ADVANTAGE STEEL

CISC

CISC Alberta Alliance: Focusing – Forging

Interchange opens Oakville to the future

Architectural Student Design Competition – Has 'Corner Gas' landed 'On the Island'?

PUBLICATION OF THE CANADIAN INSTITUTE OF STEEL CONSTRUCTION NUMBER 21 FALL 2004

From the editor

While 'Corner Gas' is a new truly Canadian TV comedy series, 'On the Island' was the title of this year's SSEF Architectural Student Competition for which these aspiring minds had to develop a novel canopy structure for a gas bar (island). Congratulations to all who entered – read about it on page 16.

Several regions of the CISC have conducted surveys of their regional fabricator membership to ascertain the capacity to handle large projects in their region. In this issue, the Alberta Region Alliance is featured.

In his address at CISC's Annual General Meeting, Garry Kerrison of XL Ironworks states, "Looking ahead… opportunity and options for the steel (fabrication) industry are exceptionally promising." CISC Members look forward to your projects with enthusiasm.

Michael I. Gilmor,
President, CISC

Above: Replacement of the existing structure at QEW and Third LIne Road

Cover: 2003/2004 SSEF Student Architectural Competition

In this issue

Advantage Steel Number 21 Fall 2004

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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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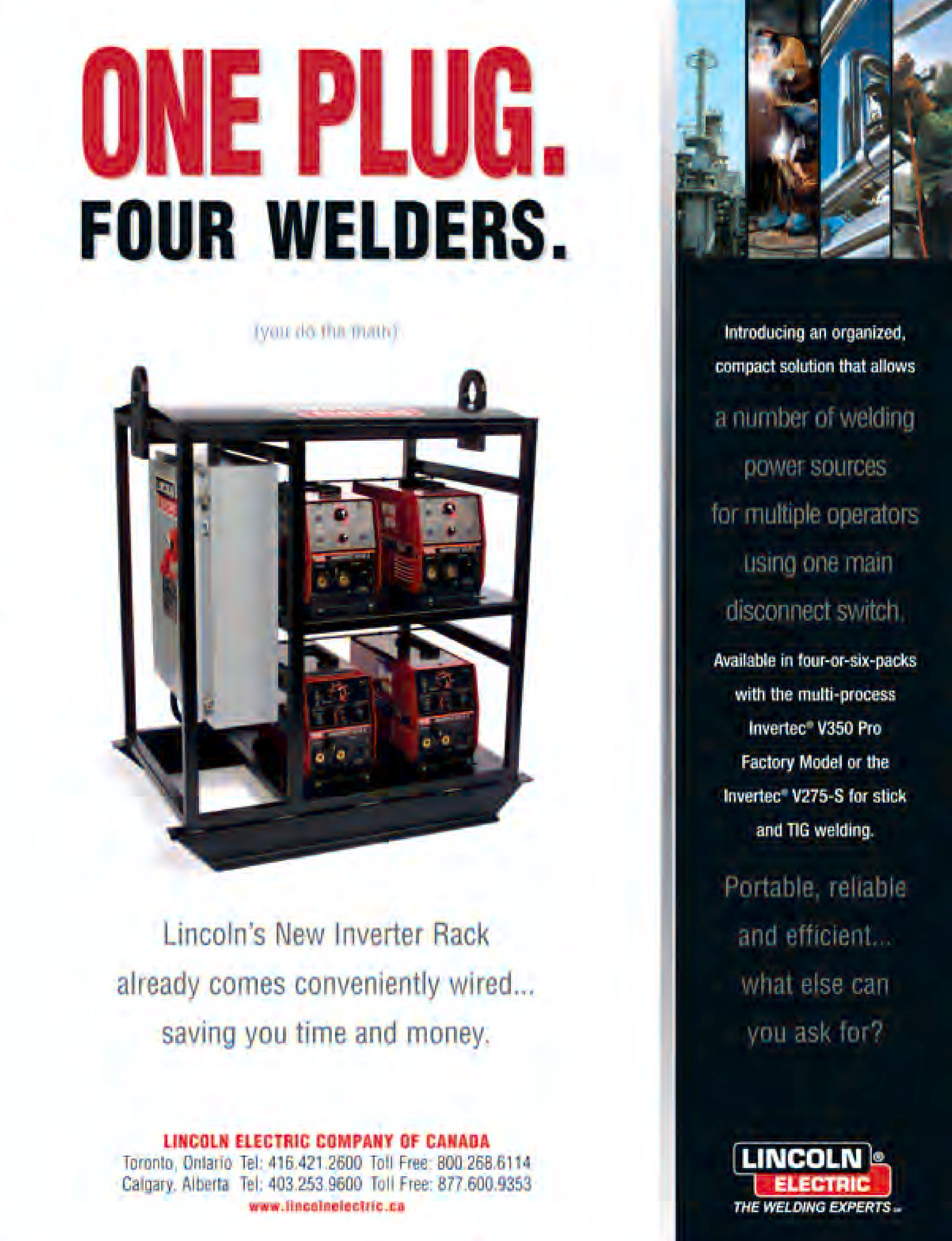

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ASK DR. SYLVIE

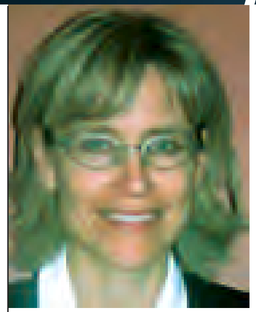


Photo by: Adrien Voutaz

Curved steel

My query is about the design of a 5m long HSS arched member of a canopy with a 1m vertical. Can we design it simply as if it was a straight member, i.e. a beam column? Are there other methods to design this type of vertical curved member? Any references you can point me to?
– *S.M.*

I thought I would have a quick answer for you. However, to my knowledge, there is nothing specifically on curved members in S16-01, or other Canadian design references. The American Steel Mills' Technical Committee on Structural Shapes is currently sponsoring the writing of a guide entitled "Bending of steel shapes for construction – A guide for architects, engineers and contractors". The guide will focus on straightening, cambering and curving structural steel shapes of common structural grades. It will briefly highlight bending equipment and applications, but get into more depth on curving mechanics and analysis, including practical criteria for shape curving (bending), such as sample limits of curving using basic curving criterion developed by Reidar Bjorhovde. Some answers to questions about the effect of residual stresses due to the bending process can be found in Question 4.4.11 of AISC's FAQ - www.aisc.org/faq.

