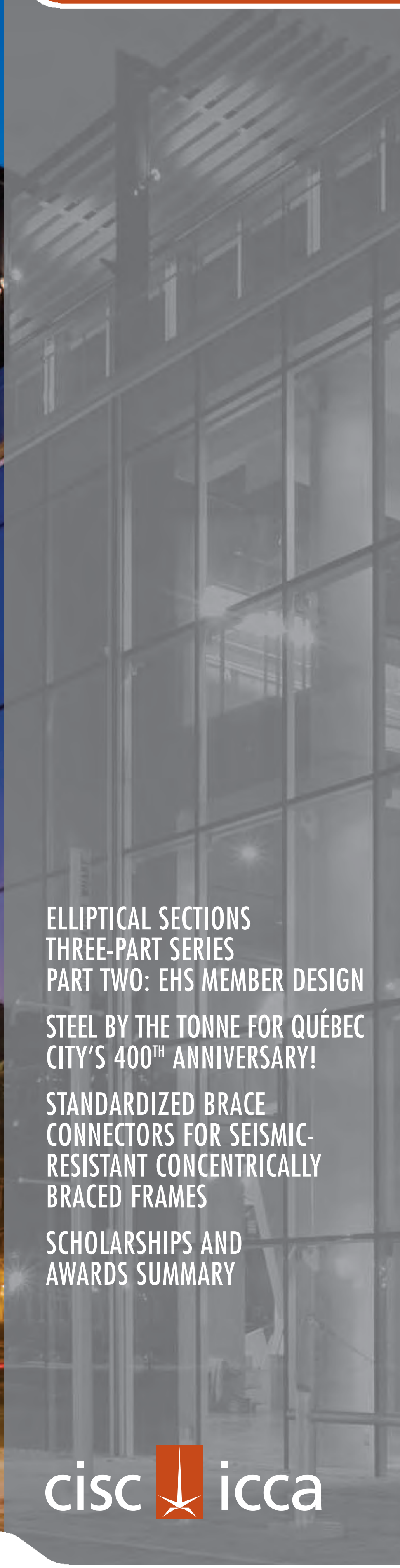
NO 36 WINTER 2009

ADVANTAGE STEEL



ELLIPTICAL SECTIONS
THREE-PART SERIES
PART TWO: EHS MEMBER DESIGN

STEEL BY THE TONNE FOR QUÉBEC CITY'S 400TH ANNIVERSARY!

STANDARDIZED BRACE CONNECTORS FOR SEISMIC-RESISTANT CONCENTRICALLY BRACED FRAMES

SCHOLARSHIPS AND AWARDS SUMMARY

cisc icca

CANADIAN INSTITUTE OF STEEL CONSTRUCTION

SDS/2 DESIGN DATA

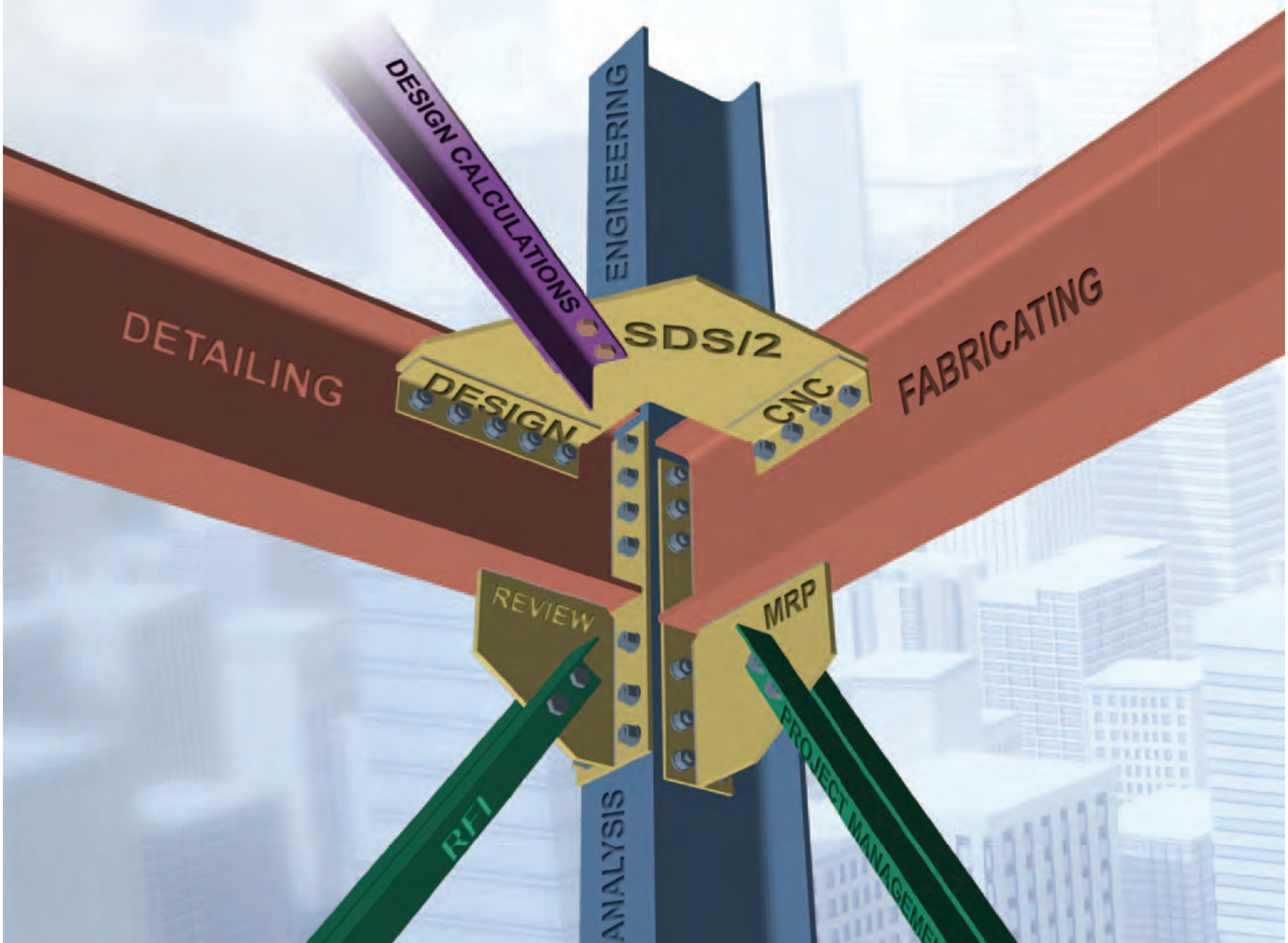
BUILDING INTELLIGENT CONNECTIONS.

Connecting Through SDS/2

Building intelligent connections is more than beams, columns and bolts. It's seamlessly integrating your project delivery and connecting project partners — it's the essence of BIM.

SDS/2 provides you with a superior BIM tool by connecting with many commonly used steel software products. You can share information from all disciplines: architecture, engineering, piping and HVAC, detailing, fabricating, erecting, and much more. Whether you are importing a model or exporting information for CNC or conflict resolution, SDS/2 provides trustworthy model data, from start to finish.

Become a BIM expert in time for your next project. Visit sds2.com or call 866.435.6366 to learn how you can connect through SDS/2 to start building intelligent connections in your projects today.



www.magnus-mr.ca | 866.435.6366 | 450.435.4665 | e-mail: info@magnus-mr.ca


Russel Metals Inc.
SERVICING YOUR STRUCTURAL NEEDS
Russel Metals Inc. is No. 1 in Canada in Structurals (wide flange, HSS, bars, angles, flats and channels) with over 200,000 tons of inventory. To serve you better, this gives you the flexibility of shorter lead times, increased processing capabilities and superior product selection with coverage throughout Canada from multiple locations.
A.J. FORSYTH
800-665-4096
ACIER LEROUX
800-241-1887
RUSSEL METALS
905-819-7777
YORK-ENNIS
905-384-9700

FROM THE EDITOR

We did not set out to make this a HSS Special Issue however in many ways that is what has happened. Steel tubes are central to most of the articles. Not surprising from an architectural perspective. Hollow Structural Steel has long been used to provide beauty, environmental stewartship, as well as function. We are now seeing more development and research work going into non standard shapes, pushing the architectural envelope, providing even more options for steel designers.

Professor Jeffrey Packer's fascinating series on Elliptical Hollow Sections continues with Part Two on EHS member design. He explores the technical specifications and engineering properties necessitated in the design of EHS. Carlos de Oliveira looks at ingenious solutions to the need for seismic-resistant concentrically braced frames using standardized brace connectors. While Seismic Corner launches Part 1 on buckling-restraining braced frames and one of the questions Ask Dr. Sylvie deals with is HSS corner radius. Ask Dr. Sylvie also deals with AESS categories, shortened out-standing angle legs and advises the 10th Edition of the CISC Handbook will be released by June 2010.

Also, we have an article examining three CISC Design Award winning structures launched as part of Quebec City's 400th anniversary. The image above of the EHS in the Telus Atrium in B. C. also received a CISC Design Award. Always an interesting read, our annual summary of scholarship and awards wraps up this issue.

My best wishes to you all, for a healthy and prosperous 2010!

Ed Whalen, P.Eng.
President CISC

IN THIS ISSUE

CISC HEAD OFFICE
3760 14th Avenue, Suite 200, Markham, Ontario L3R 3T7
Phone 905-946-0864 Fax 905-946-8574 Email: info@cisc-icca.ca Web: www.cisc-icca.ca

REGIONAL CONTACTS

ONTARIO
3760 14th Avenue, Suite 200
Markham, Ontario L3R 3T7
Phone 905-946-0864 ext. 106
Email sjohn@cisc-icca.ca

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

WESTERN CANADA
3760 14th Avenue, Suite 200
Markham, Ontario, Canada L3R 3T7
Phone 905-946-0864 ext. 109
Email ewhalen@cisc-icca.ca

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

ADVANTAGE STEEL NUMBER 36 WINTER 2009

Advantage Steel and the French-language edition Avantage Acier (available on request) are published by the Canadian Institute of Steel Construction (CISC) on behalf of its members. CISC is not responsible for the statements made nor for the opinions expressed in this publication by those contributing articles. CISC gratefully acknowledges the support contributed to this publication by the CWB Group. Visit us at **www.cisc-icca.ca** or Tel **905-946-0864**, Fax **905-946-8574**

CHAIRMAN Rob McCammon, *IWL Steel Fabricators*
EDITOR Ed Whalen, P.Eng.
MARKETING & COMMUNICATIONS SPECIALIST Rob White, BFA
EDITING/TECH ADVISOR Sylvie Boulanger, P.Eng. Ph.D
PUBLISHER Richard Soren
Design Print Media
Tel 416-465-6600 designprint@sympatico.ca
DESIGN & FORMATTING Katherine Lalonde
KLDESIGN
info@kldesign.ca

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

ISSN 1192-5248 PUBLICATIONS NUMBER 40693557

PLEASE RETURN UNDELIVERED COPIES TO:
Canadian Institute of Steel Construction
3760 14th Avenue, Suite 200
Markham, Ontario, Canada L3R 3T7

COVER PHOTO:
Quebec 400 Pavillon | photo by Michel Brunelle

PHOTO ON THIS PAGE:
Telus Atrium, B. C. | *Ziggy Walsh, George Third and Sons*

photo: Anne Resta

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

AESS CATEGORIES

We are bidding on an interesting project where the engineer has specified AESS2 and AESS3 in the specifications for the exposed steel portion of the job. Can you provide information on what additional work these categories represent to us in terms of fabrication? – R.T.

It's starting! As you recall, CISC has produced documents to help designers specify Architecturally Exposed Structural Steel (AESS). A full article was presented in the Summer 2008 issue (no. 31). The link to this article and all relevant AESS information is available on our website: **www.cisc-icca.ca/aess**

In terms of the expected work you are required to perform (and bid on) to meet the specifications for these Categories, you need to refer to the newest edition of the CISC Code of Standard Practice Appendix I – Architecturally Exposed Structural Steel, which became available earlier in 2009. Additionally, I imagine that the engineer has referred to the AESS Category Matrix in his or her specifications under the Structural Steel Division and includes requirements that resemble the Sample Specification provided at the same website address mentioned above. You should also note that the Ontario Region has developed a Sample Structural Steel Division 5 Specification document to ensure the most cost and schedule efficient project for the owner. That document is available from the Technical Resources of our website: **www.cisc-icca.ca/ONDiv5Specs**

I notice that for your project, the engineer specified AESS2 and AESS3: likely AESS2 for the portion that is over 6 m from view and AESS3 for the steel that's within closer view. That is very much how we expected the Categories would function i.e. one Category for a portion or group of members of the expressed structure. We imagine that architects decide in conjunction with the structural engineers, which Categories best suit the needs of the project. After that, the Categories appear on all design documents. For more visual examples, you can download a presentation that Terri Meyer Boake, Walter Koppelaar and myself gave at the Steel Conference: **www.cisc-icca.ca/docs/aess/NASCC08_E15AESS.pdf**

Finally, a Guide for specifying AESS is in preparation by Terri Meyer Boake, architecture professor at the University of Waterloo to help architects and engineers understand the AESS documents and more specifically the different characteristics that are associated to each Category. There will be loads of beautiful images to nurture your inspiration and appreciate what is more or less costly. There will be comments about galvanizing, paints and intumescent coatings. Our hope is to improve communication between architects, engineers, fabricators, detailers, erectors and suppliers so pricing and expectations are neatly aligned! We also secretly hope that these documents will help reduce the amount of UUSS or Unfortunately Unexposed Structural Steel! Express the beauty of steel to satisfy fit, form and function.

HSS CORNER RADIUS

I am presently detailing a connection and I would like to know what the outside radius of curvature for a HSS 102x102x13 is? Actually, is there a fast rule for all HSS radii? – F.P.

The truth is the outside corner radius of a HSS varies with sizes and with each producer! Nonetheless, Table 13 of CSA-G40.20-04 defines the maximum exterior corner radius as a function of the wall thickness of the tube and the perimeter. For a rectangular tube with a nominal wall thickness of 13 mm and a perimeter smaller than 700 mm, the maximum outside corner radius presented in this table is 36 mm.

You should also note that to calculate the section properties in the Handbook, we use a value for the outside corner radius equal to twice the wall thickness and an internal corner radius equal to the thickness (see page 6-96 of the Handbook 9th Edition). For HSS produced to CSA G40.20-04/G40.21-04 this thickness is taken to be the nominal wall thickness. For HSS produced to ASTM A500-07 this thickness is taken to be the "design wall thickness", or 90% of the nominal wall thickness (see page 6-97 of the Handbook 9th Edition).

