economically offers good corrosion resistance with minimal maintenance and a good capacity to withstand low-temperature impact.

It is often wrongly believed that the lightest structure will be the cheapest. To replace the west bridge over Rivière-aux-Mulets, several design measures were taken to optimize the structure (see box) in order to facilitate fabrication and construction. Nothing was left to chance: the spacing of the girders, the spacing of the braces, the thicknesses and width of the plates, and the splices.

By increasing the web thickness to reduce the number of transverse stiffeners, by limiting the number of plate thicknesses, and by simplifying the details, less time is needed for detailing, fabricating and erecting.

As Robin Lapointe, from Structal-Bridges, points out, *"Engineers had a positive impact on construction based on their design decisions. In this project, we estimate that these design choices helped us save 15% off our fabrication schedule."* In the end, they also resulted in a more economical and durable solution, making the bridge easier to inspect and to maintain.

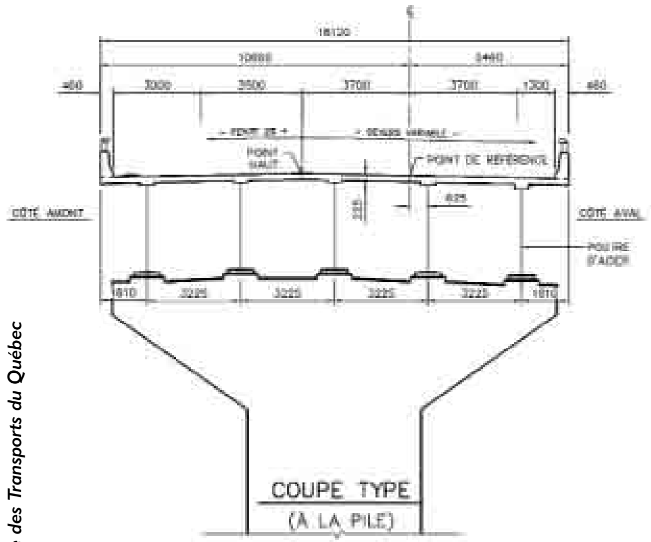
SUMMARY OF MEASURES TO REDUCE AND FACILITATE
The entire structure was designed to reduce fabrication and erection time and facilitate maintenance. The design features are as follows:

- reduction of the number of splices thanks to 41.25 m girder sections, which is fairly uncommon (and which required verification with trucking companies);
- constant flange width for each girder section and little variation in thickness;
- increase in thickness of the girder web plates to 20 mm, making it possible to decrease the number of transverse stiffeners and thus simplify the details;
- constant and slender depth (L/27) of the girder sections;
- choice of a 0.75 ratio between the spandrel spans and the central span (for better moment distribution);
- for the composite sections, an increase of the compression flange width (± L/85) in relation to the current practice (± L/110) to obtain a girder that is more stable and easier to handle;
- oversize holes to facilitate the erection of intermediate bracing.


Ministère des Transports du Québec

STRUCTAL-BRIDGES: 30,000 TONNES OF CAPACITY

On the technological cutting edge, Structal-Bridges is the leading bridge builder in Canada, with an annual production of 30,000 tonnes. Founded in 1956 under the name of Structal, and now Structal-Bridges, a division of Canam Group, the company has carried out many major projects in the last decade. Such projects include the curved box-girders for the access ramps of Lester B. Pearson Airport in Toronto, and two bridges in British Columbia, one with a capacity of 2,500 tonnes. Structal-Bridges was also called upon to rebuild the failed concrete viaducts last spring in Laval, Québec. We have seen an increasing interest in steel structures in recent years, says Robin Lapointe, its Director of Sales. Early involvment in the design process is definitely an attitude that contributes to their success. For more information: www.structalbridges.ws



Ministère des Transports du Québec

CHARACTERISTICS

STEEL WEIGHT 1000 tonnes

STEEL GRADE 350 AT

TOTAL LENGTH 216 m

NUMBER OF SPANS 3 spans (61.25 m; 80.00 m; 61.25 m)

NUMBER OF GIRDERS 5 girders spaced at 3225 mm c/c

DEPTH OF GIRDERS 3000 mm

SPACING OF CROSS-FRAMES 7500 mm (side spans) 8000 mm (central span)

TYPE OF CONSTRUCTION Composite steel-concrete construction, constant-depth, I-girders, continuous spans

OVERALL WIDTH 16.12 m

SLAB THICKNESS 225 mm

HEIGHT OF PIERS 14.4 m

DESIGN STANDARD CAN/CSA-S6-00

SEISMIC CLASS OF IMPORTANCE Emergency-route bridge

BEARING TYPE Confined elastomer

SEISMIC UPLIFT FORCES 4110 kN on piers

SPECIAL FEATURES
- Vertical restraint against uplift
- Longitudinally fixed
- Transversely free

Photos: Tower Steel Company Ltd.

Photo by M.J. Gilmor

Photos: Tower Steel Company Ltd.

THE AMALFI RESIDENCES ON THE RAVINE – A PROJECT CONVERTED TO STEEL

by Daria Kachi P.Eng., and Peter Kulba P.Eng.

This condominium building has one level of underground parking followed by three storeys of residential space. A mechanical penthouse near the centre of the building is located above the main roof.

The configuration of the building is not a typical rectangular high-rise layout. The floor plan of the building is a U-shaped layout. The left wing of the "U" is 66 feet by 170 feet, and the right wing is 66 feet by 230 feet. The horizontal base of the "U" is a 72-foot by 162-foot link connecting the left and right wings.

The owner requested that this building be a high-end type condominium and as a result the architectural layout of suites on the upper floors did not match any of the structural supports used in the underground parking. This created an interesting design challenge. In fact, the grid layout for the underground parking structure was different from the grids used for the building structure above the ground floor. This meant that transfer beams would be used on the ground floor structure to support all loads from above.

Obviously, a heavier concrete structure would require much larger transfer beams in the basement, robbing precious headroom in the underground parking.

The site consisted of very wet and sensitive sub-grade material that made foundation construction difficult. There was only a crust of good soil available for shallow foundations directly below the basement floor slab. Deep foundations would entail caissons 40 feet or deeper on one side of the site that would drive the cost of foundations too high. This site was definitely not conducive to a heavy concrete structure. Alternate framing schemes such as wood framing, hollow core pre-cast and cold-formed steel joists were also considered in the preliminary stages of design but were eliminated because of cost factors, owner's and architect's preferences.

In order to keep the building structure (self-weight) light and benefit from the available crust of soil for the design of shallow foundations, a steel structure was selected above the ground floor concrete structure. In fact, the final steel design saved the client considerable time and money, yet very few condominiums in Ontario are designed with steel!