In the UK, the Steel Construction Institute has developed, as part of their Specialist Design Guides, a document called "Design of Curved Steel", intended to assist structural design engineers. There are several worked examples covering common applications and structural arrangements in buildings. Technical aspects regarding the curving process and the metallurgical issues are also briefly addressed. The document can be purchased through their web site, at www.steelbiz.org.

That's for the documentation. As you know, architects specify curved steel more and more for its undoubted aesthetic appeal, which means that engineers ARE designing them. So what do real engineers do in the real world? They apply basic principles and S16-01.

A common practice for a first analysis is to divide the curved member into many discrete elements, and then refine. Design considerations will be very different if the curvature is in elevation or in plan. Depending on the axial load, Babak Seyed, from Yolles Engineering in Toronto, put much of his effort into the P-Δ analysis to design the Niagara Casino curved (in elevation) dome members. A grey zone seems to exist for determining which load factor to apply to the P-Δ loads and what effective length K to assume. He used a finite element analysis program. Cintube, who curved the members for the Casino project, said that a radius as low as 3 timesthe diameter of the tube can be applied without difficulty provided the wall thickness is not too thin.

Andrew Metten, from Bush Bohlman Partners in Vancouver, said that for one of the curved (in plan) peripheral beams at the Vancouver Airport, much of the engineering effort went into taking the torsional forces away from the member and especially the connections, to reduce deflections. For that reason, he generally encourages architects to use a closed section, such as an HSS. A space frame program was judged sufficient, and subsequent tweaking of the discrete elements was applied. Depending on the radius and type of curvature sought, Andrew Metten likes to discuss with a bending specialist, such as Advanced Bending Technology or Marks Metal Technology, early on in the process.By the way, this is my first question from Bermuda.
How on earth did you get my name?

Anchor rods

On a recent project, A325 anchor bolts were specified, but I was told that they were not available? Does Canada not produce anchor bolts?
– A.R.

Traditionally, the term 'anchor bolts' has been used to describe what we now call 'anchor rods'. ASTM A325 is the standard specification for Structural Bolts, Steel, Heat Treated 120/105 ksi Minimum Tensile Strength. These bolts range in diametre from 1/2" to 1 1/2" only, and are intended for structural connections involving only steel.

On the other hand, anchor rods may be of various structural grade steels, may be hooked or straight, threaded at one or both ends, or even made from deformed bars. Commonly anchor rods have been made from either ASTM A36 steel or rods conforming to G40.21-300W grade steels.

In the 8^{th} Edition Handbook, on page 4-153, you will also find other tidbits on anchor rods, namely a reference to ASTM F1554. That means rods of 36, 55 and 110 ksi grades can be used. If you have specific questions on fasteners, you might want to try Haydon Bolts' Bulletin Board (I did!): www.haydonbolts.com.

Ductile connections

According to Clause 27.10(a) of CSA Standard S16-01, can you elaborate on what is meant by "the expected connection failure mode is ductile"?
– J.M.

That is a very good question, but harder to answer in a few words. Although steel is ductile, according to Michael Gilmor, the manner by which we attach members and components can vastly improve "ductility" of the assembly. According to the CISC Commentary: "Some details that may be considered as achieving ductile failure modes when appropriately proportioned include extended-end-plate moment connections, flange plate moment connections, gusset plates proportioned for ductility (Cheng and Grondin), welded connections comprising fillet welds loaded primarily in shear, and bolted connections in which the governing failure mode corresponds to bolt bearing failure."

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.

CISC CHAIRMAN'S ADDRESS

The following is an excerpt from CISC Chairman, Garry Kerrison's address at the 74th CISC Annual General Meeting, held in Jasper, Alberta on June 12, 2004.

"In today's turbulent market, it's important to see that there is still evolution. Our steel industry has suffered through many recent tragic events, including terrorist attacks, Middle East wars, cross border trade issues, and a rising Canadian dollar. After stick handling our way through these challenges, we probably figured we had seen everything. Then, half way around the world a country called China causes scrap metal prices to escalate, placing weekly and bi-monthly surcharges on our material prices. These higher prices are here to stay and stabilization in just on the horizon.

In the meantime, we need to educate owners, developers, architects, consulting engineers and general contractors as to the impact of increased structural steel prices on their projects. Price increases at steel mills and service centres have only a small impact on the overall cost of a project.

For example, on a typical commercial project, the cost of the fabricated and erected steel frame represents only 10 to 12% of the total cost. Material cost of that steel frame package accounts for only 20 to 25% of the fabricated/erected costs. In other words, mill material costs account for only 2 to 3 % of the total project costs, and a 40% increase in mill costs would only equate to 1% in project costs. Lets get this message out to the decision makers.

It is important to note that many other facets of construction projects, including building materials and trade services, are also undergoing cost increases. The owner/builder/developers must not focus strictly on the comparison of old steel prices versus new steel prices. Project cost increases cannot be laid solely at the feet of the structural steel industry, and they most certainly cannot be brought under control by simply shifting to a different structural framing system.

The rising price of other construction materials gives us steel industry professionals the perfect opportunity to truly illustrate we are knowledgeable and professional individuals. We can showcase to the engineering community, the primary benefits of choosing a structural steel frame versus something different. We all know them – a steel frame is significantly lighter than other materials, and more economical.