Finally, Professor Jeff Packer, of the University of Toronto, has measured outside corner radii on several recent HSS samples. Depending on the sample, the radii varied between 1.92 and 2.43 times the actual wall thickness measured. The entire article can be obtained from the AISC "Engineering Journal" First Quarter, 2005, or a summary found in the Fall 2003 issue of the Canadian Welding Association's journal at this address: **www.cwa-acs.org/members/journal/Fall2003/Packer.pdf**

SHORTENED OUTSTANDING ANGLE LEGS

You once wrote that for practical and economical reasons, some fabricators sometimes shorten the outstanding legs of a double-angle shear connection to fit a small HSS column. Has that been verified? – M.R.

Yes it has and the findings seem to indicate those connections have sufficient capacity. The concern was whether or not there was sufficient rotational capacity because of the reduced lever arm. You may recall that I was somewhat surprised to hear from an engineer that he often saw these connections proposed by fabricators. Upon doing a brief survey, it turns out that in some areas, this practice is common: fabricators either shorten the


photo: S. Boulanger

outstanding legs and use fillet welds or they use flare bevel groove welds with full-section angles when the wall width of the HSS column is narrow (152 mm or less). So a research project was proposed and Yanglin Gong of Lakehead University was awarded a grant from the Steel Structures Education Foundation to perform the research work. The results confirmed that although there is less rotational capacity, it appears that all twelve full-size connections were able to undergo the required rotation. In other words, the connections reached their theoretical shear failure strengths without any premature failure, though shortened outstanding legs did reduce the rotational capacity.

More specifically, the research results indicate that the practice of either shortening the outstanding legs or using flare bevel groove welds are both acceptable for double-angle shear connections with (1) outstanding legs not shorter than 30 mm; (2) angle thickness from 6.4 mm to 9.5 mm; (3) the number of bolts not greater than 6, and (4) twice weld size top return for fillet welds and no top return for flare bevel groove weld. For more details, see the summary page on the SSEF website or read the CSCE journal article: **www.ssef-ffca.ca/research/gong**

NEXT HANDBOOK

I heard CSA-S16-09 was available for purchase and I wondered when the next Handbook Edition was going to be printed? – P.L.

Yes, S16-09 can be ordered from CSA but it is not yet adopted by any of the provinces. However, we are planning to print the 10th Edition of the Handbook by June 2010. It will again contain the Standard in Part 1 and the Commentary in Part 2.

SEISMIC CORNER
BUCKLING-RESTRAINED BRACED FRAMES – PART 1

Alfred F. Wong, P.Eng.

YOU CAN HAVE STEEL BRACES THAT NEVER BUCKLE! ARE THEY TOO GOOD TO BE TRUE? READ ON…

Steel braced frames are essentially vertical trusses whose members are subjected primarily to axial forces only. As Eiffel demonstrated, they make the most efficient lateral-force resisting system. However, due to the strength of steel, relatively light and slender braces are used in many applications. The compressive resistance, C_r, for a slender brace is substantially smaller than its tensile resistance, T_r (For *CSA G40.21 350W* steel, C_r for a brace at the maximum permissible slenderness limit, $KL/r = 200$, is about $0.13T_r$).

TRADITIONAL BRACED FRAMES

Moderately ductile and limited-ductility concentrically braced frames, as defined in *CSA Standard S16* are proportioned to dissipate energy through inelastic action of the braces. Once the compression-acting braces have buckled and cannot regain their pre-buckling compressive resistance their tension-acting counterparts resist the bulk of the seismic forces. The above-mentioned reserve of tensile capacity due to brace slenderness is then mobilized provided the connections and other capacity protected elements can accommodate the redistributed forces in the post-buckling condition. A balanced frame configuration ensures sufficient tension-acting braces when the structure is subjected to motions in both forward and reverse directions.

BUCKLING-RESTRAINED BRACES

A buckling-restrained brace is prevented from buckling to allow the attainment of yielding in compression and strain-hardening. The resulting increase in compressive capacity usually permits the use of significantly smaller braces. A buckling-restrained brace

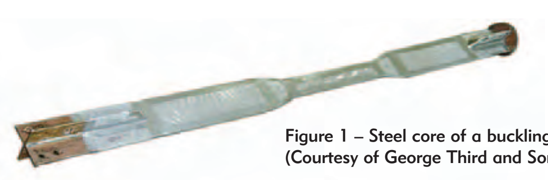


Figure 1 – Steel core of a buckling-restrained brace (Courtesy of George Third and Son)

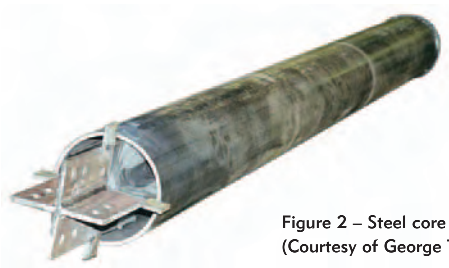


Figure 2 – Steel core inserted in steel tube casing (Courtesy of George Third and Son)

consists of a steel core and a buckling-restraining system that prevents the core from buckling, such that the brace's compressive resistance equals or exceeds its tensile resistance. Typically, the brace core is a flat steel bar that is confined in a buckling-restraining system which usually consists of a steel tube casing filled with mortar. *Figure 1* shows the flat bar core of a brace and *Figure 2* shows the view of the brace core inserted in its steel tube casing. The exposed ends are stiffened to preclude buckling. Their cruciform cross-section also facilitates field-bolted connection.

BUCKLING-RESTRAINED BRACED FRAMES

Physical tests have demonstrated that a well-proportioned buckling-restrained braced frame behaves very well when cyclically loaded well into the inelastic range. *Figure 3* shows its typical stable, full and balanced hysteretic behaviour. Because of its system ductility *CSA S16-09* recognizes the use of a *ductility-related force modification factor*, R_d, = 4.0. Moreover, the use of smaller braces leads to smaller capacity design forces and smaller connection design forces. Reduction in capacity design forces may also result in smaller beams and columns and reduction in foundation and diaphragm forces.

The use of buckling-restrained braced frames in hundreds of buildings in Japan and dozens in the U.S. has been reported in the literature. The IKEA Superstore in Coquitlam, B.C. that was completed in 2002, a CISC Steel Design Awards winner, is the first application of the buckling-restrained bracing system in western Canada *(Figure 4)*. Comprehensive provisions for the design and testing of ductile buckling-restrained braced frames are introduced in the recently published *CSA Standard S16-09*.

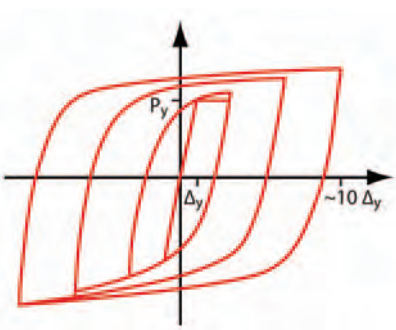


Figure 3 – Typical hysteresis of a buckling-restrained brace (Schematic)

Figure 4 – IKEA Superstore in Coquitlam, B.C. (A CISC Steel Design Awards winner in 2002)

Largest HSS selection –Shortest Cycle Times.

As North America's largest manufacturer of Hollow Structural Sections (HSS), we're relied upon by professionals in the construction industry to provide the most complete size range available.

With the industries' shortest cycle times, our four plants operate 24/7 to service all of North America. This ensures unparalleled customer service and your products delivered on time.

We're ready for your next order!

12", 14", 16" Square
18", 20" Round Pipe
Size Ranges:
Square 1" to 16"
Rectangular .75"x1.5" to 20"x12"
Round 1.050" to 20"
Wall Thickness .083" to .680"

Specifications:
ASTM A500
ASTM A252
ASTM A53
ASTM A847
CSA G40.21
ROPS
HSLA

NEW!
EPOXZKOTE®
Powder Primed Tubing

Atlas TUBE

Usines de fabrication
Harrow, ON
800-265-6912
Chicago, IL
800-733-5683
Blytheville, AR
Plymouth, MI
sales@atlastube.com
www.atlastube.com

Divisions of the John Maneely Company
Seminole Tubular Products Co.
Wheatland Tube Company

photos: Ziggy Welsh, George Third and Sons

Telus Atrium, British Columbia

ELLIPTICAL SECTIONS
THREE-PART SERIES
PART TWO: EHS MEMBER DESIGN

Jeffrey A. Packer

In Part One of this series, properties and applications of a new steel section on the market were presented. There is no doubt that many of our readers were excited to see these unique Elliptical Hollow Sections (EHS), perhaps for the first time. With a few Canadian applications already visible – as shown above with the Telus Atrium – architects are likely going to want to use them more often. Engineers will surely share their enthusiasm once they know how they can design them. Where can one find the properties and dimensions of EHS? How does one determine their slenderness? To what extent is their resistance in compression and bending different to Rectangular or Circular Hollow Sections (RHS and CHS)? How does one connect them?

The design of compression and flexural members requires knowledge of the cross-section classification. However, this is not covered by any current code, specification or standard at present. Fortunately, a Table of 46 shapes has been developed at the University of Toronto to provide engineering properties of EHS cross-sections. A sample Table is shown in this article. (The full list is available on the CISC website.) The format is very similar to the familiar Handbook of Steel Construction Tables.

The EHS section classification and member design issue has been pursued intensely by Gardner and colleagues in the U.K. and elsewhere. On the basis of experimental and numerical (finite element (FE)) studies, Gardner and colleagues have classified EHS into Classes 1, 2, 3 and 4 (per Eurocode 3 (CEN 2005)) with limiting wall slenderness ratios for various aspect ratios. Their system for cross-section classification has covered all prime loading cases: axial compression, bending about both principal axes and combined compression plus bending. The Eurocode 3 class limits for CHS (very similar to those in Canada (CSA 2009)) were shown to be applicable to EHS if the EHS was treated as a CHS with an equivalent diameter of D_e. Two definitions of D_e have been used in the literature, which are herein termed $D_{e,\,old}$ and $D_{e,\,new}$, defined by:

$$D_{e,\,old} = 2a\,(a\,/\,b) \text{ for axial compression and minor axis bending} \quad (1)$$

$$D_{e,\,old} = 1.3a\,(a\,/\,b) \text{ for major axis bending, with aspect ratios of 2:1} \quad (2)$$

$$D_{e,\,new} = 2a\,(1 + f\,[a\,/\,b] - 1) \text{ for axial compression,} \quad (3)$$

$$D_{e,\,new} = 0.8a\,(a\,/b) \text{ for major axis bending, with aspect ratios of 2:1} \quad (4)$$

$$\text{with } f = 1 - 2.3\,(t\,/\,2a)^{0.6} \quad (5)$$

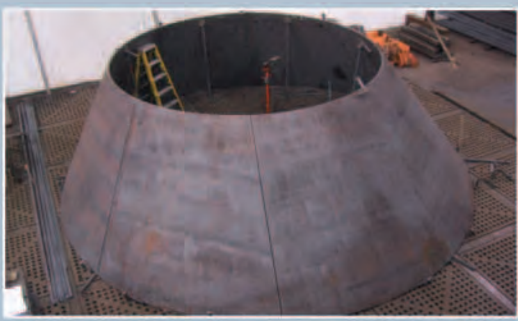
where a is half the larger EHS dimension and b is half the smaller EHS dimension, as illustrated in the schematic. That figure also illustrates the diameter of equivalent CHS ($D_{e,\,old}$ and $D_{e,\,new}$) for axial loading on an EHS with dimensions of 2a x 2b and of medium wall slenderness (2a/t = 35). The equivalent diameters can be seen to be much larger than the major dimension (2a) of the EHS. Thus, by taking the less conservative of Gardner's two approaches for axial compression loading, an EHS cross-section could be deemed to be non-slender (not "Class 4") providing (interpreting Table 1 of CSA-S16-09):

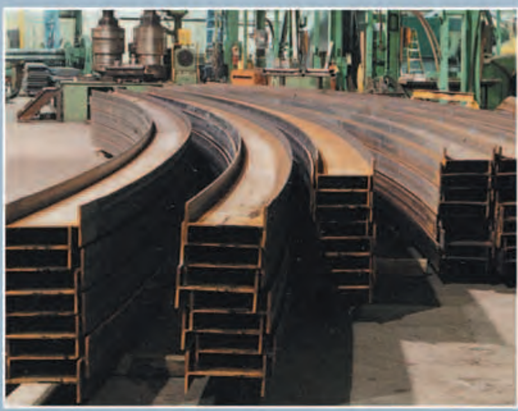
$$D_{e,\,new}\,/t \le 23\,000\,/F_y \quad \text{or} \quad 2a\,(1 + f\,[a\,/\,b] - 1)/t \le 23\,000\,/F_y \quad (6)$$

If one, however, looks at the local buckling failure mode of a typical EHS stub column in compression (see laboratory image), it resembles plate buckling more than cylinder (shell) buckling.

Hodgson Custom Rolling Inc.

services a wide variety of industries in the ENERGY SECTORS of hydro, petro chemical, atomic, gas, oil, wind, etc. in addition to those in heavy manufacturing, steel, pulp & paper, mining, marine, forestry, etc. Hodgson's commitment to providing customers superior products and personalized professional service has earned itself a reputation for excellence, making the name HODGSON synonymous with "paramount quality and workmanship".





Hodgson Custom Rolling Inc. is one of North America's largest plate rolling, forming, section rolling and fabricating companies.

STRUCTURAL SECTION ROLLING

HCR has the expertise to roll curved structural sections into a wide range of shapes and sizes (angle, wide flange beam, I-beam, channel, bar, tee section, pipe, tubing, rail, etc.), including flanges, support beams, gear blanks, etc. **We specialize in Spiral Staircase Stringers**.

PRESS BRAKE FORMING & HOT FORMING

Hodgson Custom Rolling's brake department processes all types of steel sections and plate up to 14" thick. Developed shapes such as cones, trapezoids, parabolas, reducers (round to round, square to round) etc.

PLATE ROLLING & FLATTENING

Hodgson Custom Rolling specializes in the rolling and flattening of heavy plate up to 7" thick and up to 12 feet wide. Cylinders and segments can be rolled to diameters ranging from 10" to over 20 feet. Products made include ASME pressure vessel sections. **Crane Hoist Drums**, thick walled pipe, etc.

FABRICATING

Hodgson Custom Rolling combines expertise in rolling, forming, assembly and welding to produce various fabrications including kiln sections, rock drums, heavy weldments, ladles, pressure vessel parts, multiple **Components for Heavy Equipment** applications etc.

Hodgson
Custom Rolling Inc.