The weight of each level of composite floor slab, ceilings and the supporting steel structure is 52 psf (versus the weight of an eight-inch thick floor slab plus concrete beams, columns and concrete walls which averages approximately 120 psf). Therefore the weight of the structure above the ground floor level was reduced by approximately 57% — more than half! This lower weight reduced the design and cost of the transfer beams on the ground floor and ultimately, the cost of the foundations.

Since seismic loads govern the lateral forces for this building (and since seismic loads are directly proportional to the weight of the structure), by reducing the weight of the building, the lateral seismic loads were also reduced by 57%. The substantial reduction in the lateral loads allowed for a 3-dimensional moment frame using mainly rectangular HSS columns that could fit within six-inch metal stud walls. There were approximately 300 moment connections per floor, for a total of 912. All available HSS sections — 10 x 6, 8 x 6 and 6 x 6 — were used, all of which would fit within the very limited 6" space. The thickness of the HSS columns used in moment frames was increased as required to eliminate additional stiffener plates. For the columns, further savings were achieved by using three HSS segments, each of a different thickness and spliced into one column that would be erected in one lift, from ground level to the third floor. The fabricator determined that the cost of splices was less than that of a single heavier section.

Light chevron braces were also used within demising walls to help reduce the building's lateral deflections.

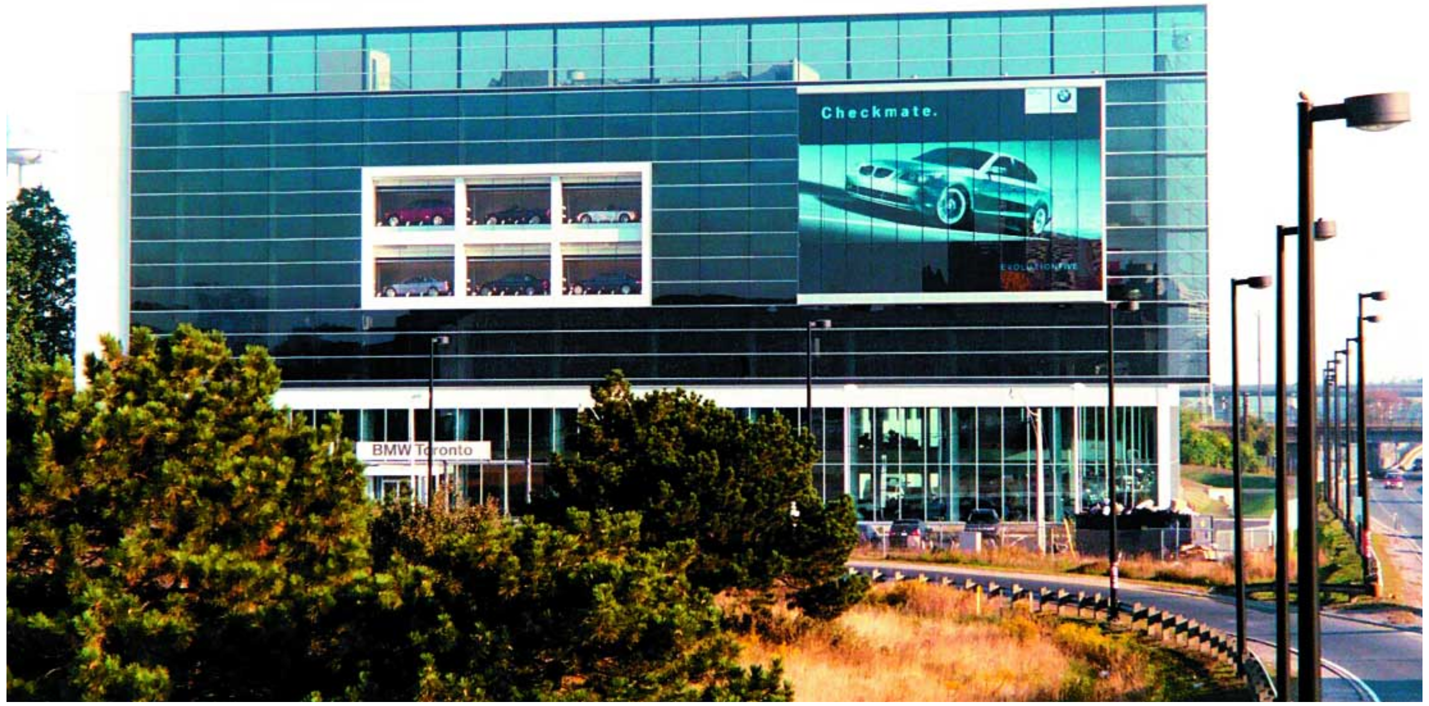
Sixteen-inch deep OWSJ's were used for all floor and roof framing in order to run all mechanical and electrical services within the joist depths. This additional floor depth added to the overall building height and ultimately increased the cost of finishes and brick cladding; however, the higher cost was offset by cheaper shallow foundations. Furthermore, unsightly bulkheads were eliminated because of the increased floor-to-floor heights which resulted in cleaner open spaces as requested by the owner.

The U-shape layout would have required two separate expansion joints if a concrete structure was to be used. By designing a steel structure with only one expansion joint in the centre of the building, further cost savings were realized.

An additional benefit realized by the owner was a considerable saving in time. While the underground concrete foundations were being constructed on site, the steel fabricator (Tower Steel) was also underway fabricating steel at their shop (both trades were working at the same time). Once the foundation work was complete, the structural steel work was also complete and ready to be erected. The three floors of steel and joists with penthouse totalled 520 tons and were fully erected in seven weeks! The foundations with ground floor slab took 13 weeks. Thus the concrete foundation and steel framing took a combined total of 20 weeks to complete. Due to the complexity of this project, conventional flying forms could not have been used for a concrete structure, thus saving 19 weeks of construction time by using steel.

In conclusion, the Amalfi condominium, with its unique design challenges, demonstrated that steel is the cost-effective winner as the preferred building material for these multi-floor structures.

Photo courtesy of Deutsch Associates Architects/Photographer: Jesse Shotwell



BMW SALES AND SERVICE CENTRE, DOWNTOWN TORONTO

by Frank Roselli, Vera Straka and Mark Gorgolewski, Department of Architectural Science, Ryerson University

PROJECT SUMMARY

BMW is an internationally renowned car manufacturer based in Germany that prides itself on offering top quality products and services to discerning customers. As a leading innovator in the automotive industry, the company also has a commitment to environmental standards and what it calls *"sustainable production"*. After the Rio Summit in 1992, the company implemented strict environmental guidelines. Since then BMW has been certified under the ISO 14001 environmental management accreditation scheme.