Steel mills producing structural shapes and plates have significantly reduced their production time, and are now geared to deliver in 4 to 6 weeks rather then 10 to 14 weeks. The steel fabrication industry has made strides in automating their shop floors with sophisticated high-tech CNC equipment, enabling them to receive electronic digital information directly from 3D modeled computer assisted drawings. The most challenging geometric steel shapes can be formatted into 3D models by extracting shop drawings at speeds 30 to 40 percent faster than completing them manually. All this attributes to smoother production lines and accelerated schedules that help generate earlier revenues for owners.

In conclusion, we are more then just steel fabricators, mill producers, service centres, detailers and erectors, we are professional specialty steel experts, especially when we work together as a whole industry. The structural steel industry has never been more ready to position itself to evaluate innovative framing techniques, technological improvements for cost and schedule effectiveness.

Looking ahead to 2005 and beyond, opportunities and optimism for the steel industry are exceptionally promising. Developing nations like China and India will have vast building requirements with domestic manufacturers and suppliers of goods and services needing infrastructure expansions. Low interest rate trends will cause governments and private developers to turn to real estate and construction investments, and globalization means more trade, and more warehousing and distribution facilities.

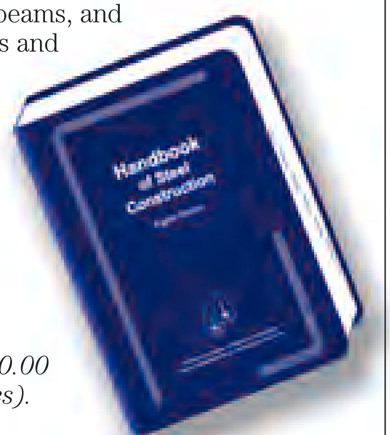
New standards for building codes means replacement or upgrading, and the continuous desire to improve lifestyles and promote longer living means new structures for entertainment, travel, healthcare and education facilities.

A growing requirement for design/build development is putting structural steelwork back to the experts and this stimulates efficiency. Structural steel will still be the construction material of choice, in order to provide the aesthetic appeal and architectural expression that is so important in public buildings and entertainment centres.

It will take each one of us as steel professionals to speak with confidence to a questioning and evolving design/construction industry and tell them clearly that structural steel remains cost effective, available and the material of choice."

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

Handbook of Steel Construction, Eighth Edition
The Eighth Edition, now in stock, contains detailed information required for designing and detailing of structural steel in SI metric units, extensively revised and enlarged. Tables are based on product-based steel grades: CSA-G40.21 350W, ASTM A572 50W, ASTM A992 and ASTM A500, and on new k-dimensions. Organized in eight parts, it includes a copy of the Standard CAN/CSA S16-01; CISC Commentary on S16-01; design tables for bolts, welds, connections, beams, and columns; revised properties and dimensions of structural steel shapes; CISC Code of Standard Practice for Structural Steel, Sixth Edition, 1999; miscellaneous data; and index.



The Eighth Edition is available at the introductory price of $150.00 CAD(plus applicable taxes). To order your copy, download an order form from www.cisc-icca.ca/pub1.

Crane-Supporting Steel Structures Design Guide
Written by R.A. MacCrimmon of Acres International, Niagara Falls, Ontario, this guide fills a long standing need for a technical guide for the design and construction of crane-supporting steel structures that is compatible with Canadian codes and standards. It is intended to be used in conjunction with the National Building Code of Canada (NBCC 2005), and CSA Standard S16-01, Limit States Design of Steel Structures.

This booklet is available complimentary and the full 134 page publication can be downloaded in PDF format directly from the CISC website by visiting, www.cisc-icca.ca/pub1.

Moment Connections for Seismic Applications
This CISC publication concentrates on the seismic design and ductile detailing criteria for some of the moment frame connections provided in FEMA 350 Recommended Seismic Design Criteria forNew Steel Moment-FrameBuildings (FEMA 2000a). CSA S16-01 permits the used of these connections in Ductile and Moderately Ductile moment resisting frames in lieu of full-scale tests.

Upcoming Events

North American Steel Construction Conference (NASCC), April 6 – 9, 2005, Montreal, Québec
The 2005 event will be held in Montreal, Quebec, from April 6 to 9, and feature plenty of speakers, and technical sessions focusing on current topics of interest to structural engineers, fabricators, detailers, erectors and educators. Some features, in particular, include topics such as, Design of Buckling-Restrained Braced Frames, How to Select Cranes and Rigging, Comparison of Steel Detailing Methods: Pacific Rim Countries. A special tutorial workshop will also be available on Seismic Design to Canadian Codes and Standards, plus other goodies.

The NASCC is a collaborative of the Canadian Institute of Steel Construction (CISC), the American Institute of Steel Construction (AISC) and the Mexican Institute of Steel Construction (IMCA).