ASME
ISO9001:2000

5580 Kalar Road
Niagara Falls
Ontario, Canada
L2H 3L1

Telephone: (905) 356-8132
Toll-free: (800) 263-2547
Fax: (905) 356-6025
E-mail: hodgson@hodgsoncustomrolling.com
Website: www.hodgsoncustomrolling.com

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

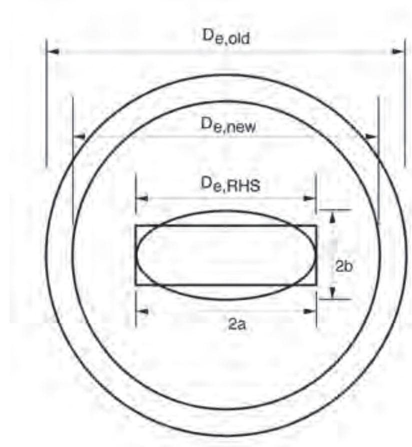
HODGSON CAN HELP SOLVE YOUR PROBLEMS

Thus, it was deemed that an "equivalent RHS shape" might be a better transformation of the elliptical tube, for the purpose of cross-section classification. Packer and colleagues proposed an equivalent RHS depth ($D_{e,\ RHS}$) equal to 2a, while the width of the equivalent RHS was determined using the condition of maintaining the same cross-sectional area. This equivalent RHS shape is also shown in the schematic. It was possible to demonstrate that this "equivalent RHS" approach was a good estimator of whether EHS axially-compressed stub columns fail by yielding (squashing) or elastic local buckling, when compared with test results by Packer and colleagues as well as all others available internationally. In fact, the correlation with test results – using either the Eurocode 3 (CEN 2005) or CSA S16 (CSA 2009) "Class 4" slenderness limit – was better for the "equivalent RHS" approach than for either of the "equivalent CHS" approaches. Thus, elastic local buckling was shown to be avoided if (interpreting Table 1 of CSA-S16-09):

EHS stub column after failure, by inelastic local buckling or "squashing"; this mode of failure resembles plate buckling more than cylinder (shell) buckling.

$$(D_{e,\ RHS} - 4t) / t \le 670 / \sqrt{F_y} \quad \text{or} \quad (2a - 4t) / t \le 670 / \sqrt{F_y} \qquad (7)$$

The schematic, the laboratory results and the foregoing experimental validation for the axial compression loading case, suggest promise for the "equivalent RHS" method of handling elliptical cross-sections. Interestingly, if one applies the cross-section classification limits of equations (6) and (7) to the 46 shapes



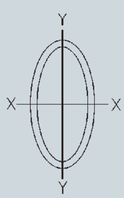
Schematic of equivalent CHS diameters and equivalent RHS depth, for EHS in axial compression (for a/b = 2 and 2a/t = 35)

available, one obtains almost identical consensus: by equation (6) 9 EHS are slender, and by equation (7) 8 EHS are slender, with the slender cross-sections generally occurring in large depth EHS.

The concept of applying the "equivalent RHS" method to define EHS members as Class 1, 2, 3 or 4 in ***flexure*** has been checked against available experimental data (18 tests by Chan and Gardner). For major axis bending the "equivalent RHS" approach is more accurate than the "equivalent CHS" approach. For minor axis bending (less common) the opposite is true, but the "equivalent RHS" approach is very conservative.

Hence, should engineers be faced with designing such a shape, two alternatives can be considered: the equivalent CHS or the equivalent RHS approach. At present, it appears that an equivalent rectangular shape shows the most promise for sizing a member. But what about connecting an EHS to another EHS? Current state of research will be presented in the next and third article on Elliptical Hollow Sections.

HOLLOW STRUCTURAL SECTIONS
CSA G40.20
Elliptical



PROPERTIES AND DIMENSIONS

Designation	Wall Thick-ness	Mass	Dead Load	Area	Axis X-X				Axis Y-Y				Torsion Inertia Constant	Torsion Modulus Constant	Surface Area
					I_x	S_x	r_x	Z_x	I_y	S_y	r_y	Z_y	J	C_t	A_s
mm x mm x mm	mm	kg/m	kN/m	mm^2	10^6 mm^4	10^3 mm^3	mm	10^3 mm^3	10^6 mm^4	10^3 mm^3	mm	10^3 mm^3	10^3 mm^4	10^3 mm^3	m^2/m
EHS 500x250															
x12.5	12.50	112	1.10	14 200	350	1 400	157	1 960	118	943	91.0	1 200	353 000	2 110	1.21
EHS 320x160															
x10	10.00	56.7	0.556	7 230	71.8	449	99.7	631	23.9	299	57.5	385	71 900	665	0.776
EHS 250x125															
x10	10.00	43.8	0.429	5 580	33.2	265	77.1	376	10.9	174	44.2	228	32 900	385	0.606
EHS 200x100															
x8	8.00	28.0	0.275	3 570	13.6	136	61.7	193	4.46	89.3	35.4	117	13 500	197	0.485

Sample Handbook Style Table of EHS Engineering Properties

The full list of References and the complete Table of Engineering Properties for the 46 EHS shapes are available on the CISC website: **www.cisc-icca.ca/publications/advantagesteel/36**

JEFFREY A. PACKER IS BAHEN/TANENBAUM PROFESSOR OF CIVIL ENGINEERING AT THE UNIVERSITY OF TORONTO.

STEEL BY THE TONNE
FOR QUÉBEC CITY'S 400TH ANNIVERSARY!

Frédéric Simonnot

In Quebec, even though the facades are often made of stone, steel is the backbone of many structures, including some of the most famous, such as the Chateau Frontenac (yes, even that one!), the two bridges spanning the river or the Ile d'Orléans Bridge. This is even truer since the redevelopment of the airport, the restoration of the Espace 400e pavilion and the construction of the Brown Basin walkway, three projects produced shortly before the City's 400th anniversary celebrations and recognized by the CISC with awards in 2008.

Photos by Michel Brunelle

The Québec City region today can take pride in a world-class airport infrastructure thanks to the major transformation of Jean-Lesage International Airport, just in time for the celebrations.

Previously, the air terminal configuration which was considered unwelcoming, resulted from a series of interventions carried out without any concern for architectural integration into the original building constructed about fifty years ago, resulting in difficulty reading the layout and poor organization of space.

This project necessitated demolition and reconstruction work on over 60% of the original surface. The mandate could be summarized as follows: improve the passenger service level and the functional aspects of the air terminal by better allocation of space; ensure sufficient operational flexibility to adapt easily to the users' and operator's requirements over a 20-year horizon; reduce the operating and maintenance costs; upgrade the general security level.

"The main challenges consisted of creating an international restructure that reflects the people of Québec City and that bears the signature of Québec engineering. This was achieved through a unique and distinct volumetry, without interrupting service, with a modest budget of about $60 million," Serge Vézina summed up. He served as structural engineer and lead designer of the project for Dessau.

In accordance with the major principles of sustainable development, an effort was made to recover and integrate part of the existing structures. Thus, the north sector of the air terminal was preserved, the new building was constructed in the footprint of the demolished part of the air terminal, part of the foundations, basement and structural slab of the ground floor was reused, and 90% of the demolished structure was sold. "The basement was preserved and the first concrete slab was superimposed on it. The metal frame was bolted to it with conventional anchors, buffers and shear keys for seismic purposes," Serge Vézina explains.

Outside, the existing ledge became an airside corrugated overhang, evoking an airplane wing and offering an easily identifiable visual signature. It then runs around the building, ending on the city side, where it joins the facade and supports a display screen. Inside, special attention was paid to the choice of materials in resonance with the Quebec identity and the development of vast, high and bright spaces offering a pleasant trip and precise control of thermal, visual and auditory comfort.

An economical, durable, easily implementable concept was chosen to meet the visual expression of the architectural volumetry and internal spatial organization, as well as the deadline imperatives.

The choice of steel was dictated by the big 16 to 18 m doors and the 13 m clearances required to create the glass canopies and give the roof its architectural signature. These canopies were produced with tubular steel sections maintained by a cable system, giving them the appearance of boat masts and allowing reversibility of suction and pressure stresses.

"In this project, we tried to reconcile elegance and durability. This was a very interesting exercise for us, especially since each step had to be conceived to respect the requirement of maintaining airport activities," Serge Vézina recalls.

The roof support structures are conventional and exposed, except for the central span, which was designed and erected to allow passage of the main mechanical and electrical utilities hidden in the crawl space. The roof's lateral stability is assured by the combined action of rigid-hinged arches and horizontal braces made of steel, attached to the concrete shear walls built around the stairwells and elevator shafts.

The structure was manufactured and erected with the cooperation of all stakeholders, particularly the teaming of the manufacturer's draftsman and the structural engineer. This cooperation was developed in virtual workshops, in which the 3D software used to produce the shop drawings was shared on Dessau's internet portal, a method that saved a lot of time. The CISC jury rightly presented an award to this project "for the clarity of the architectural concept, the aesthetic details of the fasteners and the sharing of the 3D model between the engineer and the manufacturer".

ARCHITECT: Consortium d'Architectes GPC
STRUCTURAL ENGINEER: Dessau inc.
GENERAL CONTRACTOR: Verreault inc.
OWNER: Aéroport de Québec inc.
STRUCTURE MANUFACTURER: Tecno Métal inc., Canam Canada


Photos Michel Brunelle

A SPACE AT THE HEART OF THE CELEBRATION

Everyone who visited Québec City in 2008 remembers that the Espace 400e pavilion, on the edge of Louise Basin, was a flagship building of the celebrations, hosting many shows, workshops, debates, etc. It was enlarged considerably in anticipation of the celebration, the second biggest renovation of this old cement factory, already recycled for the "Québec 1984" event.

The building not only was enlarged and transformed. It was literally given a new skin! It is now enveloped in a double skin of steel and glass, a continuous, homogeneous and smooth curtain wall. This wall is a transparent showcase containing silk-screens of images chosen from the Port of Québec's photographic archives and allowing projection of images visible from both sides.

"Although the official application for certification was not made, this project sought to achieve LEED Silver classification criteria. This is one reason why we kept the envelope, except for the south part, which had to be deconstructed to proceed with the requested expansion," explains Gilles Prud'homme, an architect with Dan S. Hanganu architectes.

The CISC jury presented an award for this project, due to the unifying effect of the facade, its positive environmental aspects, its transparency and its lightness. It should be noted that it also received the Ordre des ingénieurs du Québec Award in the sustainable development category.

An airtight single glass curtain wall was thus suspended on a new steel structure fastened at two points to the concrete structure of the existing building. "The original use of the steel joists we fastened to the roof and the foundation wall allowed us to limit the fasteners and preserve the insulating properties of the existing envelope," affirms Marc Leblanc, structural engineer with SNC-Lavalin. This dynamic wall allows control of the captive air space between the new and old envelopes. Thanks to this "variable emissivity" envelope, the building changes appearance depending on the point of view, the time of day and the seasonal cycle.

A green roof, accessible for visitors, was developed on the west side, as well as a suspended walkway. A Trombe wall installed on the south facade acts as a solar radiation captor and accumulator. A geothermal system with radiant floors also contributes to heat the building.

"The real challenge for us was installation of vertical joists and coordination of the work with the other trades, which required very close monitoring," recalls André Goulet, President of Les Aciers Fax, the structure manufacturer.

"From the structural point of view, this project's great particularity was the use of steel joists as columns to support the glass walls, which is very rare. The main difficulty was to ensure their compatibility with the connections," confirms Sébastien Paré, structural engineer, in charge of inspection of the steel joists at Canam Canada.

The building now accommodates the Parks Canada Discovery Centre, which offers a new permanent exhibition on immigration, the St. Lawrence and the Parks Canada network.

ARCHITECT: Consortium Dan Hanganu + Côté Leahy Cardas
STRUCTURAL ENGINEER: SNC-Lavalin Inc.
GENERAL CONTRACTOR: EBC inc.
OWNER: Parks Canada / PWGSC
STRUCTURE MANUFACTURER: Les Aciers Fax inc.; Canam Canada

Photos Esther Labalette

A WALKWAY OVER THE RIVER

The Brown Basin site is laden with history, because this is where General Wolfe's British soldiers landed in 1759. Subsequently, many shipyards and a railway pier were built there. Abandoned since 1973, it fell into obscurity. Since the federal government had decided to bequeath river sites to Québec City for its 400th anniversary, the Québec Port Authority wanted to redevelop the Brown Basin, a hope consistent with a movement to reclaim the river's shores.

The project stands out for the development of the site and the views it offers of the city and the river. Its development allows the creation of a visual and physical link between the shore and Québec's Upper Town, thanks to a pedestrian axis beginning at the foot of the Cap-Blanc stairway and ending on a jetty overhanging the river: a steel walkway.

"In fact, the walkway was imagined only in a second stage," confides Marc Letellier, an architect with Gagnon, Letellier, Cyr, Ricard, Mathieu Architectes. "Initially the aim was only to build the Brown Basin Interpretation Centre."

In a harmonious restoration, the roof of the centre in question today serves as a pedestrian link to the walkway. In the river, the anchoring and the foundation of the mast of this walkway are assured by one of the two existing mooring dolphin pillars. The other end is supported on the former marine infrastructures which must support a ship boarding ramp. The foundation work thus was minimized.

This is a catwalk guyed with three galvanized steel spans for a total length of 79 m and weighing 90 tonnes. It has a triangular tubular steel mesh structure. The height of the mast is 21.3 m (type A, rigid frame). The deck is treated yellow pine 86 mm thick.

"This is a special structure, in that the two angled masts give it the shape of a slightly tilted A, from which support cables were installed in one of the mooring dolphins. Having said this, the two main challenges will have been the size of the members and the tight deadline," Marc Letellier affirms.

The walkway's construction involved several technical challenges, due to the use of the existing foundations, the limited space, the complex structural geometry, and the implementation site's heavy exposure to wind and bad weather.

"This mandate required a lot more coordination than an ordinary project and we had to show ingenuity, because there was nothing in the Canadian Code on the type of assembly required to ensure the structure's strength and stability. We had to manufacture non-standard welded assemblies adapted to the context of the modules," recalls Jean-Louis Lemieux, a civil engineer with Sturo-Métal.

As can be imagined, transportation and installation were not easy either. "The walkway was made of five modules, which we had to convey by special transportation and install using two 220-tonne cranes, since the soil was too loose to support a more powerful machine. On the other hand, access to the site was difficult and it was never simple to work above the water," Mr. Lemieux remembers.

Reminiscent of a ship's architecture, the structure amplifies the axis created between the cliff and the river, especially at night when the pillars and all the bollards are illuminated. The CISC jury rewarded this project "for its aesthetic triangulation and success integration of the existing support members".