BMW's new flagship store in downtown Toronto opened in the autumn of 2003, located on a highly visible site by the Don Valley Parkway (a major traffic artery) and the Don River. The mandate to the design team was to create nearly 4,000 m^2 of new show-room and retail facilities, including a *"lifestyle boutique"* for BMW owners and enthusiasts, with a further 6,000 m^2 of space devoted to a service centre. The building is spread across six floors and features the reuse of an existing steel structure, considerably adapted for its new purpose. As an example of how an existing steel frame can be considerably altered for a new use, the BMW Sales and Service Centre illustrates the adaptability of steel structures. This case study focuses on the design issues that arose from the decision to reuse the existing steel structure, and the resulting benefits.

PROJECT BACKGROUND

One of the most important features of the site for BMW was its location close to the downtown area and its visibility from the Don Valley Parkway. The site was occupied by an existing 1960's steel-framed factory building (extended in the 1970's), and was classified as a *"brownfield site"* requiring extensive remediation. It is also adjacent to the Don River, which is an environmentally sensitive area, and the building is located in the river's flood plain. Any new construction on the site would have to comply with stringent setback regulations established by the Toronto & Region Conservation Authority. This would have pushed a new building further away from the Parkway, making it impossible to retain the same visibility as the existing structure. Thus, it made sense to keep the existing structural frame so that the new building would not have to meet current setback standards, and adapt it with structural alterations, additions and a whole new exterior and interior.

OWNER
BMW

ARCHITECTS
QUADRANGLE ARCHITECTS

STRUCTURAL ENGINEERS
BANERJEE & ASSOCIATES INC.

CONTRACTORS
BIRD CONSTRUCTION

INTERIOR DESIGNERS
OMNIPLAN AUTOMOTIVE FACILITY RETAIL PLANNING

PROJECT COST
$20 CDN MILLION

DESIGN

Because of the narrow site, the existing building consisted of a one-bay steel-frame structure with hollow precast concrete panels spanning about 4.8 m (16 feet) between the frames. This single-bay structural system proved convenient for the new use, as it permitted a column-free space. The existing building was stripped back to its steel skeleton and hollow core precast concrete slabs, which were mostly kept. One floor was partly removed to create double-height space for more dramatic effect and various other interior alterations were made. A one-storey addition was also added on the south side to house the service department. The steel frame was flexible enough to accommodate these various changes and additions. The exterior was retrofitted along the north, south and east facades with curtain walling composed mainly of blue-tinted glass. The rest of the building was clad with pre-cast concrete panels. Six car *"display windows"* were provided on the 4^{th} and 5^{th} floors which were glazed in clear lead-free glass for high visibility and minimum visual distortion. This highly visible display has been compared to a vending machine – almost as if one can simply go up to the building, deposit money, and a car will roll out the front door. At night a 9 m x 18 m backlit vinyl billboard, lit from within, attracts attention to the building. Extensive parking is also provided at the south end of the site.

DEMOLITION AND CONSTRUCTION PROCESS

At the beginning of the project it was determined that the existing structure, though sound, would need strengthening to meet the current building codes. A major part of the structural retrofit was to upgrade the frame to comply with current seismic requirements. Since three sides of the building were to be clad in glass, cross bracing was not an acceptable alternative for the seismic retrofit. However, the adaptability of the steel frame allowed strengthening to transform it into a moment-resisting frame. New moment connections between beams and columns were constructed from large steel plate ranging from 25 mm to 40 mm (1" to 1 1/2") thick, and 900 mm (36") wide. These were necessary to provide lateral stability for the structure. These plates were continuously welded around the existing columns. Steel plates, wide-flange beams, and T-sections were used to strengthen beams and columns to increase their moment capacity for seismic loads. Additional strengthening of columns was required in the double storey area. The roof was also strengthened to resist the weight of mechanical equipment and snow accumulation.

STEEL REUSE

The BMW Sales and Service Centre offered the opportunity for an existing steel structure to be adapted and reused in-situ for a new building. Although a considerable amount of new steel was required for strengthening and other structural alterations, significant cost, time, and environmental benefits resulted from reuse. Considerable primary resources were saved by using the existing steel frame, eliminating the environmentally damaging and resource-intensive process of frame and foundation construction. Reuse also resulted in a faster principal construction period, reducing local disruption.

Availability of drawings for the original building from the 1960s, and for the two-storey addition from the 1970s, made it possible to identify accurately the structural properties of the steel. However, incomplete documentation for the addition necessitated a complete analysis of the existing structure. Visual inspection was required to confirm the actual quality of the steel and in addition the properties of the steel were confirmed by tensile tests. The steel was found to be in good condition, since it had not been exposed to the elements nor subjected to corrosion, and it was approved for reuse.

Despite the considerable degree of innovation and the high quality of construction, the project was completed in just over 2 years. This included inevitable delays as some strengthening work took place during severe winter weather — welding in subzero temper-atures usually requires preheating and is not permitted below -15° C air temperature or when it snows. The steel found in the building conformed to the specifications indicated on the original drawings, with known properties. All in all the reuse of the steel structure resulted in very few complications.

CONCLUSIONS

Sustainable buildings must address issues of environment, cost, and social responsibility. The BMW Sales and Service Centre illustrates how an adaptive reuse of an existing steel-framed building can generate significant benefits. It illustrates the potential for reuse of whole steel structures to create new buildings and uses. This points the way for adaptive reuse of other buildings, reducing the demand for new resources and potentially reducing costs. It demonstrates the following:

- An existing structure, adapted and reused, may allow a more appropriate use of some sites compared to new buildings which may be restricted by current local requirements.
- Available information from existing buildings helps considerably to facilitate the reuse process.
- A steel structure can be adapted, (removing portions of floors), strengthened, enlarged, and its life extended, with relative ease.
- Steel frames can be readily and cost-effectively strengthened to meet today's code requirements.
- The reuse of an existing steel structure can lead to reduced project costs compared to building a new structure.
- A new architectural aesthetic can be readily applied to an old steel structure creating an exciting building.

The innovation and design of the BMW Sales and Service Centre have garnered praise and acclaim from the architecture, design, and local communities, and successfully demonstrate a way forward for adaptive reuse of existing structures.

FURTHER INFORMATION

American Institute of Architects. (2004). Quadrangle Architects' BMW Toronto Wins Ontario Association of Architects Award of Excellence. See: http://www.aia.org/aiarchitect/thisweek04/tw0604/

Quadrangle Architects. (2005). Company Projects. See: http://www.quadrangle.ca/ourprojects.html

Chodikoff, Ian. (2004, September). Roadside Attraction. Canadian Architect. pp. 21-25. www.canadianarchitect.com

The authors are grateful for the information and images provided by Quadrangle Architects Architect, and Banerjee & Associates Inc.

An excellent resource for this and other projects reusing steel is the web site www.reuse-steel.org.