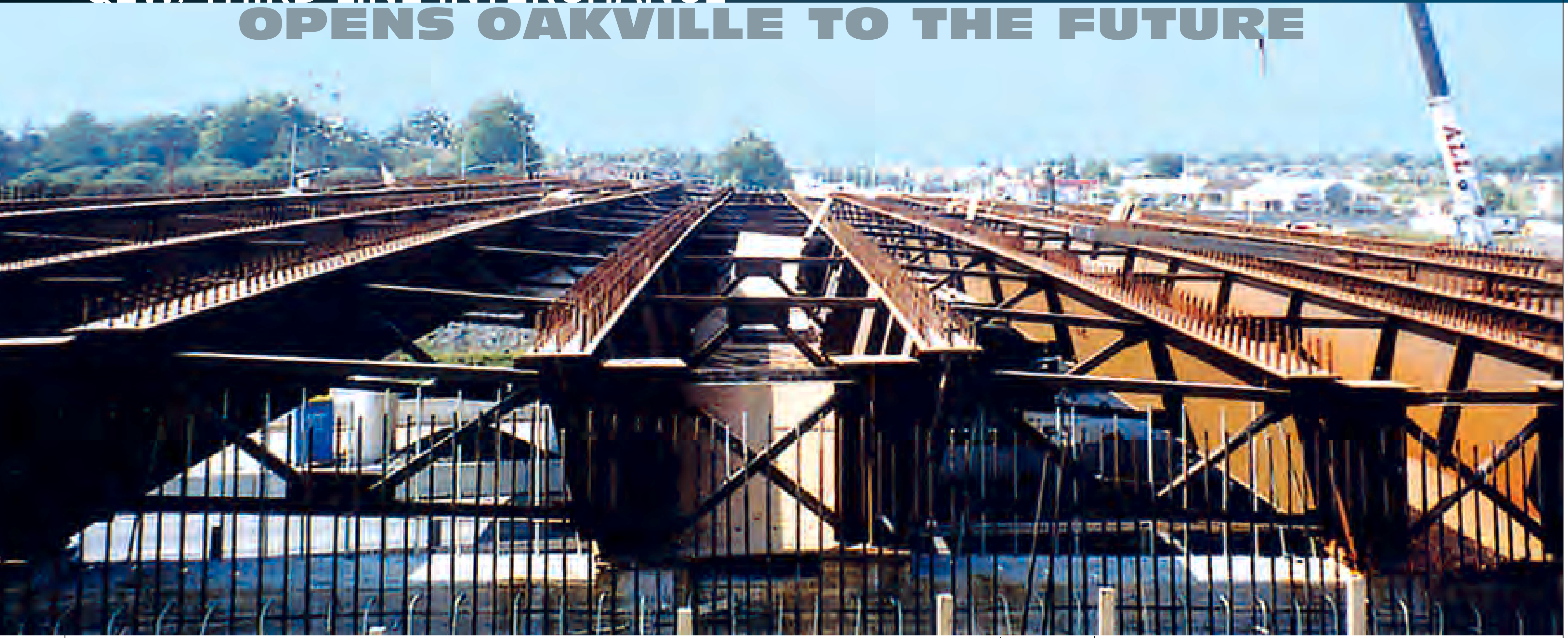
Reserve these dates now as the preliminary program will follow shortly.

59th Annual Assembly of IIW
The International Institute of Welding will host the 11th International Symposium and IIW Conference on Tubular Structures on August 27 – September 2, 2006 in Québec City. Visit www.ists11.org for full conference details.

Are you keeping up-to-date?
The CISC website is regularly and continuously updated with the latest industry news and information, innovative steel projects completed or under construction across Canada, short courses available, regional events, publication releases and more. Visit www.cisc-icca.ca and stay connected!

QEW/THIRD LINE INTERCHANGE
OPENS OAKVILLE TO THE FUTURE

By: J.K. Malmgren



Courtesy of Morrison Hershfield

The ongoing redevelopment of the QEW has provided new opportunities for steel at virtually every turn. Often, the simple need to replace existing bridges with wider spans to accommodate expanding traffic volume gives steel all the leg up it needs to land the contract. But the replacement of the existing structure where the QEW crosses busy Third Line Road in Oakville was a slightly different challenge, as it meant a complete reconfiguration of the roadway itself.

"The existing bridge is very different," says Peter Verok, manager of contracts for the Ministry of Transportation Ontario. "It goes under the QEW almost like a tunnel."

The existing Third Line interchange serviced Oakville's residential and commercial communities north and south of the QEW, and was clearly inadequate. Long waits, with vehicles idling up to 10 minutes to just get across the QEW, had become the norm. The Province of Ontario and Town of Oakville partnered in the construction of a new QEW/Third Line Interchange and widening of Third Line from two to four lanes from Wyecroft Road to Abbeywood Drive. The new interchange replaces the one built in the late 1990's, and completely reconfigures the traffic flow.

"The new bridge becomes an underpass," says Edward Li, project manager for Morrison Hershfield, the project designers and engineers. "It spans the QEW as well as the ramp acceleration lanes, with provision for further widening of the highway in the future."

With a total of 80 metres to span, steel's immediate edge was obvious.

"The longer span is certainly one of steel's big advantages," acknowledges MTO's Verok.

The bridge consists of two spans, stretching end-to-end, with each line made of 3 box girders. Overall, 18 box girders make up the bridge (six lines of three girders), with 5 diaphragms (WWF) at the piers and 70 K-frames for lateral support in the spans. Total steel weight is around 610 Imperial Tons. At each abutment, steel girders are embedded in concrete.

But, while the ability to more easily span the necessary 39 metres that the double span structure entailed made steel immediately competitive, there were other aspects to the project that made it a better choice than either concrete alternative.

"The traffic on Third Line Road had to be maintained," explains Morrison Hershfield's Li. "It had to be staged to be built in small components so that the bridge would be left open at all times. The necessary speed made us more inclined to use girders versus poured in place concrete."

In fact, the bridge construction, undertaken by Bot Construction, never saw the traffic taken down to a single lane except at night, or closed for more than fifteen minutes as the girders were hoisted into place. Erection of the steel was done overnight in the summer and fall of 2003. To erect the box girders, the two first box girders of every line had to be bolted together on the ground, creating a 51 500mm long piece that weighed approximately 63 000kg. To perform the six main lifts, an AC 1200 Demag Crane with a lifting capacity of 500 tonnes was used. The remaining girders to be erected on each line were 27 000mm long pieces that weighed 26,000kg each. To perform these last six lifts, a GMK 5175 crane with a capacity to lift 174 tonnes was used. The intricate process needed to work, and the fabricators took every precaution.

"During the fabrication, a pre-assembly of the bridge had been done in our shop to ensure a perfect fit on site," says Dominique Blouin, engineering and construction manager, Structal Inc, which fabricated the steel for the project.

"Steel gave the ability to construct without major interference," says Morrison Hershfield's Li, pointing out that using concrete precast girders would have meant smaller segments and necessarily more hoists at site. "And the lifting of these girders was all night work – they were short operations."