ARCHITECT: Gagnon, Letellier, Cyr, Ricard, Mathieu Architectes
STRUCTURAL ENGINEER: Tecsult | Aecom Inc.
GENERAL CONTRACTOR: Verreault inc.
OWNER: Québec Port Authority
STRUCTURE MANUFACTURER: Sturo Métal inc.
DETAILER: Dessins de Structure DCA inc.

STANDARDIZED BRACE CONNECTORS FOR SEISMIC-RESISTANT CONCENTRICALLY BRACED FRAMES

AWARD-WINNING, CANADIAN-BORN TECHNOLOGY THAT SAVES DESIGN TIME AND SIMPLIFIES FABRICATION AND ERECTION

Carlos de Oliveria, M.A.Sc., P.Eng., Jeffrey A. Packer, Ph.D., P.Eng., Constantin Christopoulos, Ph.D., P.Eng.

SEISMIC-RESISTANT CONCENTRICALLY BRACED FRAMES

It is no secret that concentrically braced frames (CBF) are amongst the most popular lateral force resisting systems for medium to low-rise steel structures. This is mainly due to design and erection simplicity and to the increased stiffness that CBF provide in comparison to other lateral force resisting systems. In Canada, seismic-resistant CBF that are detailed for a ductile response come in two flavours: Moderately Ductile (Type MD) Concentrically Braced Frames and Braced Steel Frames with Limited Ductility (Type LD).

In the event of a design-level earthquake, Type MD and Type LD CBF dissipate seismic energy through the cyclic yielding and inelastic buckling of their brace members. It should be no surprise then, that the cross-sectional shape, cross-sectional slenderness, and overall slenderness of the brace members in both Type MD and Type LD frames determine the building's overall response in an earthquake.

In 2006, Packer suggested the use of round HSS or Pipe over rectangular HSS for energy-dissipating brace elements. New research by Fell et al (2009) supports this and suggests that wide-flange sections and round hollow section braces provide a more desirable seismic-resistant braced frame response than rectangular HSS braces. The authors point out that in these superior sections, local buckling occurs more gradually and thereby delays fracture initiation at the central plastic hinging point of the brace.

Practicing engineers can apply these principals to aid in the design of efficient ductile braced frames. It is commonly accepted that HSS are the most efficient structural shape for carrying compressive loading. Since bracing elements must be sized to carry compressive forces (excluding braces in tension-only systems), and given the aforementioned research findings, it makes sense to specify round HSS (produced to CAN/CSA G40.20/21 or ASTM A500) or Pipe (produced to ASTM A53) for the bracing elements in both Type MD and Type LD braced frames whenever possible. Once the compressive forces become too large to be carried by round HSS or Pipe elements (i.e. the axial compressive capacity of the available sections that meet the stringent cross-sectional and overall member slenderness requirements for Type MD or Type LD frames is not sufficient), then wide-flange brace members should be specified.

These research findings, in addition to work previously done by Fell et al (2006) and as a result of recommendations made by Uriz et al (2007), are also behind the changes seen in the cross-sectional slenderness requirements for rectangular and round HSS seismic-resistant bracing in the newly published CSA steel design specification (2009) and the recent draft of the AISC seismic specification (2008).

The seismic response of CBF, characterized by cyclic yielding and buckling of their brace members, imparts arduous loading on the end connections of the activated braces. Consequently, CAN/CSA-S16 requires that all bracing connections in seismic-resistant CBF be detailed such that they are significantly stronger than the nominal cross-sectional capacity of the brace member. Specifically, for bracing elements in both Type MD and Type LD frames, the factored resistance of the brace connections must exceed both the probable tensile capacity of the bracing members in tension (given by $T_u = A_g R_y F_y$), and the probable compressive capacity of the bracing members in compression (C_u, given by the lesser of $A_g R_y F_y$ and $1.2C_r/\phi$ where C_r is computed using $R_y F_y$ and the probable post-buckling compressive resistance of bracing members). Detailing connections to provide this strength can be rather difficult, particularly when dealing with HSS.

SEISMIC-RESISTANT HSS BRACE CONNECTIONS

A slotted HSS-to-gusset connection is the most common detail used for connecting HSS brace members to the beam-column intersection. This type of connection induces shear lag in the hollow section, which can lead to connection facture at loads that are lower than the expected yield strength of the brace. Thus, it is good practice to provide net-section reinforcement in slotted hollow section bracing connections in ductile CBF. As discussed above, round HSS or Pipe elements make better energy absorbing bracing than rectangular HSS sections do, but the reinforcement of round sections requires the use of curved plate, channels, angles, or segments of other round sections, which can make detailing and fabricating the reinforced connection more onerous. Further com-

Canam Group fitter confirming the brace length before the Cast ConneX High-Strength Connectors are shop-welded to the HSS brace

plicating the issue, the next edition of CAN/CSA-S16 will require the use of a probable yield stress, R_yF_y, of at least 460 MPa when designing HSS bracing connections, regardless of the specified minimum yield stress in the HSS being used. This change will significantly increase the size (and associated materials, labour and hence cost) of all HSS brace connections and brings our standard more in line with the AISC Seismic Provisions which have required the use of higher R_y values for HSS bracing for a number of years.

In terms of brace member fabrication, the slots that are cut or burned into the HSS itself must have smooth edges, as notches in the slots can become sites for crack initiation and propagation in the connection during an earthquake. Commonly, field welding of the fillet welds between the slotted HSS and gusset is specified, which can be costly and requires substantial quality control and field inspection. If field bolting is desired, the connections must be spliced as the load path must remain concentric, thus requiring a significant number of bolts, all of which must be pre-tensioned. In many cases, the number of bolts required for spliced, slip-critical brace end connections is prohibitive.

AWARD-WINNING CANADIAN INNOVATION – STANDARDIZED CONNECTORS

Recognizing the need for a simple solution to the seismic-resistant HSS brace connection dilemma, a research team at the University of Toronto headed by Professors Jeffrey Packer and Constantin Christopoulos developed standardized cast steel connectors shaped to eliminate the need for connection reinforcement. The connectors have made their way from the University laboratory to the field, and are now commercially available from the Toronto-based *Cast Connex Corporation* under their product line of *High-Strength Connectors*.

Although other industries such as rail, marine, mining, agriculture, energy and military make significant use of steel castings in structural applications, the North American steel construction industry has been slow to embrace the benefits of steel castings. The use of a steel casting to address the brace connection issues is a part of what made the Toronto research both innovative and practical.

Full-scale cyclic testing of a 6-metre long round HSS brace assembly equipped with Cast ConneX High-Strength Connectors at École Polytechnique de Montréal

At one end, High-Strength Connectors are designed with a circular shape and preparation, which allows them to be shop welded to a round HSS brace. The circumferential weld eliminates the occurrence of shear lag in the connection, and with a complete-joint penetration weld, the joint is inherently as strong as the brace itself, regardless of the actual overstrength of the HSS element. Further, the tapered preparation on the nose of the connector accommodates any HSS of a given outer diameter, regardless of the section's wall thickness – thus standardization of the connector is achieved. This standardization leverages casting manufacturing's inclination to mass production, making the connectors commercially practical.

On their other end, the connectors accommodate a double-shear bolted connection to the gusset plate. This bolt group can be detailed to provide a resistance commensurate with the probable tensile resistance of the particular HSS member being used. As the connectors are supplied without any bolt holes, the connection designer has the freedom to use whatever bolt pattern, grade, and diameter of bolt desired. Additionally, if slip-critical connections are warranted, the faying surfaces on the High-Strength Connectors are rough, reducing the number of bolts required as Class B slip-resistance can be assumed with the appropriate treatment of the gusset plate. Alternatively, if site fit up becomes an issue, or if the connections are to be exposed and the architect would like to avoid bolted connections, the connectors can be field welded to the gussets.

Having been developed in a university setting, braces equipped with High-Strength Connectors have been subjected to rigorous full-scale testing to prove their effectiveness in a design-level earthquake. This testing was carried out in the structures laboratories at both

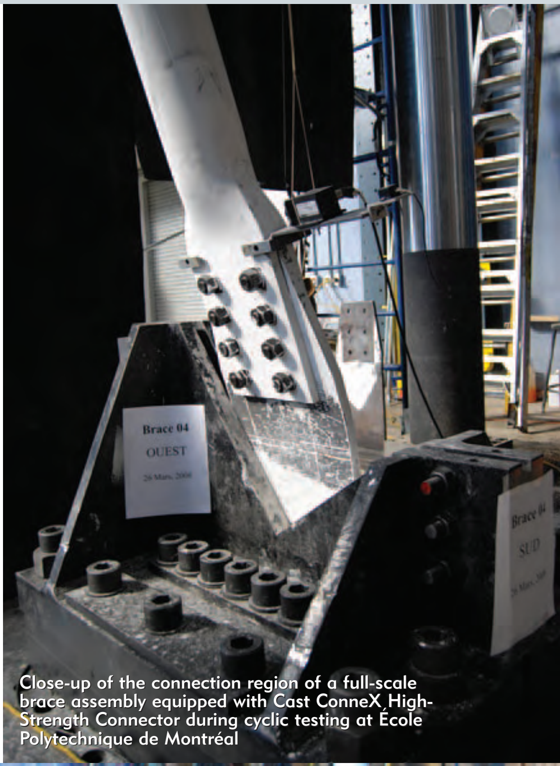
Seismic-resistant braced frame with round HSS bracing equipped with Cast ConneX High-Strength Connectors in the Sandoz Canada Inc. administration building

Photo courtesy of Deutsch Associates Architects/Photographer Jessie Shotwell

University of Toronto and École Polytechnique de Montréal and has been well documented (de Oliveira et al, 2008a, de Oliveira et al, 2008b, Tremblay et al, 2008).

The first project to feature braces equipped with these innovative connectors was a four-storey office building (expandable to six-storey) designed and constructed by CISC member Canam Group Inc. (Boucherville, Québec) and Les Architectes Odette Roy et Isabelle Jacques (St-Georges, Québec). The office building is to become the main administration building for Sandoz Canada Inc. and is part of a large new development which includes 40,000 square feet of manufacturing space, 10,500 square feet of warehousing space, and 17,000 square feet for administrative support. The site is located in Boucherville, Québec near the St-Lambert region of Montréal, which is a region of moderately high seismicity.

The Canam Group's Sandoz project, representing years of research and commercialization efforts, helped make the University of Toronto researchers and Cast Connex Corporation the inaugural winners of the Canadian Society for Civil Engineering's "Excellence in Innovation in Civil Engineering Award" in 2009. This prestigious award, presented by peers in the civil engineering community, recognizes outstanding innovation in civil engineering that has the potential for significant and far-ranging beneficial impact on the prosperity and well-being of society.



Close-up of the connection region of a full-scale brace assembly equipped with Cast ConneX High-Strength Connector during cyclic testing at École Polytechnique de Montréal

An additional design time-saving feature of the Cast ConneX® High-Strength Connectors: Cast Connex Corporation is about to launch a Design Manual that provides fully detailed double-shear bolted connections for every connector-to-brace combination possible for both bearing-type and slip-critical connections and for a variety of bolt diameters and grades. The manual also discusses everything from the full-scale product testing carried out by the company to a discussion on best practices for fitting, drilling, and welding to their connectors.

To pre-order your free digital copy, e-mail **HSCmanual@castconnex.com**.

Canam Group welder welding a Cast ConneX High-Strength Connector to a round HSS brace element for use in a seismic-resistant braced frame

For more information on Cast Connex Corporation, **visit www.castconnex.com.**

REFERENCES

AISC, 2005. Seismic provisions for structural steel buildings. ANSI/AISC 341-05, ANSI/AISC 341s1-05, American Institute of Steel Construction, Chicago, Illinois.

AISC, 2008. Seismic provisions for structural steel buildings. September 19, 2008 draft of the 2010 AISC/AISC 341 Specification.

CSA, 2005. Limit states design of steel structures for buildings. CAN/CSA-S16-05. Canadian Standards Association, Toronto, Ontario.

CSA, 2009. Design of steel structures CSA-S16-09 Specification. Canadian Standards Association, Toronto, Ontario.

de Oliveira, J.-C., Packer, J. A. and Christopoulos, C., 2008a. Cast Steel Connectors for Circular Hollow Section Braces Under Inelastic Cyclic Loading. ASCE Journal of Structural Engineering, 134(3), 374-383.

de Oliveira, J.-C., Packer, J.A., Christopoulos, C., Tremblay, R. and Gray, M.G., 2008b. Full-Scale Experimental Validation of Standardized Seismic-Resistant Cast Steel Brace Connectors. Proceedings, 14th annual World Conference of Earthquake Engineering, Beijing.

Fell, B., Kanvinde, A., Deierlein, G., Myers, A. and Fu, X., 2006. Buckling and Fracture of Concentric Braces under Inelastic Cyclic Loading. Structural Steel Education Council, Steel Tips No. 94.

Fell, B.V., Kanvinde, A.M., Deierlein, G.G. and Myers, A.T., 2009. Experimental investigation of inelastic cyclic buckling and fracture of steel braces. ASCE Journal of Structural Engineering, 135 (1), 19-32.

Packer, J.A., 2006. Tubular brace member connections in braced steel frames. 11th. International Symposium on Tubular Structures, Québec City, Canada, Proceedings, pp. 3-11.

Tremblay, R., Christopoulos, C., Packer, J. A. and de Oliveira, J. -C., 2008. Quasi-Static Cyclic Testing of Individual Full-Scale Circular Steel Tubular Braces Equipped with Cast ConneX™ High-Strength Connectors. Joint École Polytechnique de Montréal and University of Toronto Publication.

Uriz, P., Sabelli, R. and Mahin, S.A., 2007. Design implications of recent research on SCBF. Advisory Notice submitted to American Institute of Steel Construction.

SCHOLARSHIPS AND AWARDS SUMMARY

Rob White

G.J. JACKSON MEMORIAL FELLOWSHIP AWARD

The G. J. Jackson Fellowship is awarded annually by the Steel Structures Education Foundation in memory of the late Geoffrey Jackson. Mr. Jackson was for many years a leader in the Canadian structural steel fabrication industry and was a founding member of the Steel Structures Education Foundation. The Award is presented to Canadian engineering students conducting graduate studies in structural engineering, with major emphasis on steel structures. This prestigious award is currently valued at $15,000, over a one-year period. This award is presented at the SSEF Annual General Meeting.

The 2009 Jackson Fellowship recipient is **Hassan Moghimi**, from the University of Alberta. Hassan was presented with his award at the annual SSEF / CISC convention this past June in Winnipeg, Manitoba.

Hassan Moghimi is a Ph.D. student working under the supervision of R.G. Driver at the University of Alberta. Hassan's project is to investigate new applications of shear plate walls. Hassan's research will examine the effect of accidental blast on steel plate shear walls and the associated response and will also investigate the use of steel plate shear walls in low seismic zones. The aim of this research is to identify economic solutions for the use of steel plate shear walls in industrial structures.