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

CISC FABRICATORS TO HAVE AUDITED QA

When the CISC introduced its Steel Fabrication Quality Systems Guideline in 2002, third-party audits of the program were encouraged, although they were voluntary. At the April 2007 meeting of the CISC Board of Directors, the Board approved a decision to make third-party audits of fabricators' quality systems a mandatory requirement of CISC membership. Existing members were given to the year 2010 to comply, and new members will need to have their systems audited in the first year of membership. The quality systems must equal or exceed the CISC published Guidelines.

Since the program was first introduced, a number of CISC fabricators have already had their quality systems audited. The following companies have been audited and registered by Quasar:

Benson Steel Limited, Bolton, ON
Empire Iron Works Ltd., Delta, BC
Empire Iron Works Ltd., Edmonton, AB
Eskimo Steel Ltd., Edmonton, AB
IWL Steel Fabricators, Saskatoon, SK
Les Structures G.B. Ltée., Rimouski, QC
M & G Steel Ltd., Oakville, ON
Marid Industries Limited, Windsor Junction, NS
Precision Steel & Manufacturing Ltd., Edmonton, AB
Quéro-métal inc., Saint-Romuald, QC
Spec-Fab Inc./Spec-Sec Incorporated, Rexdale, ON
Structal Ponts, une division de Groupe Canam inc., Québec, QC
Supermetal Structures Inc. - Western Division, Edmonton, AB
Supermétal Structures inc., St-Romuald, QC
Supreme Steel Ltd. (Bridge Division), Edmonton, AB
Supreme Steel Ltd., Edmonton, AB
Supreme Steel Ltd., Saskatoon, SK
Walters Inc., Hamilton, ON
Weldfab Ltd., Saskatoon, SK

INNOVATIONS IN EARTHQUAKE-RESISTANT STEEL STRUCTURES

At the Ninth Canadian Conference on Earthquake Engineering held this June in Ottawa, Dr. Michel Bruneau, a member of the CSA Technical Committee, S16, presented a plenary paper on recent innovations that expand the range of applicability of a number of new and emerging structural steel systems for effective seismic resistance of steel structures. The focus was on those systems that can provide effective seismic performance based on recent physical testing of such systems as steel plate walls having light-gauge infill plates, steel plate walls with perforations (to allow for penetration of services and to tune the resistance of the plate wall under a capacity design approach), buckling-restrained braced frames (BRBFs) designed to meet the objectives of a structural fuse, eccentrically braced frames (EBF) using HSS members as links to remove the bracing requirements when W-shapes are used as links, and a concept known as rocking braced frames.

Provisions for incorporating BRBFs in Clause 27 of CSA S16 are being drafted for discussion by the S16 Technical Committee for the 2009 edition of that Standard.

CISC APPROVES A NEW CLASS OF MEMBERSHIP

The CISC approved at its Annual General Meeting held June 8, 2007, a new class of membership in CISC. This new membership class will be known as Affiliated. The Board of Directors will determine which organizations will be elected to this class of membership. Once Corporations Canada approves the appropriate changes to CISC's Bylaws, this class of membership will be officially enacted.

CISC LAUNCHES THE DON BEAM LEADERSHIP AWARD

As part of the proceedings of CISC's 77th Annual General Meeting on Saturday, June 9th, the newly created Don Beam Leadership Award was presented to Dr. G.L. Kulak.

Dr. Geoff Kulak is an expert on high-strength bolted joints, welding, fatigue, and steel plate shear walls, to name but a few areas of his expertise and interests. Beyond that, he is a leader in steel construction through his publications, his research, work on many CSA technical committees, bridges, buildings, welding, and he is a former Governor of the Steel Structures Education Foundation.

Don Beam joined CISC in 1949 as Chief Engineer and later became the General Manager until 1968 when he became a special engineering consultant until 1970. He played a pivotal role in the development of the National Building Code of Canada, first published in November 1941. He served on the Administrative Committee, Steel and Fire Protection Sub-committees. While at CISC, he continued work in developing the NBCC, fire protection issue, and model steel specifications for use by architects and engineers. Thus, it is with pride that CISC honours Dr. Kulak with the first Don Beam Leadership Award in recognition of his very impressive leadership in the structural steel industry.

NEW SSEF WEBSITE

In June 2007 the Steel Structures Education Foundation launched their new website. So please visit www.ssef-ffca.ca and checkout the new look and greatly expanded content.

Information on all aspects of SSEF's education and research programs can now be found on the website. The site has always been a good resource for educators and students of architecture thanks to Terri Meyer Boake at the University of Waterloo. Now the engineering competitions, scholarships and research programs get comparable coverage thanks to Maura Lecce at the University of Toronto.

SSEF membership is open to any organization or individual interested in advancing the application and use of steel in structures, through education. Current members are the Canadian Institute of Steel Construction, the CWB Group, Chaparral, the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers, IPSCO Inc. and Nucor-Yamato Steel Company.

CWB CELEBRATES ITS 60TH YEAR

This year marks the 60th anniversary of the founding of the Canadian Welding Bureau, now known as the CWB Group. Originally formed as a division of the Canadian Standards Association at the urging of the CISC fabricators, the CWB has provided the necessary support and confidence in welding as a method of joining structural steel to the engineering community in Canada for six decades. CISC joins in congratulating the CWB Group on all its efforts in making welding safe, effective and routine.

WINNER OF THE 2007 SSEF G.J. JACKSON FELLOWSHIP

At the Annual Meeting of the Steel Structures Education Foundation (SSEF) on June 8th, Adam Korzekwa of École Polytechnique Montréal, was awarded the $15,000 G.J. Jackson Fellowship to continue in graduate studies on structural steel under the supervision of Professor Robert Tremblay. Adam's project is to develop and validate design rules for steel buckling-restrained braces. He will use finite element analysis techniques to study and characterize the stability and behaviour of steel core braces under cyclical plastic deformation. This is intended to lead to a component calculation methodology that prevents the core from buckling. Adam will also use experimental techniques on full-scale seismic specimens to validate his results.

COURSES (FALL 2007)

The 2005 National Building Code of Canada introduces very substantial technical changes, and to reconcile the new NBCC requirements, CSA issued S16S1-05, Supplement #1 to CAN/CSA-S16-01 (CSA S16). All of these changes necessitate a fresh look at the underlying framing decisions to be made by designers. In response, CISC is offering two one-day courses intended to provide an understanding of the design theory and the rationale behind code provisions as well as the application of specific Code formulae and requirements.

STEEL-FRAMED COMMERCIAL BUILDING DESIGN

This course will be offered once again in major centres across Canada and will focus on practical and economical solutions for framing a six-storey building. Practical steel framing concepts and integration with architectural and mechanical features will be discussed. The course notes will include design solutions for the wind-resisting system as well as typical members and components of the gravity frame.