And the interchange, which includes a median support in the center and abutments at either edge of the highway, moves through considerable elevation change, which added another dimension.

"There was a lot of change in the road there, so structural depth was major issue," says Li. "Steel allows a much shallower dimension so that we could minimize the structural depth."

That also had implications on the aforementioned need for speed.

"Concrete girders are much deeper," acknowledges Li. "A girder of that span would be quite heavy and difficult to move into place."

Because of the shift in elevation and because the bridge needed to fit into and around a footprint made by a completely different structure, the bridge design was less than simple.

"It's an awkward configuration," says Li. "It's curved and slightly tapered at one end. And the abutments are skewed, so there is a fair amount of detailing involved."

The fabrication of the box girders was contracted to Structal, which took on the detailing as well as dealing with the less than straight lines.

"Structal uses SDS/2 software (3D framing software) with homemade tools to detail bridges. For every bridge, we create a 3D frame to scale and extract details to produce our shop drawings. This allows us to verify the bridge geometry prior to detailing," says Dominique Blouin. "This is very useful in the case of bridges with complex geometry like the Third Line Bridge since it ensures an accurate detail of webs, flanges, stiffeners and bracing system even if the girders are laterally curved."

"The bridge is not a rectangular shape," explains Edward Li. "But steel is capable of being bent. One of the inside girders is curved, it was bent in the shop to the required radius."

Certainly, this saved on time and therefore money, but it also provided a more elegant solution.

"Concrete girders would have needed to be in small segments to make the curve," says Li. "It doesn't look as good as one continuous piece."

With the steel in place, the job was completed in July 2004, and the end result clearly validates the design process.

"We identified a number of solutions and evaluated them," concludes Edward Li. "Steel became the right solution for the job."

CISC ALBERTA ALLIANCE: FOCUSING REGIONAL RESOURCES- FORGING MUTUAL SUCCESS

by: Peter Timler

UE-1 Hydrogen Project
Alberta Steel fabrication primarily completed by Waiward Steel Fabricators, Precision Steel & Manufacturing and Eskimo Steel, with further assistance from Supreme Steel, CW Carry and Supermétal – An excellent example of what can be achieved when CISC Members work together.

In recent years, Alberta resource developers have been continuously planning and announcing billion dollar investment projects to assist with the extraction of natural resources in the Northern regions of the province. Unfortunately, it seemed as though Alberta steel fabricator members of the Canadian Institute of Steel Construction (CISC) had fallen under the radar screen, and fabricated works for some of these projects had been awarded to overseas organizations.

The Alberta Regional Membership of the CISC was dramatically concerned with why they had not been approached to participate in these important projects. After some investigation, it became clear that there were certain misconceptions on the capacity of the regional fabricators to manage these 'mega-work' assignments.

To overcome this misconception, the CISC conducted a survey of its regional steel fabricating membership, 17 in total within Alberta. The results indicated that based on a single shift basis, the combined annual capacity of steel fabrication was tallied at approximately 150,000 tonnes. When it is further understood that numerous plants have the capability and history of operating double or even triple shifts when required, then the above estimate grows significantly. Added to this, is the potential for many of the regional membership plants within Alberta to expand with client or market demand. You've heard of the saying, "Build-it and they will come". This philosophy holds especially true when major contracts are awarded, which spawn plant expansions to handle the demanding schedules of such projects. Hence capacity within Alberta can easily grow.

A diminishing backlog of work through lost opportunity to overseas and out-of-country fabrication was rapidly encroaching a situation of 50% plant production for many local fabricators.

But there is more. Plant capability is not enough to get the work done and qualified personnel are also needed. Alberta's steel fabrication industry has been a leader in the training of apprentices for the welding and fitters trades that surpasses the national average. In fact, 25% of apprentices in these trades are trained by CISC Member Fabricators in the province. Combined with journeyman for these trades and the professional engineers that assist with the completion of specialty design (connection and erection) necessary for fabricated steel projects, this represents over 1,000 highly skilled member employees. This is truly an outstanding work force for challenges in cold regions construction.

Further, an informal CISC Alberta Alliance between the membership was struck to illustrate assurance to the major resource developers that the benefit of this combined capacity network could be drawn upon.

The Regional Committee of the CISC has aligned their capabilities and expertise to support Alberta Economic Development's goal of increasing the value added manufacturing component of the Alberta economy. Our message was prepared carefully and strategically presented to key decision makers of the resource sector through a number of forums.

The CISC Alberta Alliance is best described as, *"A fluid collaboration of regional steel fabricators, associated industry suppliers and service providers that are focused on one objective: to deliver quality fabrication to Alberta's Resource Sector faster, better and more cost effectively."*