2009 SSEF ARCHITECTURAL STUDENT DESIGN COMPETITION

"tension"
The Challenge
From an architectural perspective, the successful resolution of tension in a structure can be envisioned as the expression of an artistically satisfying equilibrium of opposing forces. While notions of tension might immediately bring to mind images of tensile structures, this exploration was not meant to be limiting in its scope. Students were invited not only to explore tension as it may be expressed in form, surfaces, and connections; they were also invited to engage in the exploration of tension as part of a structural dialogue that may occur between tension and compression as that results in the structural resolution of architectural form. While they may range from utilitarian to exquisite in their execution, all responses must, nonetheless, come to terms with one simple problem: the clear application of tension to achieve a harmonious structural solution. To this end, the solution was not to hide this structural requirement; it must, instead, be celebrated and exploited, both architecturally and structurally.

Students were challenged to design a structure that explores "tension" on a site of the designers' choosing. While the purpose and scale are left to the discretion of the designer, it is important to focus on what it means for us to engage and experience structure as tension. The structure must be primarily steel, but otherwise, the material palette was open.

The jury consisted of Chris Adach (M & G Steel Ltd.), Neb Erakovic (Halcrow Yolles), Roger Pavan (Pavan Architects) and Carol Klleinfeldt (Kleinfeldt Mychajlowycz Architects Inc.).

Award of Excellence
Matt Schmid,
University of Toronto
Faculty Advisor: Philip Beesley
Amount: $3,000

Award of Merit
Jonathan Cummings,
University of Toronto
Faculty Advisor: David Bowick
Amount: $2,000

2009 H.A. KRENZ RESEARCH AWARD

The H. A. Krentz award recognizes a researcher who's research topic has special merit and interest with promise that it will make a significant contribution to understanding the behaviour of steel structures, or advances in the economy, safety or reliability of steel structures. The 2009 H. A. Krentz Research Award is awarded to **Robert G. Driver**, **Ph.D.**, Department of Civil and Environmental Engineering, University of Alberta.

Professor Driver is the Chair of the Progressive Collapse Subcommittee (A279.6) developing the CSA Standard S850, "Design and Assessment of Buildings against Blast". He is also on the CSA S16 Committee and provides essential coordination between the two standards. His primary research interests pertain to the design and behaviour of steel structures, including topics such as bolted & welded connections, plate walls, high performance steel, rehabilitation, composite columns, and behaviour under extreme loading.

The Steel Structures Education Foundation awarded a grant of $24,000 for Professor Driver's research on the "Development of Canadian Progressive Collapse Mitigation Criteria for Steel Structures". In addition, a gift of $5,000 is given as part of this notable award. Professor Driver also received this award in years 2006, 2007 and 2008.

2009 SSEF ARCHITECTURE SCHOLARSHIP

The SSEF is pleased to provide scholarships to students enrolled in accredited professional Schools of Architecture across Canada. These students must show innovation and excellence in steel design. The precise criteria for the award were developed by the individual School and Faculty / Administration.

LAVAL UNIVERSITY
For projects conceived during a workshop of design:
Alexandre Guilbeault – Bachelor's Level
Guillaume Drouin Chartier – Master's Level
Simon Pelletier – Master's Level

UNIVERSITY OF MONTREAL
Award of Excellence
Jean François Marceau

Second Prize
Marc-Antoine Grondin
Vincent Carrière-Marleau
Simon Chawky

UNIVERSITY OF BRITISH COLUMBIA
Excellence in Steel Design
Charlotte Falk
Kali Gordon
Katy Mulla

CISC also offers a number of scholarship award programs and initiatives for students across Canada. Funded and administered through regional efforts, these initiatives are offered to students conducting studies in the field of structural engineering, and are designed to help promote structural steel studies at Canadian education institutes.

ATLANTIC REGION

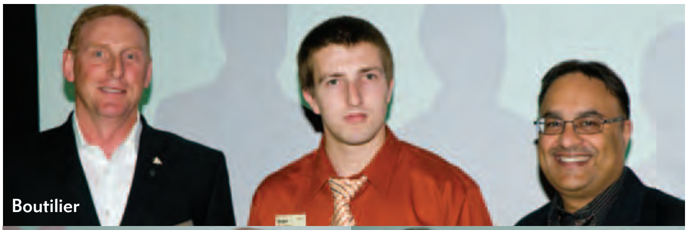
The Atlantic region's scholarship program is open to applicants who will be doing a postgraduate degree on research in structural steel structures or a related topic at one of the four Atlantic Engineering Universities (University of New Brunswick, Université de Moncton, Dalhousie University and Memorial University). Two awards, each in the amount of $2,500 are available annually.

One award has been presented in 2008 / 2009 to **Frankie Soloman** of Dalhousie. His research work is directly related to better characterize the behaviour of extended shear connections. This award is in recognition of his achievements to date and for his continuing advancement of structural steel studies at Dalhousie University.

The 2009 / 2010 Atlantic Region graduate scholarship program has been modified . Only one scholarship with a value of $7500 will be offered starting in 2009 / 2010. The Atlantic Regional Committee of the Canadian Institute of Steel Construction (CISC) has established this graduate scholarship to support an engineer who is pursuing a post graduate degree in Civil Engineering with emphasis on structural steel structures or a related steel topic. The applicant can be a recent engineering graduate or an engineer that is working in industry, government or the academic field. The goal is to provide monetary support to a person that is continuing their study in the structural steel field while encouraging that person to continue their career in the steel industry.

ONTARIO REGION

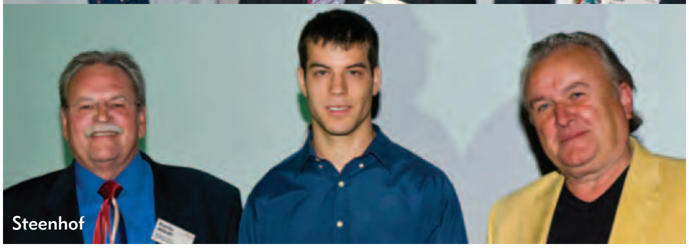
The Ontario Regional Committee awarded scholarships in 2009 to students who excelled in their steel design courses, eight of which were presented to engineering students and two to architectural students. Chosen recipients were selected based on input from their professors at each respective institution. This year scholarships went to:


Boutilier


Charbonneau


Keskinian


Reinders


Steenhof

- **Bryan Boutilier**, Windsor University, sponsored by Benson Steel & Mirage Steel
- **Matthew Charbonneau**, Waterloo University, sponsored by M & G Steel & Walters Inc.
- **Devon Comstock**, University of Western Ontario, sponsored by Dymin Steel & CISC Ontario
- **Daron Keskinian**, University of Toronto, Engineering, sponsored by Telco Steel Works & Mariani Metal Fabricators
- **Mark Reinders**, McMaster University, sponsored by Walters Inc. & Telco Steel Works
- **Mark Steenhof**, Ryerson University, Engineering, sponsored by Skyhawk Steel & MBS Steel
- **Juan Giraldo Velez**, Carleton University, sponsored by Dymin Steel & M & G Steel
- **University of Toronto**, Architectural, sponsored by Mariani Metal Fabricators & CISC Ontario
- **Queen's University**, sponsored by Benson Steel & Mirage Steel
- **Ryerson University**, Architectural, sponsored by MBS Steel & Skyhawk Steel

These awards provide each recipient with $2000 in scholarship funding. The applicants must be undergraduate students who excel in the steel design course during their third year and who also selected a steel elective in their final year. The award presentations were part of the Ontario Region's 19th Annual Spring Reception held May 13, 2009 at the Living Arts Centre in Mississauga.

BRITISH COLUMBIA REGION

The BC Regional Committee has offered a Fabricator's Engineering Apprentice program for the past nine years. The program formally integrates a UBC student's academic studies with work experience in co-operative employer organizations, for a four-month work-term working with both a CISC fabricator and structural engineering consultant. Congratulations to the following students who were selected to participate in the 2009 program. The CISC steel fabricator employer is also listed. These students were presented with a certificate award at the BC Region's 2009 Steel Design Awards of Excellence in Vancouver held on November 19, 2009.

- **Stephen Clark**, Canron Western Constructors Ltd.
- **Osvaldo Mote**, George Third & Son Ltd.

CENTRAL REGION

The Central Regional Committee has established an annual scholarship award in the amount of $2,000, which is presented to a student(s) enrolled in the College of Engineering at the University of Saskatchewan.

For more information about these education initiatives or to find out how to apply for an award, please contact your regional director or visit the websites at **www.cisc-icca.ca** and **www.ssef-ffca.ca.**

NEWS AND EVENTS

CONGRATULATIONS TO FAST + EPP AND CANNON DESIGN

Fast + Epp Structural Engineers and architectural firm Cannon Design of Vancouver received the Institution of Structural Engineers' Award for Sports or Leisure Structures for the Richmond Olympic Oval. The award, which acknowledges achievement in structural design, was announced in London, England on Friday, October 9th at the Institution of Structural Engineers 2009 Structural Awards Gala and marks the first major international award for the Richmond Olympic Oval.

CONGRATULATIONS TO SUPERMETAL STRUCTURES ON THEIR 50TH ANNIVERSARY

Since its founding in Quebec in 1959, Supermetal has made teamwork a priority. Their recipe for success depends on the motivation of each employee. From the design to the erection of structural steel, from computer drafting to the smallest little weld, every link in the chain is important. Each employee is called upon to add his best and work together with his colleagues to achieve a product and service that go beyond industry standards and clients' expectations. As in a symphony orchestra, each employee's outdoing himself is the ideal to strive for, hence the vital importance of teamwork.

Congratulations on your 50th and best wishes for the next 50!

CISC ONTARIO MEMBERS TOUR THE UNIVERSITY OF TORONTO'S STRUCTURAL TESTING FACILITY

On October 7, members of the Ontario Region were invited by Professor Christopoulos to visit the new structural testing laboratories at U of T. The laboratories have undergone major upgrades in order to acquire state-of-the-art testing and sensing equipment that will be used to carry out extensive testing on steel structures.

Prior to touring the facility; several students gave presentations on recent research projects. These students were recipients of the G. J. Jackson Fellowship or funded by SSEF. During the tour, a test on elliptical steel tube connections was carried out by an Ontario Region Scholarship Recipient.

Standing – left to right – Mike Minielly (Dymin Steel), Randy Abbott (Skyhawk Steel Ltd.), Neil McMillan (AECOM), Tsvet Tsokov (Telco Steel Works), Steven Law (Reinders + Rieder Ltd.), Tim Haskett (Canam Canada)

Seated – left to right – Tom Lau-Wiffin, CISC Ontario Chair (Ed Lau Ironworks), Paul Ast (Jablonsky, Ast and Partners)

CISC ONTARIO ANNUAL GOLF DAY

The Ontario Region held its annual Golf Day on September 19th at the Carlisle Golf & Country Club. The winning foursome, **Neil McMillan**, **Tsvet Tsokov**, **Steven Law** and **Tim Haskett** received the award for the "Lowest Score". Thanks to Mike Minielly for coordinating a fun-filled day enjoyed by member and guests.

TEACHING AID FOR THE WINNIPEG CAMPUS OF THE RED RIVER COLLEGE

CISC Central Region is fabricating a teaching aid for installation on the Red River College campus. The teaching aid is basically a column tree with a number of steel elements attached to the column using a variety of connection methods. Over the past number of years numerous such teaching aids have been placed on University and College campuses allowing students to see how actual structural steel elements are being used every day in the construction of buildings, bridges and other structures.

For more information of this program, contact your CISC Regional Manager.

SAINT JOHN HIGH SCHOOL SOFTWARE TRAINING UPDATE

Training of the high school teachers from the Saint John area who will be using the software SDS II in their technology programs, took place at Ocean Steel's training facility in June. The regional CISC representative gave a talk on the role of CISC in the steel industry with emphasis on the opportunities in the steel business. On September 2 – 3 the Saint John region technology high school teachers were at Ocean Steel for the remainder of their SDS II training. Alan Lock spent the morning of Sept 2nd presenting a comprehensive view of the structural steel industry and its importance in the Atlantic Provinces economy. That afternoon there was a guided tour of the PCS Piccadilly mine site.

2010 ASCE/AISC NATIONAL STUDENT STEEL BRIDGE COMPETITION

CISC and SSEF are proud sponsors of the ASCE/AISC National Student Steel Bridge Competition. The design of bridges is perhaps the most exciting challenge for a structural engineer. This competition fosters the challenge of designing and testing a bridge. Students are encouraged to apply their theoretical knowledge in a hands-on project that addresses the full breadth of steel design requirements, including: aesthetics, speed of erection, lightness, stiffness, economy and efficiency.

The 2010 competition will take place May 28 – May 29 at Purdue University, Indiana. AISC and the competition co-sponsors assist with travel funds for those teams invited to compete. The first top team from each region receives (US) $1000. The second top team from each region receives (US) $500. SSEF contributes $1000 to each Canadian team that qualifies for the National competition. SSEF also tries to match a team with a local CISC Steel Fabricator. CISC Regional Committees provide varying levels of financial support for Canadian teams attending regional competitions. For more information, please go to the SSEF web site. **www.ssef-ffca.ca**

CONTINUING EDUCATION COURSES – SPRING 2010

All courses listed here will be held in the **Spring of 2010**. Specific dates for the locations are to be confirmed. Please check the web site for updates: **www.cisc-icca.ca/courses**

Industrial Building Design

The course illustrates the limit states design of a single-storey industrial building. It refers extensively to the National Building Code of Canada 2005 (NBC 2005) and to CAN/CSA-S16-01 "Limit States Design of Steel Structures" including the S16S1-05 Supplement, with emphasis on the applicability to typical Industrial buildings. In addition, there are references to the CISC Crane-Supporting Steel Structures: Design Guide, 2nd Edition and various AISC publications.

St. John's, NL Spring 2010
Moncton, NB Spring 2010
Ottawa, ON Spring 2010
Saskatoon, SK Spring 2010
Calgary, AB Spring 2010

Conception de bâtiments industriels

Ce cours illustre la conception des états limites d'un bâtiment industriel à un seul étage. Il renvoie fréquemment au Code national du bâtiment du Canada 2005 (CNBC 2005) et à la norme CAN/CSA-S16-01 « Règles de calcul aux états limites des charpentes en acier », supplément à la norme S16S1-05 compris, et plus particulièrement à l'applicabilité aux bâtiments industriels types. Le cours renvoie également au « Crane-Supporting Steel Structures: Design Guide, 2nd Edition » de l'ICCA ainsi qu'à diverses publications de l'AISC.