The course is being offered on the following dates and locations:

Moncton, NB – October 10, 2007,
Holiday Inn Express

Vancouver, BC – October 29, 2007,
Best Western Hotel, Richmond

Calgary, AB – October 31, 2007,
Greenwood Inn

Toronto, ON – November 5, 2007,
Premiere Convention Centre, Richmond Hill

Montreal, QC – November 21, 2007, (in French)
Holiday Inn Midtown

SEISMIC DESIGN OF STEEL-FRAMED BUILDINGS

This high-demand course will be offered in seismically active centres in Canada for the second time and will cover the design of various categories of braced frames and moment frames to the requirements of NBCC 2005 and CSA S16-01 (S16S1-05) incorporating design examples for buildings ranging from one to ten storeys in height.

The course is being offered on the following dates and locations:

Moncton, NB – October 11, 2007,
Holiday Inn Express

Vancouver, BC – October 30, 2007,
Best Western Hotel, Richmond

Calgary, AB – November 1, 2007,
Greenwood Inn

Toronto, ON – November 6, 2007,
Premiere Convention Centre, Richmond Hill

Montreal, QC – November 22, 2007, (in French)
Holiday Inn Midtown

An interactive online registration form is available at http://www.cisc-icca.ca/courses/

BOLTING AND WELDING FOR DESIGN ENGINEERS

This popular course is designed to provide an introduction to the basics of bolting and welding of steel structures with emphasis on practical and economical solutions. Although not a connection design course per se, participants will come away with a solid understanding of the materials, products, specifications, installation, field challenges and design methodologies for connecting structural steel components.

Toronto, ON – December 6, 2007
Register online at www.cisc-icca.ca/courses.

EVENTS

The Steel Conference, NASCC 2008,
April 2 – 5, 2008 Nashville, TN

IABSE Conference – Information and Communication Technology (ICT) for Bridges, Buildings and Construction Practice
June 4 – 6, 2008 Helsinki, Finland
www.iabse.org/conferences/helsinki2008

CISC and SSEF Annual General Meetings
June 4 – 7, 2008
Fairmount Algonquin
St. Andrews, NB

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

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* Mount Pearl, Nfld. (709) 745-8060
www.cherubinigroup.com

Marid Industries Limited S
Windsor Junction, N.S. (902) 860-1138
www.marid.ns.ca

MacDougall Steel Erectors Inc. S
Cornwall, PEI (902) 855-2100
www.mse-steel.ca

Maritime Steel and Foundries Limited S,P
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www.maritimesteel.com

MQM Quality Manufacturing Ltd. S,P
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Ocean Steel & Construction Ltd. S,P
Saint John, N.B. (506) 632-2600
www.oceansteel.com

Prebilt Structures Ltd. S,P
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* Summerside, P.E.I. (902) 436-920l

RKO Steel Limited S,P
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www.rkosteel.com

Tek Steel Ltd. S
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Titan Metal Group Ltd. S
Saint-Antoine, NB (506) 525-2416
www.titansteelgroup.com

QUÉBEC REGION

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www.metauxspec.ca

Acier Robel inc. S
St-Eustache, Québec (450) 623-8449
www.acierrobel.com

Acier Trimax Inc. S
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www.trimaxsteel.com

Alma Soudure Inc S
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www.almasoudure.com

B.K. Fer Ouvré/Iron Works Inc. S
St-Bruno, Québec (450) 441-5484

Constructions PROCO Inc. S
St. Nazaire, Québec (418) 668-3371
www.proco.ca

Industries Canatal Inc. S
Thetford Mines, Québec (418) 338-6044
www.canatal.net

Canam and Structal S,J
Beauce, Québec (418) 582-3331
* Boucherville, Québec (450) 641-4000
* Sainte-Foy, Québec (418) 652-8031
www.canam.ws

Jean Yves Fortin Soudure Inc.
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Lainco Inc. S
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Les Aciers Fax Inc. S
Charlesbourg, Quebec (418) 841-7771

Les Acier Jean-Pierre Robert inc. S
Laval, Québec (450) 661-4400
www.jprobert.ca

Les Charpentes d'acier Sofab Inc. S
Boucherville, Québec (450) 641-2618
www.sofab.ca

Les Constructions Beauce-Atlas Inc. S
Ste-Marie de Beauce, Québec (418) 387-4872
* Montréal, Québec (514) 942-7763
www.beauceatlas.ca

Les Industries V.M. inc. S
Longueuil, Québec (450) 651-4901

Les Métaux Feral Inc S
St-Jerome, Québec (450) 436-8353

Les Structures C.D.L. Inc. S
St-Romuald, Québec (418) 839-1421
www.structurescdl.com

Les Structures GB Ltée S,P
Rimouski, Québec (418) 724-9433
www.structuresgb.com

Les Structures Gialay Inc. S
Varennes, Québec (450) 929-4765

Locweld Inc. S
Candiac, Québec (450) 659-9661
www.locweld.com

Métal Moro Inc. S
Montmagny, Québec (418) 248-1018

Métal Perrault Inc.
Donnacona, Québec (418) 285-4499

Nico Métal inc. S
Trois-Rivières, Québec (819) 375-6426
www.nico-metal.com

Delta Joists Inc./ Poutrelles Delta Inc. J
Saint-Marie, Beauce, Québec (418) 387-6611
* Montréal, Québec (450) 923-9511
www.deltajoists.com

Quéro Métal inc. S
St. Romuald, Québec (418) 839-0969
www.querometal.com

Quirion Métal Inc. S
Beauceville, Québec (418) 774-9881
www.quirionmetal.com

Structal - Bridge (Division of Canam Group Inc.) S,P,F
Québec, Québec (418) 683-2561
www.structal.ws

Structures Yamaska inc. S
Saint-Césaire, Québec (450) 469-4020

Sturo Métal Inc. S
Levis, Québec (418) 833-2107
www.sturometal.com

Supermétal Structures Inc. S,P
St. Romuald, Québec (418) 834-1955
www.supermetal.com

Systèmes TAG (2844249 Canada Inc.) S
Ange-Gardien, Québec (450) 379-9661

ONTARIO REGION

ACL Steel Ltd. S
Kitchener, Ontario (519) 568-8822
www.aclsteel.ca

Agent Steel Inc. S
Bolton, Ontario (905) 857-4437
www.agentsteel.ca

Benson Steel Limited S,J
Bolton, Ontario (905) 857-0684
www.bensonsteel.com

Burnco Mfg. Inc. S
Brampton, Ontario (905) 794-5400
www.burncomfg.com

Canam – Joists and Steel Deck, Division of Canam Group Inc. J
Mississauga, Ontario (905) 671-3460
www.canam.ws

Central Steel Fabricators Limited S,J
Hamilton, Ontario (905) 547-1437

Central Welding & Iron Works Group S,P
North Bay, Ontario (705) 474-0350
www.central-welding.com