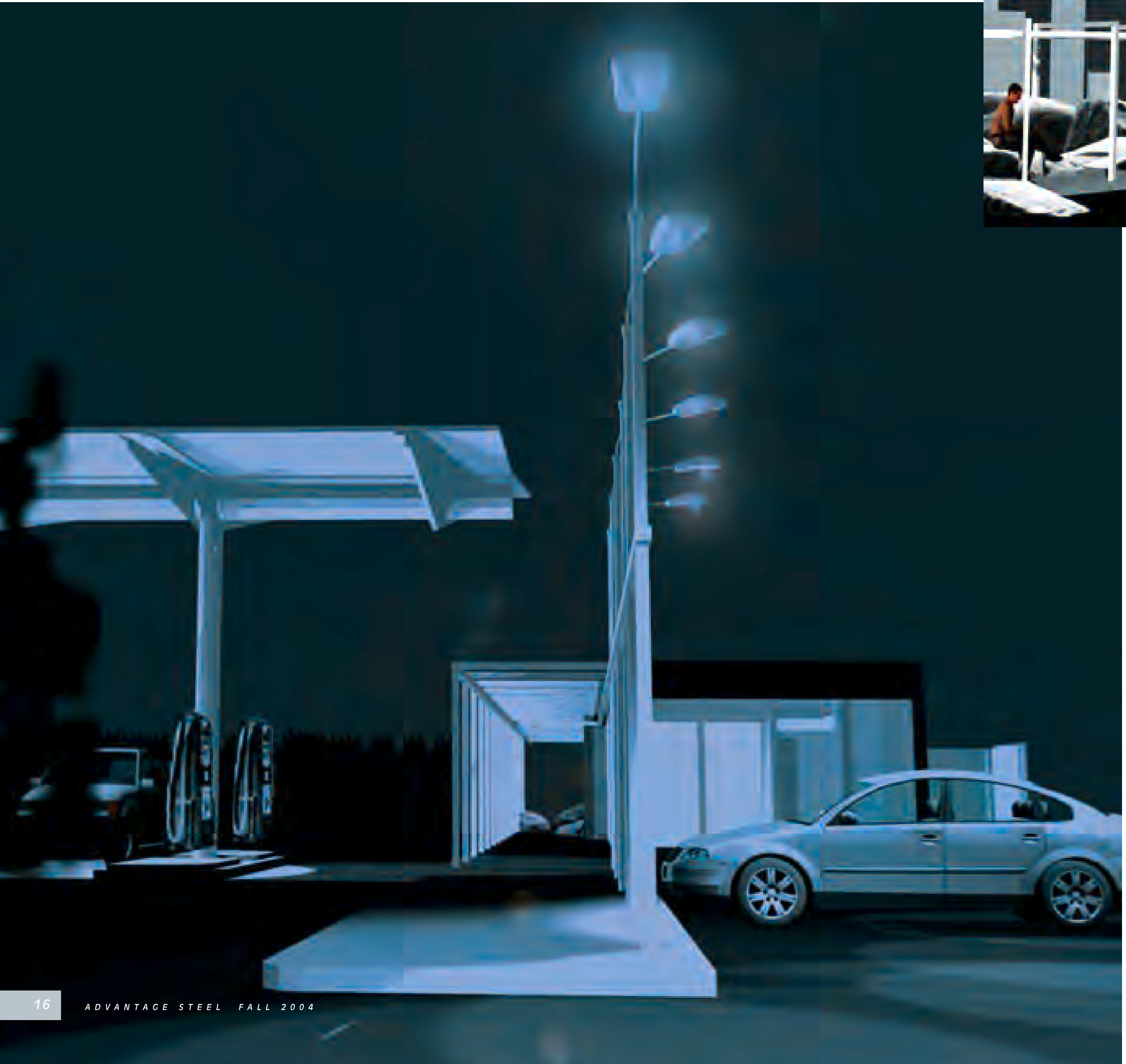
This strategy seems to be working. Today, owners of major development projects are receptive to input from the CISC fabricators during design development and on contracting strategy. Recently, major projects have again been opened to these fabricator members based on the alliance model.

In the past, there had been reports of significant cost overruns on some of these resource projects due to the lack of a quality risk management strategy. CISC fabricators are now being asked how best to install the works for cost effectiveness.

The CISC's "Steel Fabrication Quality Systems Guideline" and subsequent certification process are recognized and respected as one method of attaining the quality assurance necessary for these complicated works. Recently, other fabricators and suppliers are seeking membership within the CISC because of its reputation as a solid industry representative and their need to become a partner with the CISC Alberta Alliance.

Industry organizations do work, and there certainly is strength in numbers when critical mass is required to overcome issues, whether professional, contractual or political. Currently the Alberta Pressure Vessel Manufacturer's Association, having the same experience with out-of-country procurement, is viewing the CISC's leadership and success with great interest. The message is getting out!

HAS "CORNER GAS" LANDED "ON THE ISLAND"?



Greg Demaiter's winning design

The Third Annual, 2003/2004 SSEF Architectural Student Design Competition was launched once again this year and the foundation received close to 40 entries from students studying architecture across Canada. As in the previous two years, the primary intention of this competition is to provide Canadian architectural students with a unique opportunity to embark on a design process that brings to together concept and reality.

The realistic concept is defined in two forms, first through the requirement to include constructible details, primarily utilizing structural steel, and through the direct contact with the steel fabrication industry to process those details.

This year, students were challenged to design a single span gas station island, using steel as the primary structural material. The ultimate goal for a team's submission was to combine good architectural design with sound structural considerations and material choices.

The winning project was submitted by Gregory Demaiter, an architecture student from the University of Waterloo, studying under the direction of Professor Terry Meyer-Boake. Greg's 'On the Island' project was designed to be constructed 40 miles outside of Medicine Hat, Alberta. The service station design aims to move beyond the standard re-fueling condition with a strategically placed cantilever line, from the vehicle canopy, that draws in the distant horizon of the Canadian Rockies' foothills. With gas prices illuminated on the underside of the vehicle canopy, passengers can stretch their legs and enjoy the view from an alternative pedestrian canopy structure.

"What separated this project from the others was that the student clearly understood the essence of the material, the program and its context, and did not rely on unnecessary ornament or complexity to achieve a clearly organized and refined design solution", said Sean Stanwick of Farrow Partnership Architects, one of the judges from this year's competition. "From the drawings presented, the functional and architectural intent was clear but most importantly, its constructability was highly believable."

Two honourable mentions were also awarded this year, first to a team from Dalhousie University that included Kirsty Bruce, Mark Harrington, Stephen Van de Meer, and faculty sponsor Professor Steven Mannell. The second team was also from the University of Waterloo, and included James Andrachuk and Uros Novakovic.

This year's judging panel consisted of Stephen Benson of Benson Steel, Sean Stanwick of Farrow Partnership Architects, Ian Chodikoff, Editor of Canadian Architect and Dave MacKinnon, SSEF.

SSEF is supported by all CISC Members, CWB Group and the International Association of Bridge, Structural Ornamental and Reinforcing Iron Workers. All three of this year's entries can be viewed in detail on the CISC website by visiting www.cisc.ca/ssef.html. Information on the Fourth Annual Architectural Student Design Competition is also available on the website.