Québec, QC Printemps 2010
Montréal, QC Printemps 2010
Trois-Rivières, QC Printemps 2010

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.

St. John's, NL Spring 2010
Halifax, NS Spring 2010
Fredericton, NB Spring 2010
Ottawa, ON Spring 2010
Toronto, ON Spring 2010
Winnipeg, MB Spring 2010
Regina, SK Spring 2010
Edmonton, AB Spring 2010
Vancouver, BC Spring 2010

Boulonnage et soudage à l'intention des ingénieurs en structure

Ce cours propose une introduction à l'assemblage des charpentes d'acier et insiste sur les solutions économiques et pratiques. Bien que ce ne soit pas un cours de conception d'assemblages proprement dit, les participants en tireront cependant une solide compréhension des matériaux, produits, caractéristiques, installations, problèmes sur le chantier et méthodes de calcul pour l'assemblage des charpentes d'acier.

Québec, QC Printemps 2010
Montréal, QC Printemps 2010
Trois-Rivières, QC Printemps 2010

Conception parasismique d'immeubles à charpente d'acier

Ce cours très en demande sera offert une nouvelle fois dans les centres à activité sismique du Canada et abordera la conception de diverses catégories de contreventements et cadres rigides selon les exigences du Code national du bâtiment du Canada (CNBC) – Édition 2005 et de la norme CSA S16-01 (S16S1-05) en incorporant des exemples de conception d'immeubles allant de un à dix étages.

Quebéc, QC Printemps 2010
Montréal, QC Printemps 2010

NEW MEMBERS

At the November meeting the CISC Board of Directors elected the following organizations as new members.

FABRICATOR

Austin Steel Group Inc.
39 Progress Court, Brampton ON L6S 5X2
Tel: 905 799 3324 Fax: 905 779 8011

D & M Steel Ltd.
1285 Ringwell Drive, Newmarket ON L3Y 8T9
Tel: 905 936 6612 Fax: 905 836 6637

Linesteel (1973) Limited
561 Welham Road, Barrie ON L4N 8Z6
Tel: 705 721 6677 Fax: 705 721 0778

Mometal Structures Inc.
201 Chemin du Lac, Varennes, QC, J3X 1P7
Tel: 450 929 3999 Fax: 450 929 4505

Produits Metalliques PMI,
261, avenue du Havre, Rimouski QC G5M 0B3
Tel: 418 723 2610 Fax: 418 725 4485

Steel 2000 Inc.
P.O. Box 669, 3686 Ford Drive, Chelmsford ON P0M 1L0
Tel: 705 855 0803

STEEL SERVICE CENTRE

Wilkinson Steel and Metals
888 S.E. Marine Drive, Vancouver BC V5X 2V3
Tel: 604 324 6611 Fax: 604 301 3222

SUPPLIER

Laboratoire D'Essai Mequaltech
8740 boul. Pie-IX, Montreal, QC
Tel: 514-593-8338 Fax: 514 593 8338

EVENTS

IABSE-fib Conference
May 3 – 5, 2010, Dubrovnik, Croatia
www.iabse.org/conferences/Dubrovnik2010/index.php

NASCC - The Steel Conference
May 12 – 15, 2010 Orlando, U.S.A.
www.aisc.org

ASCE/AISC Student Steel Bridge Competition
May 28 – 29, 2010 Purdue University, U.S.A.
www.aisc.org/content.aspx?id=780

2010 CISC / SSEF Annual Convention
June 9 – 12, 2010 Kananaskis, AB

4th International Conference on Steel and Composite Structures
July 21 – 23, 2010 Sydney, Australia
www.iceaustralia.com

8th International Conference on Short & Medium Span Bridges
August 3 – 6, 2010 Niagara Falls, ON
www.bridgeconference2010.com

The Pacific Structural Steel Conference 2010
October 19 – 22, 2010 Beijing, China
www.pssc2010.com

International Symposium on Tubular Structures
December 15 – 17, 2010 Hong Kong, China
www.hku.hk/civil/ISTS13

REGIONAL ACTIVITIES

Alberta Region - "The Steel Workshop"
March 25, 2010

Ontario Design Awards
May 13, 2010 - The Living Arts Centre, Mississauga

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

ATLANTIC

Atcon Construction Ltd. Br
Miramichi, NB 506 627 1220
www.atcongroup.com

Cherubini Metal Works Limited S, P
Dartmouth, NS 902 468 5630
www.cherubinigroup.com

MacDougall Steel Erectors Inc S
Cornwall, PE 902 855 2100
www.macdougallsteel.com

Marid Industries Limited S
Windsor Junction, NS 902 860 1138
www.marid.ns.ca

MQM Quality Manufacturing Ltd. S, P
Tracadie-Sheila, NB 506 395 7777
www.mqm.ca

Ocean Steel & Construction Ltd. S, P
Saint John, NB 506 632 2600
www.oceansteel.com

Prebilt Structures Ltd. S, P
Charlottetown, PE 902 892 8577
www.prebiltsteel.com

RKO Steel Limited S, P
Halifax, NS 902 468 1322
www.rkosteel.com

Tek Steel Ltd. S
Fredericton, NB 506 452 1949

QUEBEC

Acier Métaux Spec. inc. S
Chateauguay, QC 450 698 2161
www.metauxspec.ca

Acier Robel inc. S
St-Eustache, QC 450 623 8449
www.acierrobel.com

Acier Trimax Inc. S
Ste-Marie de Beauce, QC 418 387 7798
www.trimaxsteel.com

Alma Soudure inc. S
Alma, QC 418 669 0330
www.almasoudure.com

B.K. Fer Ouvré S
St-Bruno, QC 450 441 5484
www.bkiron.com

Canam Canada, une division de Groupe Canam Inc. S, J
Boucherville, QC 450 641 4000

Canam Canada, une division de Groupe Canam Inc. S, J
Ville de St-Georges, QC 418 228 8031
www.canam-poutrelle.ws

Charpentes Métalliques TAG (6541984 Canada inc.)
Ange-Gardien, QC 450 379 9661

Constructions PROCO Inc. S
St. Nazaire, QC 418 668 3371
www.proco.ca

FASLRS Métaux Ouvrés F.G. S
Saint-Léonard, QC 514 852 6467
www.fgmetal.com

Industries Canatal Inc. S
Thetford Mines, QC 418 338 6044
www.canatal.net

Jean Yves Fortin Soudure Inc. S
Montmagny, QC 418 248 7904

Lainco Inc. B, Br, S
Terrebonne, QC 450 965 6010

Les Aciers Fax inc
Charlesbourg, QC 418 841 7771

Charpentes d'acier Sofab Inc. S
Boucherville, QC 450 641 2618
www.sofab.ca

Les Constructions Beauce-Atlas Inc. S
Ste-Marie de Beauce, QC 418 387 4872
www.beauceatlas.ca

Les Industries V.M. Inc. S
Longueuil, QC 450 651 4901

Les Métaux Feral Inc. S
St-Jérôme, QC 450 436 8353

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

Les Structures GB Ltée S, P
Rimouski, QC 418 724 9433
www.structuresgb.com

Locweld Inc. S
Candiac, QC 450 659 9661
www.locweld.com

Métal Moro inc S
Montmagny, QC 418 248 1018

Métal Perreault Inc. B, S, P
Donnaconna, QC 418 285 4499
www.metalperreault.com

Mométal Structures Inc. B, S
Varennes, QC 450 929 3999
www.mometal.ca

Nico Métal inc. S
Trois-Riviéres, QC 819 375 6426
www.nico-metal.com

Poutrelles Delta Inc. J
Ste-Marie, Beauce, QC 418 387 6611
www.deltajoists.com

Produits Métalliques PMI S
Rimouski, QC 418 723 2610

Quéro Métal Inc. S
St. Romuald, QC 418 839 0969
www.querometal.com

Quirion Métal Inc. S
Beauceville, QC 418 774 9881
www.quirionmetal.com

Ray Métal Joliette Ltée S
Joliette, QC 450 753 4228

Structal - ponts, une division de Groupe Canam Inc. S, P
Québec, QC 418 683 2561
www.structalponts.ws

Structures Yamaska Inc. S
Saint-Césaire, QC 450 469 4020

Sturo Métal Inc. S
Levis, QC 418 833 2107
www.sturometal.com

Supermétal Structures Inc. S, P
St. Romuald, QC 418 834 1955
www.supermetal.com

Tardif Métal Inc. B, S, P
Lac St-Charles, QC 418 849 6919
www.sm-inc.com

Tecno Métal Inc. B, S
Quebec, QC 418 682 0315
tecnometal.ca

ONTARIO

ACL Steel Ltd. S
Kitchener, ON 519 568 8822
www.aclsteel.ca

Austin Steel Group Inc. S
Brampton, ON 905 799 3324
www.gensteel.ca

Azimuth Three Enterprises Inc. S
Brampton, ON 905 793 7793

Benson Steel Limited S, J
Bolton, ON 905 857 0684
www.bensonsteel.com

Burnco Mfg. Inc. S
Concord, ON 905 761 6155
www.burncomfg.com

C & A Steel (1983) Ltd. S
Sudbury, ON 705 675 3205

C_ore Metal Inc.
Oakville, ON 905 829 8588
www.coremetal.com

Canam Canada, A Division of Canam Group Inc. J
Mississauga, ON 905 671 3460
www.canam-steeljoist.ws

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

Cooksville Steel Limited S
Kitchener, ON 519 893 7646
www.cooksvillesteel.com

Cooksville Steel Limited S
Mississauga, ON 905 277 9538
www.cooksvillesteel.com

D & M Steel Ltd. S
Newmarket, ON 905 936 6612

Eagle Bridge Inc. S
Kitchener, ON 519 743 4353

Ed Lau Ironworks Limited S
Kitchener, ON 519 745 5691
www.edlau.com

Fortran Steel Inc. S
Greely, ON 613 821 4014
www.fortransteel.com

G & P Welding and Iron Works S, P
North Bay, ON 705 472 5454
www.gpwelding.com

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

Gorf Contracting Limited S, P
Schumacher, ON 705 235 3278
www.gorfcontracting.net

Lambton Metal Services S
Sarnia, ON 519 344 3939
www.lambtonmetalservice.ca

Laplante Welding of Cornwall Inc. S
Cornwall, ON 613 938 0575
www.laplantewelding.com

Linesteel (1973) Limited B, S
Barrie, ON 705 721 6677

Lorvin Steel Ltd. S
Brampton, ON 905 458 8850
www.lorvinsteel.com

M & G Steel Ltd. S
Oakville, ON 905 469 6442
www.mgsteel.ca

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

Maple Industries Inc. S
Chatham, ON 519 352 0375
www.mapleindustries.ca

Mariani Metal Fabricators Limited S
Etobicoke, ON 416 798 2969
www.marianimetal.com

MBS Steel Ltd. J
Brampton, ON 905 799 9922
www.mbssteel.com

Mirage Steel Limited S, J
Brampton, ON 905 458 7022
www.miragesteel.com

Norak Steel Construction Limited S
Concord, ON 905 669 1767
www.noraksteel.com

Nor-Weld Ltd. B
Orillia, ON 705 326 3619
www.norweld.com

Paradise Steel Fab. Ltd. S
Richmond Hill, ON 905 770 2121

Paramount Steel Limited S
Brampton, ON 905 791 1996
www.paramountsteel.com

Pittsburgh Steel Group S
Vaughan, ON 905 669 5558
www.pittsburghsteel.com

Quad Steel Inc. S
Bolton, ON 905 857 9404
www.quadsteel.ca

Rapid Steel Fabrication Co. Inc. S
Erin, ON 519 833 4698
www.rapidsteel.com

Refac Industrial Contractors Inc. S, P
Harrow, ON 519 738 3507
www.refacindustrial.com

Shannon Steel Inc. S
Orangeville, ON 519 941 7000
www.shannonsteel.com

Spencer Steel Limited S
Ilderton, ON 519 666 0676
www.spencersteel.com

Steel 2000 Inc. S
Chelmsford, ON 705 855 0803

Telco Steel Works Ltd. S
Guelph, ON 519 837 1973
www.telcosteelworks.ca

Tower Steel Company Ltd. S
Erin, ON 519 833 7520
www.towersteel.com

Tresman Steel Industries Ltd. S
Mississauga, ON 905 795 8757
www.tresmansteel.com

Victoria Steel Corporation S
Oldcastle, ON 519 737 6151

Walters Inc. S, P
Hamilton, ON 905 388 7111
www.waltersinc.com

CENTRAL

Abesco Ltd. S
Winnipeg, MB 204 667 3981

Capitol Steel Corp. S
Winnipeg, MB 204 889 9980
www.capitolsteel.ca

Coastal Steel Construction Limited S, P
Thunder Bay, ON 807 623 4844
www.coastalsteel.ca

Elance Steel Fabricating Co. Ltd. S
Saskatoon, SK 306 931 4412
www.elancesteel.com

Empire Iron Works Ltd. S
Winnipeg, MB 204 589 7371
www.empireiron.com

IWL Steel Fabricators Ltd. S, P
Saskatoon, SK 306 242 4077
www.iwlsteel.com

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

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

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

Weldfab Ltd. S
Saskatoon, SK 306 955 4425
www.weldfab.com

ALBERTA

Bow Ridge Steel Fabricating S
Calgary, AB 403 230 3705

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

Canam Canada, A Division of Canam Group Inc. J
Calgary, AB 403 252 7591
www.canam-steeljoist.ws

Capital Steel Inc., S
Edmonton, AB 780 463 9177

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

Empire Iron Works Ltd. S, P, J
Edmonton, AB 780 447 4650
www.empireiron.com

Eskimo Steel Ltd. S, P
Sherwood Park, AB 780 417 9200
www.eskimosteel.com

Garneau Manufacturing Inc. S
Morinville, AB 780 939 2129

Leder Steel Limited S
Edmonton, AB 780 962 9040
ledersteel.com

Moli Industries Ltd. S
Calgary, AB 403 250 2733
www.moli.ca

Norfab Mfg (1993) Inc. B
Edmonton, AB 780 447 5454

Northern Weldarc Ltd. S, P
Sherwood Park, AB 780 467 1522
www.northern-weldarc.com

Omega Joists Inc. J
Nisku, AB 780 955 3390
www.omegajoists.com

Petro-Chem Fabricators Ltd. S
Edmonton, AB 780 414 6701

Precision Steel & Manufacturing Ltd. S
Edmonton, AB 780 449 4244
www.precisionsteel.ab.ca

Rampart Steel Ltd. S
Edmonton, AB 780 465 9730
www.rampartsteel.com

RIMK Industries Inc. B, S
Calgary, AB 403 236 8777

Spartan Steel Ltd. S
Edmonton, AB 780 435 3807

Supermétal Structures Inc., Western Division S, P
Leduc, AB 780 980 4830
www.supermetal.com