Cooksville Steel Limited S
Mississauga, Ontario (905) 277-9538
Kitchener, Ontario (519) 893-7646
www.cooksvillesteel.com

Eagle Bridge Inc. S
Kitchener, Ontario (519) 743-4353

Ed Lau Ironworks Limited S
Kitchener, Ontario (519) 745-5691
www.edlau.com

Etobicoke Ironworks Limited S
Weston, Ontario (416) 742-7111
www.eiw-ca.com

Fortran Steel Inc. S
Greely, Ontario (613) 821-4014
www.fortransteel.com

G & P Welding & Iron Works S,P
North Bay, Ontario (705) 472-5454
www.gpwelding.com

Gorf Contracting Limited S,P
Schumacher, Ontario (705) 235-3278
www.gorfcontracting.com

Lambton Metal Service S
Sarnia, Ontario (519) 344-3939
www.lambtonmetalservice.ca

Laplante Welding of Cornwall Inc. S
Cornwall, Ontario (613) 938-0575
www.laplantewelding.com

Lorvin Steel Ltd. S
Brampton, Ontario (905) 458-8850
www.lorvinsteel.com

Maple Industries Inc. S
Chatham, Ontario (519) 352-0375
www.mapleindustries.ca

Mariani Metal Fabricators Limited S
Etobicoke, Ontario (416) 798-2969
www.marianimetal.com

M & G Steel Ltd. S
Oakville, Ontario (905) 469-6442
www.mgsteel.ca

MBS Steel Ltd. J
Brampton, Ontario (905) 799-9922
www.mbssteel.com

M.I.G. Structural Steel (div. of 3526674 Canada Inc.) S
St-Isidore, Ontario (613) 524-5537
www.migsteel.com

Mirage Steel Limited S.J
Brampton, Ontario (905) 458-7022
www.miragesteel.com

Niagara Structural Steel, A Division of Canadian Erectors Limited S,P
1-888-853-4346
St. Catharines, Ontario (905) 684-2022
www.niagarastructuralsteel.com

Nickel City Steel Limited S,P
Sudbury, Ontario (705) 522-1982

Norak Steel Construction Limited S
Concord, Ontario (905) 669-1767

Noront Steel (1981) Limited S,P
Copper Cliff, Ontario (705) 692-3683
www.norontsteel.com

Nor-Weld Ltd. S
Orillia, Ontario (705) 326-3619
www.norweld.com

Paramount Steel Limited S
Brampton, Ontario (905) 791-1996
www.paramountsteel.com

Paradise Steel Fab. Ltd.
Richmond Hill, Ontario (905) 770-2121

Pittsburgh Steel Group (A Division of 1226616 Ontario Inc.) S
Vaughan, Ontario (905) 669-5558
www.pittsburghsteel.com

Quad Steel Inc.
Bolton, Ontario (905) 857-6404

Rapid Steel Inc. S
Erin, Ontario (519) 833-4698
www.rapidsteel.com

Shannon Steel Inc. S
Orangeville, Ontario (519) 941-7000
www.shannonsteel.com

Skyhawk Steel Construction Limited S
Brampton, Ontario (905) 458-0606
www.skyhawksteel.com

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

Spec-Sec Incorporated S,P
Rexdale, Ontario (416) 213-9899
www.spec-sec.com

Spencer Steel Limited S
Ilderton, Ontario (519) 666-0676
www.spencersteel.com

* **Supermétal Structures Inc.** S, P
Oshawa, Ontario 1-800-361-0810
www.supermetal.com

Telco Steel Works Ltd. S
Guelph, Ontario (519) 837-1973
www.telcosteelworks.ca

Tower Steel Company Ltd. S
Erin, Ontario (519) 833-7520
www.towersteel.com

Tresman Steel Industries Ltd. S
Mississauga, Ontario (905) 795-8757
www.tresmansteel.com

Victoria Steel Corporation S
Oldcastle, Ontario (519) 737-6151

Walters Inc. S,P
Hamilton, Ontario (905) 388-7111
www.waltersinc.com

CENTRAL REGION

Abesco Ltd. S
Winnipeg, Manitoba (204) 667-3981

Capitol Steel Corp. S
Winnipeg, Manitoba (204) 889-9980

Coastal Steel Construction Limited S,P
Thunder Bay, Ontario (807) 623-4844
www.coastalsteel.ca

Elance Steel Fabricating Co. Ltd S
Saskatoon, S.K. (306) 931-4412
www.elancesteel.com

Empire Iron Works Ltd. S
Winnipeg, Manitoba (204) 589-7371
www.empireiron.com

Falcon Machinery 1965 Ltd.
Winnipeg, Manitoba (204) 927-7000
www.falcongalv.com

IWL Steel Fabricators S,P
Saskatoon, SK (306) 242-4077
www.iwlsteel.com

JNE Welding Ltd. S,P
Saskatoon, SK (306) 242-0884
www.jnewelding.com

* **Omega Joists Inc.** J
Winnipeg, Manitoba (204) 237-3528
www.omegajoists.com

Precision Industries Ltd. S,P
Prince Albert, SK (306) 763-7471
www.precisionindustrialltd.com

Shopost Iron Works (1989) Ltd. S
Winnipeg, Manitoba (204) 233-3783
www.shopost.com

Supreme Steel Ltd. S,P
Saskatoon, SK (306) 975-1177
www.supremesteel.com

Weldfab Limited S
Saskatoon, SK (306) 955-4425
www.weldfab.com

ALBERTA REGION

Bow Ridge Steel Fabricating S
Calgary, Alberta (403) 230-3705

Canam – Joists and Steel Deck, Division of Canam Group Inc J
Calgary, Alberta (403) 252-7591
www.canam.ws

Capital Steel Inc.
Edmonton, Alberta (780) 463-9177

Collins Industries Ltd. S
Edmonton, Alberta (780) 440-1414
www.collins-industries-ltd.com

C.W. Carry (1967) Ltd. S,P
Edmonton, Alberta (780) 465-0381
www.cwcarry.com

Empire Iron Works Ltd. S,P,J
Edmonton, Alberta (780) 447-4650
www.empireiron.com

Eskimo Steel Limited S,P
Sherwood Park, Alberta (780) 417-9200
www.eskimosteel.com

Garneau Welding Inc. S
Morinville, Alberta (780) 939-2129
www.garweld.com

Moli Industries Ltd. S
Calgary, Alberta (403) 250-2733
www.moli.ca

Norfab Mfg. (1993) Inc.
Edmonton, Alberta (780) 447-5454

Northern Weldarc Ltd.
Sherwood Park, Alberta (780)467-1522
www.northern-weldarc.com