SSEF UNIVERSITY RESEARCH GRANTS PROGRAM

The Steel Structures Education Foundation (SSEF) offers annual research grants to steel researchers in engineering departments at Canadian universities. Through its University Research Grants Program, faculty representatives are invited to apply for this annually awarded initiative, and research topics are judged and chosen based on their value in advancing the use of steel in construction.

Since 1995, 52 research grants have been awarded. Thirty researchers from 17 Canadian universities have benefited from the opportunity to expand the understanding of the behaviour of steel structures. For 2004, the total value of SSEF research grants was approximately $90,000 and winners were announced in the spring. In this issue, several SSEF funded research projects of interest to designers are profiled.

Investigation of Steel Roofs Designed to Retain Rainwater

Researchers: Derek Praught, MESc Candidate, & F. Michael Bartlett, Associate Professor, Department of Civil and Environmental Engineering, University of Western Ontario

Rainwater ponds as a large flat roof deflects, and so intensifies the load at the most critical location. This potential instability is exacerbated by municipal bylaws that require controlled-flow roof-drainage systems. Current design criteria is based on 35-year old research and does not consider the effects of residual stresses or initial deformations. As a first step in this project, a "Ponding Map of Canada" was derived, that identifies the west coast of Vancouver Island, Calgary, southwestern Ontario and southern Nova Scotia as particularly susceptible to ponding failures.

With the assistance of practitioners, typical roof geometries and roof drainage systems will be quantified and, with climatic data from the Meteorological Services of Canada, the roof loading will be formulated. The current criteria in the National Building Code of Canada will then be investigated by a parametric study, using sophisticated ponding instability software, developed by Schouten Engineering Consultancy B.V. in Dongen, Netherlands.

The provisons of the current Ontario Building Code that require buildings to be designed to resist the weight of snow plus the 24-hour rain load (and so differ from the provisions of the National Building Code of Canada that require design for the weight of snow plus the rain that might occur with the maximum snow load) will also be investigated.

"This is turning into a rather fun multi-facetted project," said Professor Michael Bartlett. "The link to Schouten Engineering is quite exciting as they investigate half of the 20 ponding failures that occur every year in the Netherlands."

A Comprehensive Monograph for the Design of Steel Plate Shear Walls

Researchers: Professor Robert Driver and Gilbert Grondin, Department of Civil and Environmental Engineering, University of Alberta

The objective of this project is to prepare a comprehensive and authoritative monograph that contains practical and specific state-of-the-art guidelines for the design and detailing of steel plate shear walls. Also included in the document will be a focused literature review to direct engineers to sources of background information, design examples, and advice pertaining to economics. Of particular note is that new simplified methods of analysis are being developed for inclusion in the monograph that are more suitable for the design office than the finite element models commonly used for research.

"A wealth of information on steel plate shear walls exists in scholarly journals and various university research reports, but it is not conveniently accessible by design engineers," said Professor Robert Driver.

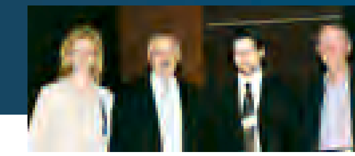
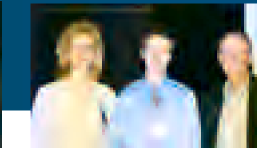
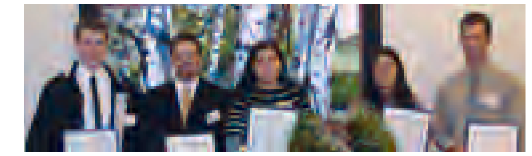
"This creates a distinct impediment to transferring the research into practice. The monograph will not only provide the key information in a single document, it will also implicitly highlight the leading role that Canadian research has played in the development of this system."

Strength of Plasma Cut 3-Plate Steel Columns

Researchers: Professor Sivakumaran, Professor Pramalathan, Department of Civil Engineering, McMaster University

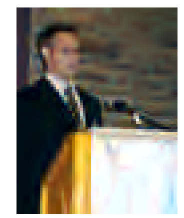
Steel fabricators are increasingly using the plasma arc cutting process, which uses electrically conductive plasma gas jet to cut metals at extremely high temperatures. For example, an H-shape column may be fabricated by welding together plasma cut flange and web plates. Different fabrication techniques result is different degree of heat-affected-zones, which translates into different residual stresses and geometric imperfections and the resulting influence on the strength of such columns. The objective of this investigation is to quantify the effects of plasma cutting process on the strength of columns. The investigation considered plasma-cut welded columns and corresponding flame-cut welded columns. For both sets of columns geometric imperfections, and the residual stresses were established before and after various stages of fabrication namely; cutting of flange and web plates and welding of these plates to form the column section. Temperature profiles were also established during these processes. Mechanical strain gauges and the method of section were used to quantify residual strains and stresses. Last phase of this study experimentally established the axial strength of plasma-cut and flame-cut 3-plate steel columns having slenderness parameters of 1.2, 1.0, 0.8, 0.5, 0.3, and 0.2. Steel Structures Education Foundation (SSEF), Walters Inc., Hamilton, and Materials and Manufacturing Ontario (MMO) provided funding for this investigation.

SCHOLARSHIPS AND AWARDS

G.J. Jackson Memorial Fellowship Award

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 2004 Jackson Fellowship was awarded to Mr. Charles-Phillippe Lamarche, a civil engineering student currently completing his Master's degree at the Université de Sherbrooke, at SSEF's 18th Annual General Meeting on June 11, 2004 in Jasper, Alberta. Charles obtained his Bachelor's degree in civil engineering from École Polytechnique in Montreal. After finishing his Masters, he plans to undertake his Ph. D. studies at École Polytechnique, focusing on the earthquake resistant design of steel structures, under the supervision of Professors Robert Tremblay and Patrick Paultry.

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

Where are they now?