Supreme Steel Ltd. S, P
Edmonton, AB 780 483 3278
www.supremesteel.com

Supreme Steel Ltd., Bridge Division S, P
Edmonton, AB 780 467 2266
www.supremesteel.com

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

TSE Steel Ltd. S
Calgary, AB 403 279 6060
www.tsesteel.com

W.F. Welding & Overhead Cranes Ltd. S
Nisku, AB 780 955 7671
www.wfwelding.com

Waiward Steel Fabricators Ltd. S, P
Edmonton, AB 780 469 1258
www.waiward.com

Whitemud Ironworks Limited S
Edmonton, AB 780 701 3295
www.whitemudgroup.ca

BRITISH COLUMBIA

Bar None Metalworks Ltd. S
Chilliwack, BC 604 701 6070
www.barnonemetals.com

Canron Western Constructors Ltd. S, P
Delta, BC 604 524 4421
www.supremesteel.com

Clearbrook Iron Works Ltd. S
Abbotsford, BC 604 852 2131
www.cliron.com

Dynamic Structures S, P
Port Coquitlam, BC 604 941 9481
www.empireds.com

Empire Iron Works Ltd. S
Delta, BC 604 946 5515
www.empireiron.com

George Third & Son S, P
Burnaby, BC 604 639 8300
www.geothird.com

ISM Industrial Steel & Manufacturing Inc. B, Br, S, P
Delta, BC 604 940 4769
www.ismbc.ca

J.P. Metal Masters Inc. S
Maple Ridge, BC 604 465 8933
www.jpmetalmasters.com

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

Macform Construction Group Inc. B, S, P
Langley, BC 604 888 1812
www.macform.org

Rapid-Span Structures Ltd. S, P
Armstrong, BC 250 546 9676
www.rapidspan.com

Solid Rock Steel Fabricating Co. Ltd. S
Surrey, BC 604 581 1151
www.solidrocksteel.com

Warnaar Steel Tech Ltd. S
Kelowna, BC 250 765 8800
www.warnaarsteel.com

Wesbridge Steelworks Limited S
Delta, BC 604 946 8618
www.wesbridge.com

XL Ironworks S, J
Surrey, BC 604 596 1747
www.xliron.com

DETAILER

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

A.D. Drafting B
Brampton, ON 905 488 8216

ABC Drafting Company Ltd. B
Mississauga, ON 905 624 1147
www.abcdrafting.com

Acklam Drafting Service B, Br, S
Tecumseh, ON 519 979 1674

Aerostar Drafting Services B
Georgetown, ON 905 873 6565

Automated Steel Detailing Associates B, Br, P
Toronto, ON 416 241 4350
www.asda.ca

Base Line Drafting Services Inc. B
Concord, ON 905 660 7017
www.bld.ca

CADD Atla Drafting & Design B
Edmonton, AB 780 461 3550
www.caddalta.com

Dessins Cadmax inc. B, Br
Boisbriand, QC 450 621 5557
www.cadmax.ca

Dessin Structural B.D. Inc. B, Br, P, J
Boucherville, QC 450 641 1434
www.bdsd.com

Dessins de Structures DCA Inc., R
Levis, QC 418 835 5140
www.structuredca.com

Detailed Design Drafting Services Ltd. B
Parksville, BC 250 248 4871
www.detaileddesign.com

Draft-Tech Inc. B
Windsor, ON 519 977 8585

Dtech Enterprises Inc. B
White Rock, BC 604 536 6572
www.dtechenterprises.com

GENIFAB Inc. B, Br
Charlesbourg, QC 418 622 1676
www.genifab.com

Haché Services Techniques Ltée B, P
Caraquet, NB 506 727 7800

Husky Detailing Inc. B
London, ON 519 850 9802
www.huskydetailing.com

International Steel Detailing Ltd. B
Nanaimo, BC 250 758 6060
www.intersteel.ca

IRESCO Ltd. B
Edmomton, AB 780 433 5606
www.steeldetailers.com

JCM & Associates Limited B, P
Frankford, ON 613 398 6510

JP Drafting Ltd. B, Br, P, J
Maple Ridge, BC 604 465 8933
www.jpdrafting.com

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

Les Dessins de Structure Steltec Inc B, Br, P
Ste-Thérèse, QC 450 971 5995
www.steltec.ca

Les Dessins Trusquin Inc. B, Br
Boisbriand, QC 450 420 1000
www.trusquin.com

Les Systèmes Datadraft Inc., Datadraft Systems Inc. B
Montréal, QC 514 748 6161
www.datadraft.com

M & D Drafting Ltd. B, Br, P
Edmonton, AB 780 465 1520
www.mddrafting.com

M & D Drafting Ltd. (BC) B, Br, P
Surrey, BC 604 576 8390
www.mddrafting.com

Maximum Steel Detailing Inc. B
Langley, BC 604 514 1474

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

ProDraft Inc. B, Br, P
Surrey, BC 604 589 6425
www.prodraftinc.com

Ranmar Technical Services B, P
Mt. Pearl, NF 709 364 4158
www.ranmartech.com

River City Detailers Limited B
Winnipeg, MB 204 221 8420
www.rivercitydetailers.com

Saturn Detailing Services Ltd. B
Winnipeg, MB 204 663 4649

Summyx inc. Br, S
Ste-Marie, Beauce, QC 418 386 5484
www.summyx.com

TDS Industrial Services Ltd. B, P
Prince George, BC 250 561 1646
www.tdsindustrial.com

Techdess Inc. B
Saint-Jérôme, QC 450 569 2629
www.techdess.com

Tenca Steel Detailing Inc. Br
Charlesbourg, QC 418 634 5225
www.tencainc.com

Workpoint Steel Detailing Ltd. S
Surrey, BC 604 574 2221

ASSOCIATE ERECTOR

E.S. Fox Limited B
Niagara Falls, ON 905 354 3700
www.esfox.com

K C Welding Ltd. B
Angus, ON 705 424 1956

Montacier International Inc. B, Br
Boisbriand, QC 450 430 2212
www.montacier.com

Montage D'Acier International Inc. B, P
Terrebonne, QC 450 965 1911

ASSOCIATE SUPPLIER

A/D Fire Protection Systems Inc.
Laval, QC 450 661 0006
www.adfire.com

Acier Altitube Inc. / Altitube Steel Inc.
Chomedey, Laval, QC 514 637 5050
www.altitube.com

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

Acier CMC, division de Crawford Metal Corp.
Longueuil, QC 450 646 6000
Angles, channels, hss, beams, plates

Acier Picard inc.
St-Romuald, QC 418 834 8300
www.acierpicard.com

Advanced Bending Technologies Inc.
Langley, BC 604 856 6220
www.bending.net
Rolled or bent structural sections

Agway Metals Inc.
Brampton, ON 905 799 7535
www.agwaymetals.com

Amcan Jumax Inc.
St-Hubert, QC 450 445 8888
www.amcanjumax.com
bolts, studs, anchors, hot-dip galvanization

Amercoat Canada [Montréal]
Montréal, QC 514 333 1164
www.amercoatcanada.com
Protective paints and coatings

Amercoat Canada [Oakville]
Oakville, ON 905 847 1500
www.amercoatcanada.com
Protective paints and coatings

Behlen Industries COM-BLD Division
Edmonton, AB 780 237 8497
www.behlen.ca

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

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

Bolair Fluid Handling Systems
Halton Hills , ON 905 564 2231
www.bolair.ca
Paint spray equipment & accessories, ie: horses, valves, filters, spray guns, etc.

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

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

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

Commercial Sandblasting & Painting Ltd.
Saskatoon, SK 306 931 2820
Sandblasting and protective coating applications

Corrcoat Services Inc., Sandblasters and Coaters
Surrey, BC 604 881 1268
Sandblasters & Coaters

Custom Plate & Profiles
Delta, BC 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, AB 780 468 6868
www.daamgalvanizing.com
Hot dip galvanizing

Devoe Coatings
Edmonton, AB 780 454 4900
www.devoecoatings.com
Coating, paint

DryTec Trans-Canada
Terrebonne, QC 450 965 0200
www.drytec.ca
Grating, metallizing, paint

EBCO Metal Finishing L.P.
Richmond, BC 604 244 1500
www.ebcometalfinishing.com
Hot dip galvanizing

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

Endura Manufacturing Co. Ltd.
Edmonton, AB 780 451 4242
www.endura.ca
Paint and Coating materials

Fisher & Ludlow,
A Division of Harris Steel Limited [Edmonton]
Edmonton, AB 780 481 3941
www.fisherludlow.com
Welded steel/ aluminum/stainless steel grating, "Grip Span" and "Shur Grip" safety grating

Fisher & Ludlow,
A Division of Harris Steel Limited [Surrey]
Surrey, BC 604 888 0911
www.fisherludlow.com
Welded steel/ aluminum/stainless steel grating, "Grip Span" and "Shur Grip" safety grating

Fisher & Ludlow,
division d'acier Harris Ltée [Longueuil]
Pointe Aux Trembles, QC 514 640 5085
www.fisherludlow.com
Welded steel/ aluminum/stainless steel grating, "Grip Span" and "Shur Grip" safety grating

Frank's Sandblasting & Painting
Nisku, AB 780 955 2633

General Paint / Ameron Protective Coatings
Vancouver, BC 604 253 3131
www.generalpaint.com
Shop primers, protective coatings, paint

Globec Machinieries / Globec Machinery
Québec, QC 418 864 4446
www.globec-machinery.com

ICI Devoe Coatings
Vancouver, BC 604 299 1399
www.devoecoatings.com

IKG Industries
Newmarket, ON 905 953 7779
ikgindustries.com

J & M Sandblasting & Painting
Oshawa, ON 905 436 6582
www.jmsandblasting.com
Sandblasting and protective coating applications

Kubes Steel Inc.
Stoney Creek, ON 905 643 1229
www.kubesteel.com

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

La Corporation Corbec
Lachine, QC 514 364 4000
www.corbecgalv.com
Supplier of hot dip galvanizing only

Laboratoire D'Essai Mequaltech
Montreal, QC 514-593-8338
www.mequaltech.com

Les Industries Méta-For inc.
Terrebonne, QC 450 477 6322
www.meta-for.ca

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

Magnus Inc.
Ste-Therese, QC 866 435 6366
www.magnus-nr.ca
SDS/2 Design Software

Marmon/Keystones Canada Inc.
Leduc, AB 780 986 2600
www.marmonkeystone.com
Hollow structural Sections, A106 Seamless Pipes

Midway Wheelabrating Ltd.
Abbotsford, BC 604 855 7650
www.midwaywheelabrating.com
Wheelbrating, sandblasting, industrial coatings

Moore Brothers Transport Ltd.
Brampton, ON 905 840 9872
www.moorebrothers.ca

Pacific Bolt Manufacturing Ltd.
New Westminster, BC 604 524 2658
www.pacificboltmfg.ca
Steel fasteners, structural bolts, anchor bolts, tie rods

Peinture Internationale (une division de Akzo Nobel Peintures Ltée) / International Paints (A Division of Akzo Nobel Coating Ltd.)
Dorval, QC 514 631 8686
www.international-coatings.com
Protective coatings, corrosion-resistant paints

Price Steel Ltd.
Edmonton, AB 780 447 9999
www.pricesteel.com

Pure Metal Galvanizing, Division of PMT Industries Limited
Rexdale, ON 416 675 3352
www.puremetal.com
Custom "Hot Dip" Zinc Galvanizing; Picking and Oiling

Red River Galvanizing Inc.
Winnipeg, MB 204 889 1861
www.redrivergalvanizing.com
Supplier of hot dip galvanizing only

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

Reliable Tube Inc.
Langley, BC 604 857 9861
www.reliabletube.com
Hollow Structural Steel Tube

Samuel, Son & Co. Limited
Winnipeg, MB 204 985 6600
www.samuel.com
Structural Sections incl. Bar angle, shapes and plate

Selectone Paints Limited
Weston, ON 416 742 8881
www.selectonepaints.ca
Paint primers, fast dry enamels, coatings

Silver City Galvanizing Inc.
Delta, BC 604 524 1182
Custom "hot dip Zinc Galvanizing; Picking and Oiling

Terraprobe Testing Ltd.
Brampton, ON 905 796 2650
www.terraprobe.ca
Structural steel inspections

The Sherwin-Williams Company
Ville d'Aujou, QC 514 356 1684
www.sherwin.com
Specialty industrial coatings

Tri-Krete Coatings Company
Bolton, ON 905 857 6601
Sandblasting; protective coatings, metallizing

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

VARSTEEL Ltd. [Delta]
Delta, BC 604 946 2717
www.varsteel.ca
Beam, angle, channel, HSS plate, Sheet, Grating, expanded metal, pipe, flats, rounds, etc.

VARSTEEL Ltd. [Lethbridge]
Lethbridge, AB 403 320 1953
www.varsteel.ca
Beam, angle, channel, HSS plate, Sheet, Grating, expanded metal, pipe, flats, rounds, etc.