Omega Joists Inc. J
Nisku, Alberta (780) 955-3390
* Calgary, Alberta (403) 250-7871
www.omegajoists.com

Petro-Chem Fabricators Ltd. S
Edmonton, Alberta (780) 414-6701

Precision Steel & Manufacturing Ltd. S
Edmonton, Alberta (780) 449-4244
www.precisionsteel.ab.ca

Rampart Steel Ltd. S
Edmonton, Alberta (780) 465-9730
www.rampartsteel.com

RIMK Industries Inc.
Calgary, Alberta (403) 236-8777

Spartan Steel Ltd. S
Edmonton, Alberta (780) 435-3807

Supermétal Structures Inc., Western Division S,P
Edmonton, Alberta (780) 435-6633
www.supermetal.com

Supreme Steel Ltd. S,P
Edmonton, Alberta (780) 483-3278
www.supremesteel.com

Supreme Steel Ltd., Bridge Division S,P
Edmonton, Alberta (780) 467-2266
www.supremesteel.com

Triangle Steel (1999) Ltd. S,P
Calgary, Alberta (403) 279-2622
www.trianglesteel.com

TSE Steel Ltd. S
Calgary, Alberta (403) 279-6060
www.tsesteel.com

Waiward Steel Fabricators Ltd. S,P
Edmonton, Alberta (780) 469-1258
www.waiward.com

W.F. Welding & Overhead Cranes Ltd. S
Nisku, Alberta (780) 955-7671
www.wfwelding.com

Whitemud Ironworks Limited S
Edmonton, Alberta (780) 465-5888
www.whitemud.com

BRITISH COLUMBIA REGION

* **Canam – Joists and Steel Deck, Division of Canam Group Inc.** J
Port Coquitlam, B.C. (604) 583-9760
www.canam.ws

Canron Western Constructors Ltd. S,P
Delta, B.C. (604) 524-4421
www.supremesteel.com

Clearbrook Iron Works Ltd. S
Abbotsford, B.C. (604) 852-2131
www.cliron.com

Dynamic Structures Ltd. S,P
Port Coquitlam, B.C. (604) 941-9481
www.empireds.com

Empire Iron Works Ltd. S
Delta, B.C. (604) 946-5515
www.empireiron.com

George Third & Son S,P
Burnaby, B.C. (604) 526-2333
www.geothird.com

J.P. Metal Masters Inc. S
Maple Ridge, B.C. (604) 465-8933
www. jpmetalmasters.com

M3 Steel (Kamloops) Ltd. S,P
Kamloops, B.C. (250) 374-1074
www.m3steel.com

Macform Construction Group Inc.
Surrey, BC (604) 888-1812

* **Omega Joists Inc.** J
Surrey, B.C. (604) 596-1138
www.omegajoists.com

Rapid-Span Structures Ltd. S,P
Armstrong, B.C. (250) 546-9676
www.rapidspan.com

Solid Rock Steel Fabricating Co. Ltd. S
Surrey, B.C. (604) 581-1151
www.solidrocksteel.com

Warnaar Steel-Tech Ltd. S
Kelowna, B.C. (250) 765-8800

Wesbridge Steelworks Limited S
Delta, B.C. (604) 946-8618
www.wesbridge.com

X.L. Ironworks Co. S,J
Surrey, B.C (604) 596-1138
www.xliron.com

CISC DETAILER MEMBERS

9009 - 7403 Québec Inc. B
Lachenaie, Québec (450) 654-0270

ABC Drafting Company Ltd. B
Mississauga, Ontario (905) 624-1147
www.abcdrafting.com

ACL Structural Consultants B
Sylvan Lake, Alberta (403) 887-5300
www.acl-corp.com

A.D. Drafting B
Brampton, Ontario (905) 488-8216

Aerostar Drafting Services B
Georgetown, Ontario (905) 873-6565

Automated Steel Detailing Associates Ltd. (ASDA) B,Br,P
Toronto, Ontario (416) 241-4350
www.asda.ca

Base Line Drafting Services Inc. D,B
Concord, Ontario (905) 660-7017
www.bld.ca

B.D. Structural Design Inc./ Dessin Structural B.D. Inc. B,Br,P,J
Boucherville Québec (450) 641-1434
www.bdsd.com

Cadmax Detailing Inc./Dessin Cadmax Inc. B,Br
Bois-des-Fillon, Québec (450) 621-5557
www.cadmax.ca

Capacity Plus Inc. B
Mississauga, Ontario (905) 267-0647
www.capacity-plus.com

Datadraft Systems Inc./ Les Systèmes Datadraft Inc. S,P,J,B
Montréal, Québec (514) 748-6161
www.datadraft.com

Detailed Design Drafting Services Ltd. B
Parksville, B.C. (250) 248-4871
www.detaileddesign.com

Dessins de Structures DCA Inc.
Levis, Québec (418) 835-5140

Dowco Consultants Ltd. B,Br,P
Surrey, BC (604) 606-5800
Maple Ridge, BC (604) 462-7770
Laval, QC (450) 963-4455
Mississauga, ON (905) 565-9030
www.dowco.com

GENIFAB B,Br
Charlesbourg, Quebec (418) 622-1676
www.genifab.com

Haché Technical Services Ltd./ Haché Services Techniques Ltée B,P
Caraquet, N.B. (506) 727-7800

Husky Detailing Inc. B
London, Ontario (519) 850-9802
www.huskydetailing.com

International Steel Detailing Ltd. B
Nanaimo, B.C. (250) 758-6060
www.intersteel.ca

IRESCO Ltd. B
Edmonton, Alberta (708) 433-5606
www.steeldetailers.com

JCM & Associates B,P
Frankford, Ontario (613) 398-6510

JP Drafting Ltd. B,Br,P,J
Maple Ridge, B.C. (604) 465-3568
www.jpdrafting.com

KGS Group Steel Detailing Division
Winnipeg, MB (204) 896-1209
www.kgsgroup.com

Les Dessins de Structures Steltec Inc. B
Ste-Thérèse, Québec (450) 971-5995
www.steltec.ca

Les Dessins Trusquin Inc. B,Br
Laval, Québec (450) 688-7336

Maximum Steel Detailing Inc. B
Langley, B.C. (604) 514-1474

M & D Drafting Ltd. B,Br,P
Edmonton, Alberta (780) 465-1520
Surrey, BC (604) 513-4210
www.mddrafting.com

MHM Drafting Inc. B
Wellesley, Ontario (519) 656-2059

M-Tec Drafting Services Inc. B
Sherwood Park, Alberta (780) 467-0903
www.mtecinc.ca