One of the most important benefits of the scholarships and awards is the training of highly competent engineers. Today, many of the fellowship and award winners are deeply involved in the design community or steel industry, such as the 1988 Jackson Fellowship recipient, Dr. Gilbert Grondin. Dr. Grondin is now a Professor of Civil and Environmental Engineering at the University of Alberta, helping to educate and create future engineering geniuses.

CISC also offers a number scholarship award programs and initiatives for students, by region, across Canada, conducting studies in the field of structural engineering. The following awards have been presented in the Ontario, Alberta, Central and British Columbia Regions in 2004.

Ontario Region

In 2004, four scholarship awards of $2000 each were given to undergraduate students who excelled in the steel design course during their third year, and selected a steel elective in their final year. This year's winners include, Remo Gentile at Carleton University, studying under the direction of Professor Gil Hartley; Danny Rosanova at the University of Toronto, under the direction of Professor Peter Birkemore; Darryl Klassen at University of Western Ontario and under the direction of Mike Bartlett; and Simon Thwaits at Waterloo University, studying under the direction of Professor Lei Xu.

Alberta Region

The Alberta Regional Committee recently named its annual $15,000 scholarship award after Dr. G.L. Kulak, Professor Emeritus, University of Alberta to recognize his outstanding contributions to the engineering profession, education and to the Canadian steel industry.

The first recipient of the G.L. Kulak Scholarship Award is Mr. Jonah Shishkin, who was presented with the award on June 11, 2004 at the CISC 2004 Annual Convention in Jasper, Alberta. Jonah is now studying under Professors Grondin and Driver at UofA, and researching one of today's leading structural steel innovations, Steel Plate Shear Walls.

Central Region

University of Saskatchewan, College of Engineering student, Alex Gardner is the successful recipient of the 2004 scholarship award from the Central Region. He will receive a $500 scholarship award for his outstanding efforts as an engineering student at the University.

British Columbia Region

The BC Regional Committee has offered a Fabricator's Engineering Apprentice program for the past five year's. The program formally integrates a UBC student's academic studies with work experience in cooperative employer organizations, for a four-month work-term working with both a fabricator and structural engineering consultant. Congratulations to the following students who were selected to participate in the 2004 program, Oliver Brandt, Melissa Graal, Brad Nordal, Mike Samilski and Cristina Valentinuzzi.

New in the Atlantic Region

CISC's Atlantic Regional Membership have also established an annual scholarship award, known as the Atlantic University Scholarship for Steel Structures Studies. In order to be eligible, applicants must be in their third year of undergraduate studies, pursuing a degree in Civil Engineering with emphasis on structural steel design. The first recipient of this award will be announced in November 2004, and presented with a $2,500 scholarship toward their final year at one of three Maritime Universities, University of New Brunswick, University of Moncton or Dalhousie University.

Legend: *sales office only S – structural P – platework J – open web steel joist

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

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").

Deloitte & Touche Quality Registrar Inc.
Winnipeg, Manitoba (204) 944-3625
www.deloitte.ca
(ISO 9001 Quality Management System Registration services; ISO 14001 Environmental Management System Registration Services)

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

Devoe Coatings
Edmonton, Alberta (780) 454-4900
(Coating, paint)

EBCO Metal Finishing L.P.
Richmond, B.C. (604) 244-1510
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, perf-o grip, traction)

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

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

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)

ICI Devoe Coatings
Vancouver, B.C. (604) 299-1399
(Paints, Linings, Protective Coatings)

Industrie Dry-Tec Coating inc.
Terrebonne, Québec (450) 965-0200
www.drytec.com
(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 Compagnie Américaine de Fer et Métaux Inc.
Montréal, Québec (514) 494-2000
www.scrapmetal.net

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

Lincoln Electric Company of Canada Limited
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.
Winnipeg, Manitoba (202) 633-0022
Edmonton Alberta (780) 432-4519
www.microncoating.ca
(Protective coatings)

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

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

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
(Hollow structural steel tube)

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

Samuel, Son & Co. Ltd. (Québec)
Laval, Québec (514) 384-5220
www.samuel.com
(Steel, aluminum and stainless steel plates)

Samuel, Son & Co., Limited
Winnipeg, Manitoba (204) 985-6600
www.samuel.com
(Structural Sections incl. bar, angle, shapes and plate)

Sherwin-Williams Canada
Laval, Québec (514) 356-1684
www.sherwin.com
(Specialty industrial coatings)

Mill, Service Centre, Honorary and Associate Members

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

S.N.F. Quebec Metal Recycling/
S.N.F. Québec Métal Recyclé
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)

Tuyaux et Matériel de Fondation Ltée. /
Pipe and Piling Supplies Ltd.
St. Hubert, Québec (450) 445-0050
www.pipe-piling.com
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www.vicwest.com
(Steel Metal floor/roof deck, wall and roof cladding)

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

Western Industrial Services Ltd.
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,
Edmonton, Alberta (780) 434-8441
www.wilkinsonsteel.com
(Structurals - angles, flats, beams, channel, plate)

Wilkinson Steel and Metals,
A division of Premetalco Inc.
Vancouver, B.C. (604) 324-6611
www.wilkinsonsteel.com
(Misc. structural shapes, hot rolled bars and plates)

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* Calgary, Alberta (403) 263-4102
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www.algoma.com

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

Copperweld Canada
Brampton, Ontario 1-800-268-3005
www.ltb-copperweld.com

Dofasco Inc.
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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

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

Acier Pacifique Inc. (514) 384-4690
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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

Enniseel, Div. Russel Metals Inc.
Port Robinson, Ontario 1-800-471-1887
* Cambridge, Ontario (519) 650-1666
www.russelmetals.com

Russel Metals Inc.
Lakeside, N.S. (902) 876-7861
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www.russelmetalswinnipeg.com

York Steel, Division of Russel Metals Inc.
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www.arcelor.com

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www.chaparralsteel.com

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