ProDraft Inc. B,Br,P
Surrey, B.C. (604) 589-6425
www.prodraftinc.com

Ranmar Technical Services B,P
Mt. Pearl, Nfld. (709) 364-4158
www.ranmartech.com

Saturn Holdings Limited B
Winnipeg, Manitoba (204) 663-4649

SDI Structural Drafting Inc. B,Br,P
Edmonton, Alberta (780) 463-2140
www.sdiinc.ca

TDS Industrial Services Ltd. B,P
Prince George, B.C. (250) 561-1646
www.tdsindustrial.com

Techdess Inc. B
Saint-Jérôme, Québec (450) 569-2629
www.techdess.com

Tenca Steel Detailing Inc. Br
Charlesbourg, Quebec (418) 634-5225
www.tensorengr.com

ASSOCIATE - ERECTOR

E.S. Fox Limited B
Niagara Falls, Ontario (905) 354-3700
www.esfox.com

K C Welding Ltd. B
Angus, Ontario (705) 424-1956

Montacier Plus Inc. B,Br
Boisbriand, Québec (450) 430-2212
www.montacier.com

Montage D'acier International
Terrebonne, Québec (450) 965-7360

Supermétal-Mojan Inc. B,Br,J
St-Romuald, Québec (418) 834-1955
www.supermetal.com

ASSOCIATE - SUPPLIER

Acier Picard Inc.
St-Romuald, QC (418) 834-8300
www.acierpicard.com

Advanced Bending Technologies Inc.
Langley, B.C. (604) 856-6220/ 1-800-563-2363
www.bending.net
(Rolled or bent structural sections)

AIR LIQUIDE CANADA INC.
Vanier, Québec (418) 683-1917
www.airliquide.com
(Industrial gases, welding materials & equip.)

Altitube Steel Inc./Acier Altitube Inc.
Chomedey, Québec (514) 637-5050
www.altitube.com
(Specializing in tubes (HSS), structural pipe)

Amcan Produits Filetés Inc.
Saint Bruno de Montarville, Québec (450) 441-6011
www.amcanfasteners.com
(Bolts)

Amercoat Canada
Montréal, Québec (514) 333-1164
Oakville, Ontario (905) 847-1500
www.amercoatcanada.com
(Protective paints and coatings)

American Iron & Metal Inc./ La Compagnie Américaine de Fer et Métaux Inc.
East Montréal, Québec (514) 494-2000
www.scrapmetal.net

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

Amcan Jumax Inc.
Ste-Julie, Québec (450) 922-1987
www.jumax.net
(bolts, Nelson studs, anchors, hot-dip galvanization)

Atlantic Industries Limited
Dorchester, NB (506) 379-2428
www.ail.ca
(galvanizing)

Blastal Coatings Services Inc.
Brampton, Ontario (905) 459-2001
www.blastal.com
(Wheelbrating, blasting, glass bead services, epoxy coatings, enamels, zinc rich primers, metalizing, plastic flame coating)

Blastech Corporation
Brantford, Ontario (519) 756-8222
www.blastech.com
(Abrasive blasting, glass bead blasting application of liquid coatings, baked on coatings and powder coatings of metalizing)

Bolair
Mississauga, ON (905)564-2231
www.bolair.ca
Paint spray equipment & accessories, ie: hoses, valves, filters, spray guns, etc.

Borden Metal Products (Canada) Limited
Beeton, Ontario (905) 729-2229
www.bordengratings.com
(Aluminum, Stainless Steel, Steel Grating)

Brunswick Steel
Winnipeg, Manitoba (204) 224-1472
www.brunswicksteel.com
(Steel - Structures plate bars hss)

Canadian Galvanizing Ltd.
Edmonton, Alberta (780) 479-5547
(Hot dip galvanizing)

Cloverdale Paint Inc.
Edmonton, Alberta (780) 453-5700
www.cloverdalepaint.com
(Specialty hi-performance industrial coatings and paint products)

Commercial Sandblasting & Painting Ltd.
Saskatoon, Saskatchewan (306) 931-2820
(Sandblasting and protective coating applications)

Corrcoat Services Inc.
Surrey, BC (604) 881-1268

CMC Steel division of Crawford Metal Corp./ Acier CMC division de Crawford Metal Corp.
Longueuil, Québec (450) 646-6000
(Angles, channels, hss, beams, plates)

Custom Plate & Profiles
Delta, B.C. (604) 524-8000
www.customplate.net
(Cut to size steel plate in various grades to 12" thick. Stock size sheets of plate to 12")

Daam Galvanizing Inc.
Edmonton, Alberta (780) 468-6868
www.daamgalvanizing.com
(Hot dip galvanizing)

Devoe Coatings
Edmonton, Alberta (780) 454-4900
www.devoecoatings.com
(Coating, paint)

Distribution d'Acier de Montréal
St-Hyacinthe, Québec (450) 771-7101
(Steel tubes (HSS), round, square and rectangular)

EBCO Metal Finishing L.P.
Richmond, B.C. (604) 244-1500
www.ebcometalfinishing.com
(Hot dip galvanizing)

EDVAN Industries Inc.
Nisku, Alberta (780) 955-7915
www.edavancan.com
(Shear & form of steel plates & coil, supply of safety grating – grip strut, pert-o grip, traction, tread))

Endura Manufacturing Co. Ltd.
Edmonton, Alberta (780) 451-4242
www.endura.ca
(Paint and Coating Materials)

Fisher & Ludlow, A Division of Harris Steel Limited
Longueuil, Québec (450) 670-5085
Edmonton, Alberta (780) 481-3941
Surrey, B.C. (604) 888-0911
www.fisherludlow.com
(Welded steel /aluminum/stainless steel grating, "Grip Span" and "Shur Grip" safety grating)

Frank's Sandblasting & Painting
Nisku, Alberta (780) 955-2633

General Paint/Ameron Protective Coatings
Vancouver, B.C. (604) 253-3131
www.generalpaint.com
(Shop primers, protective coatings, paint)

Globec Machinery/Globec Machineries
Quebec, QC (418)864-4446
www.globec-machinery.com

ICI Devoe Coatings
Vancouver, B.C. (604) 637-1152
www.devoecoatings.com
(Paints, Linings, Protective Coatings)

Industrie Dry-Tec Coating inc.
Terrebonne, Québec (450) 965-0200
www.drytec.ca
(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)

Kubes Steel Inc.
Stoney Creek, Ontario (905) 643-1229
www.kubessteel.com

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)

Les Industries Méta-For Inc.
Terrebonne, QC (405) 477-6322
www.meta-for.ca

Marmon Keystone Canada Inc.
Langley, B.C. (604) 857-9844
Leduc, AB (708) 986-2600
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)

Pacific Bolt Maufacturing Ltd.
New Westminster, BC (604) 524-2658
www.pacolt.com
Steel fasteners, structural bolts, anchor bolts, tie rods.

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)

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
Winnipeg, MB (204) 669-9500
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
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