VICWEST Corporation [Edmonton]
Edmonton, AB 780 454 4477
www.vicwest.com
Steel Metal Floor/roof deck, wall and roof cladding

VICWEST Corporation [Moncton]
Moncton, NB 506 857 0057
www.vicwest.com
Steel Metal Floor/roof deck, wall and roof cladding

VICWEST Corporation [Oakville]
Oakville, ON 905 825 2252
www.vicwest.com
Steel Metal Floor/roof deck, wall and roof cladding

VICWEST Corporation [Surrey]
Surrey, BC 604 590 2220
www.vicwest.com
Steel Metal Floor/roof deck, wall and roof cladding

VICWEST Corporation [Winnipeg]
Winnipeg, MB 204 669 9500
www.vicwest.com
Steel Metal Floor/roof deck, wall and roof cladding

Vixman Construction Ltd.
Milton, ON 905 875 2822
www.vixman.com
Roof and Floor Deck

Waxman Industrial Services Corp.
Brantford, ON 866 294 1699
www.waxmanindustrial.ca

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

Western Studwelding Supply
Edmonon, AB 780 434 3362

MILL

Atlas Tube Canada ULC
Harrow, ON 519 738 5000
Buffalo, NY 519 536 1114
www.atlastube.com

Essar Steel Algoma Inc.
Sault Ste. Marie, ON 705 945 2351
Burlington, ON 905 331 3400
Calgary, AB 403 263 4102
www.algoma.com

Gerdau Ameristeel Corporation
Whitby, ON 905 668 8811
www.gerdauameristeel.com

SSAB Enterprises, LLC
Lisle, IL 630 810 4800
www.ssab.com

SERVICE CENTRE

A.J. Forsyth, A Division of Russel Metals Inc.
Delta, BC 604 525 0544
www.russelmetals.com

Acier Leroux Boucherville, Division de Métaux Russel Inc.
Boucherville, QC 450 641 2280
www.leroux-steel.com

Acier Pacifique Inc
Laval, QC 514 384 4690
www.pacificsteel.ca

Dymin Steel (Western) Inc.
Abbotsford, BC 604 852 9664
www.dymin-steel.com

Dymin Steel Inc.
Brampton, ON 905 840 0808
www.dymin-steel.com

Dymin Steel Inc. (Alberta)
Nisku, AB 780 979 0454
www.dymin-steel.com

Metalium Inc.
Laval, QC 450 963 0411
www.metalium.com

Russel Metals Inc.
Edmonton, AB 780 439 2051
www.russelmetals.com

Russel Metals Inc.
Lakeside, NS 902 876 7861
www.russelmetals.com

Russel Metals Inc.
Mississauga, ON 905 819 7777
www.russelmetals.com

Russel Metals Inc.
Winnipeg, MB 204 772 0321
www.russelmetals.com

Salit Steel (Division of Myer Salit Limited)
Niagara Falls, ON 905 354 5691
www.salitsteel.com

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Edmonton, AB 780 434 8441
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Calgary, AB 403 236 0300
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Fort McMurray, AB 780 791 6860
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Regina, SK 306 949 9524
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Saskatoon, SK 306 652 7151
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Vancouver, BC 604 324 6611
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Cranbrook, BC 250 489 3333
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Kamloops, BC 250 374 7122
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Prince George, BC 250 561 1950
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

Wilkinson Steel and Metals, A Division of Premetalco Inc.
Victoria, BC 250 361 4800
www.wilkinsonsteel.com
Misc. structural shapes, hot rolled bars and plates. Structurals- angles, flats, beams, channel, plate

York-Ennis, A Division of Russel Metals Inc.
Mississauga, ON 905 819 7297
Port Robinson, ON 905 384 9700
www.russelmetals.com

HONORARY

ArcelorMittal International Canada
Contrecoeur, QC 450 587 8600
www.arcelormittal.com

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

AFFILIATE

CWB Group
Mississauga, ON 905 542 1312
www.cwbgroup.org

INDIVIDUAL

William J. Alcock, P.Eng., North Vancouver, BC	604 986 0663
Jonathan Atkins, P.Eng., Toronto, ON	416 489 7888
Christian Audet, ing., Sherbrooke, QC	819 434 1832
Dwain A. Babiak, P.Eng., Calgary, AB	403 338 5826
Douglas Bach, Truro, NS	902 895 1507
Ryan Bakay, Calgary, AB	403 289 2912
Michael F. Bartlett, P.Eng., London, ON	519 661 2111
Leonard Basaraba, Vancouver, BC	604 664 5409
Dominique Bauer, ing., Montréal, QC	514 389 9844
Gordon J. Boneschansker, P.Eng., Fredericton, NB	506 452 7000
M. Eric Boucher, ing., Québec, QC	418 871 8103
Gordon D. Bowman, P.Eng., Gloucester, ON	613 742 7130
George Casoli, P.Eng., Richmond, BC	604 273 7737
François Charest, ing., Repentigny, QC	450 581 8070
Bruno Chouinard, Montreal, QC	514 846 4000
Simon Claude, ing, Montreal, QC	514 525 8655
M.P. (Michel) Comeau, Halifax, NS	902 429 5454
Marc-Andre Comeau, ing., Salaberry-de-Valleyfield, QC	450 371 8585
Frédéric Côté, ing., Sherbrooke, QC	819 565 3385
Louis Crépeau, M Ing., Montréal, QC	514 931 1080
Jean-Pierre Dandois, St. Bruno, QC	514 592 1164
Jean-Marc Dugre, Sherbrooke, QC	819 864 0609
Arno Dyck, P.Eng., Calgary, AB	403 255 6040
Nayef El-Tabbah, Joliette, QC	450 759 1213
Daniel A. Estabrooks, P.Eng., Saint John, NB	506 674 1810
Curtis Feeg, Calgary, AB	403 540 0677
Roberto Filippi, ing., Montreal, QC	514 881 9197
Richard Frehlich, P.Eng., Calgary, AB	403 281 1005
Alex Fulop, Vaughan, ON	905 760 7663
Bernard Gérin-Lajoie, Outremont, QC	514 279 4821
Francis J. Gerrits, Barrie, ON	705 737 3303
Jean-Paul Giffard, ing., Saint-Jean-Chrysostome, QC	418 839 7937
James M. Giffin, P.Eng., Amherst, NS	902 667 3300
Daniel Girard, Chambly, QC	450 447 3055
Robert Girard, Chicoutimi, QC	418 549 9687
Movses R. Gulesserian, P.Eng., North York, ON	416 391 1230
Ralph W. Hildenbrandt, Calgary, AB	403 245 5501
Gary L. Hodgson, P.Eng., Niagara Falls, ON	905 357 6406
David Howard, P.Eng., Burlington, ON	905 632 9040
Don R. Ireland, P.Eng., Brampton, ON	905 846 9514
Ely E. Kazakoff, P.Eng., Kelowna, BC	250 860 3225
Ron Kekich, Markham, ON	905 474 2355
Bhupender S. Khoral, P.Eng., Ottawa, ON	613 739 7482
Franz Knoll, ing., Montréal, QC	514 878 3021
Pierre Laplante, ing., Sainte Foy, QC	418 651 8984
Renaud Lapointe, ing., Drummondville, QC	819 474 1448
R. Mark Lasby, P.Eng., Vancouver, BC	604 629 9525
Barry F. Laviolette, P.Eng., Edmonton, AB	780 454 0884
René Laviolette, ing., Lévis, QC	418 304 1405
Nazmi Lawen, P.Eng., Charlottetown, PE	902 368 2300
Marc LeBlanc, P.Eng., Dieppe, NB	506 382 5550
Steve Lécuyer, ing., Montréal, QC	514 333 5151
Jeff Leibgott, ing., Montreal, QC	514 933 6621
Salvatore Leo, Kirkland, QC	514 334 1234
William C.K. Leung, P.Eng., Woodbridge, ON	905 851 9535
Chet Liu, Chatam, ON	514 351 9612
Constantino Loutas, P.Eng., Edmonton, AB	780 423 5855
Clint S. Low, P.Eng., Vancouver, BC	604 688 9861
James R. Malo, Thunder Bay, ON	807 345 5582
Ciro Martoni, ing., Montréal, QC	514 340 0046
Alfredo Mastrodicasa, P.Eng., Woodbridge, ON	905 856 2530
Rein A. Matiisen, P.Eng., Calgary, AB	403 338 5804
Brian McClure, Nanaimo, BC	250 713 9875
Philip A. McConnell, Edmonton, AB	780 450 8005
Mark McFadden, Chatam, ON	514 351 9612
Alan J. McGill, P.Eng., Port Alberni, BC	250 724 3400
Glenn J. McMillan, London, ON	519 453 1480
Avrid Meland, P.Eng., Calgary, AB	403 716 8158
Andrew W. Metten, P.Eng., Struct.Eng., Vancouver, BC	604 688 9861
Jason Mewis, P.Eng., Saskatoon, SK	306 978 7730
Mark K. Moland, P.Eng., Lepreau, NB	506 659 6388
Mirek Neumann, P.Eng., Mississauga, ON	905 823 7134
Neil A. Paolini, P.Eng., Etobicoke, ON	416 249 4651
Francis Pare, Trois-Rivieres, QC	819 373 1145
Serge Parent, Oakville, ON	905 808 0344
Claude Pasquin, ing., Montreal, QC	514 282 8100
Tiberiu Pepelea, ing., Trois-Rivières, QC	819 372 4543
Jacques Pharand, Montreal, QC	514 872 5466
Gérard Pilon, ing, Valleyfield, QC	450 373 9999
Nathan Priest, P.Eng., Prince William, NB	506 575 1222
Bertrand Proulx, ing., Shawinigan, QC	819 537 5771
R. Paul Ransom, P.Eng., Burlington, ON	905 693 9628
Dan S. Rapinda, P.Eng., Winnipeg, MB	204 488 6674
Hamidreza Razaghi, Edmonton, AB	780 989 7120
Mehrak Razzvi, P.Eng., North Vancouver, BC	604 988 7131
Joël Rhéaume, ing., Beauport, QC	418 660 5858
William (Bill) Rypstra, P.Eng., ILDERTON, ON	519 298 0101
Bijoy G. Saha, P.Eng., Fredericton, NB	506 452 9000
Sohail Samdani, Mississauga, ON	905 614 4412
Joseph M. Sarkor, P.Eng., Kelowna, BC	250 868 1413
Wilfred Siu, P.Eng., Edmonton, AB	780 451 1905
Stig Skarborn, P.Eng., Fredericton, NB	506 452 1804
Paul Slater, Kitchener, ON	519 743 6500
Ralph E. Southward, P.Eng., Burlington, ON	905 639 7455
Danis St-Laurent, Dieppe, NB	506 382 9353
Robert Stolz, P.Eng., Medicine Hat, AB	403 526 6761
Thor A. Tandy, P.Eng., Victoria, BC	250 384 9115
Mike L. Trader, P.Eng., Hamilton, ON	905 381 3231
Serge Tremblay, ing., Quebec, QC	418 878 3218
Daniel E. Turner, Montreal, QC	514 344 1865
Gérard Vallière, ing., Laval, QC	450 688 4970
Deborah VanSlyke, P.Eng., Fredericton, NB	506 452 8480
Serge Vézina, ing., Laval, QC	514 281 1010
J.H.R. Vierhuis, P.Eng., Willowdale, ON	416 497 8600
Dave R.M. Vrkljan, Calgary, AB	403 251 2578
M. Declan Whelan, P.Eng., Hamilton, ON	905 523 1988
Chell K. Yee, Edmonton, AB	780 488 5636
Ken Zwicker, P.Eng., St. Albert, AB	780 458 6964

COMPANY

Adjeleian Allen Rubeli Ltd., Ottawa, ON	613 232 5786
AECOM, Whitby, ON	905 668 4021
Allnorth Consultants Ltd., Grande Prairie, AB	780 538 2070
Arcon Engineering Consult. Ltd., WILLOWDALE, ON	416 491 2525
Associated Engineering (B.C.) Ltd., Burnaby, BC	604 293 1411
Axys Consultants inc., Sainte-Marie de Beauce, QC	418 387 7739
Baird, Bettney & Associates Ltd., Surrey, BC	604 574 2221
Blackwell Bowick Partnership Ltd., Toronto, ON	416 593 5300
BPR Bâtiment Inc., Quebec, QC	418 871 8151
BPTEC - DWN Engineering Ltd., Edmonton, AB	780 436 5376
Brenik Engineering Inc., Concord, ON	905 660 7732
Bureau d'études spécialisées inc., Montréal, QC	514 393 1500
Byrne Engineering Inc., Burlington, ON	905 632 8044
Carruthers & Wallace (A Trow Company), Toronto, ON	416 789 2600
CIMA+, Québec, QC	418 623 3373
Cohos Evamy , Edmonton, AB	780 429 1580
CPE Structural Consultants Ltd., Toronto, ON	416 447 8555
CWMM Consulting Engineers Ltd., Vancouver, BC	604 731 6584
D'Aronco, Pineau, Hébert, Varin, Laval, QC	450 969 2250
Dessau inc., Longueueil, QC	514 281 1033
Dessau inc., Saint-Romuald, QC	418 839 6034
Dorlan Engineering Consultants Inc., Mississauga, ON	905 671 4377
E.C. & Associates Ltd., Markham, ON	905 477 9377
Finelli Engineering Inc. , Burlington, ON	905 639 5555
Gauthier Consultants, Longueuil, QC	450 674 5548
GENIVAR Consultants, Markham, ON	905 475 7270
Genivar Consultants Ltd. Partnership, Burnaby, BC	604 294 5800
Giffels Associates Limited/IBI Group, Etobicoke, ON	416 679 1930
Glotman Simpson Consulting Engineers, Vancouver, BC	604 734 8822
Group Eight Engineering Limited, Hamilton, ON	905 525 6069
Group2 Architecture Engineering Ltd., Red Deer, AB	403 340 2200
Haddad, Morgan and Associates Ltd. , Windsor, ON	519 973 1177
Halcrow Yolles, Toronto, ON	416 363 8123
Halsall Associates Limited, Toronto, ON	416 487 5256
Hastings & Aziz Limited, Consulting Engineers, London, ON	519 439 0161
Herold Engineering Limited, Nanaimo, BC	250 751 8558
Hillside Consulting Engineers Ltd., Fredericton, NB	506 454 4455
IRC McCavour Engineering Group Inc., Mississauga, ON	905 607 7244
K D Ketchen & Associates Ltd., Kelowna, BC	250 769 9335
Krahn Engineering Ltd., Abbotsford, BC	604 853 8831
Leekor Engineering Inc., Ottawa, ON	613 234 0886
Les Consultants GEMEC Inc., Montreal, QC	514 331 5480
Magnate Engineering and Design Inc., Brampton, ON	905 799 8220
Morrison Hershfield Ltd., North York, ON	416 499 3110
MPa Groupe-Conseil Inc., Richelieu, QC	450 447 4537
N.A. Engineering Associates Inc., Stratford, ON	519 273 3205
Pow Technologies, Div. of PPA Engineering Technologies Inc., Ingersoll, ON	519 425 5000
Quinn Dressel Associates, Toronto, ON	416 961 8294
R.J. Burnside & Associates Limited, Collingwood, ON	705 446 0515
Read Jones Christoffersen Ltd., Toronto, ON	416 977 5335
Roche ltee, Groupe-Conseil, Quebec, QC	418 654 9600
RSW Inc, Québec, QC	418 648 9512
Saia, Deslauries, Kadanoff, Leconte, Brisebois, Blais, Montréal, QC	514 938 5995
Schorn Consultants Ltd., Waterloo, ON	519 884 4840
SNC Lavalin Inc., Montréal, QC	514 393 1000
Stantec Consulting Ltd., Mississauga, ON	905 858 4424
Stephenson Engineering Ltd., Toronto, ON	416 635 9970
Tecsult/Aecom inc., Montreal, QC	514 331 5480
The Walter Fedy Partnership, Kitchener, ON	519 576 2150
UMA Engineering Ltd., Mississauga, ON	905 238 0007
Valron Structural Engineers - Steel Detailers, Moncton, NB	506 856 9601
VanBoxmeer & Stranges Engineering Ltd., London, ON	519 433 4661
Weiler Smith Bowers, Burnaby, BC	604 294 3753
Westmar Consultants Inc., North Vancouver, BC	604 985 6488

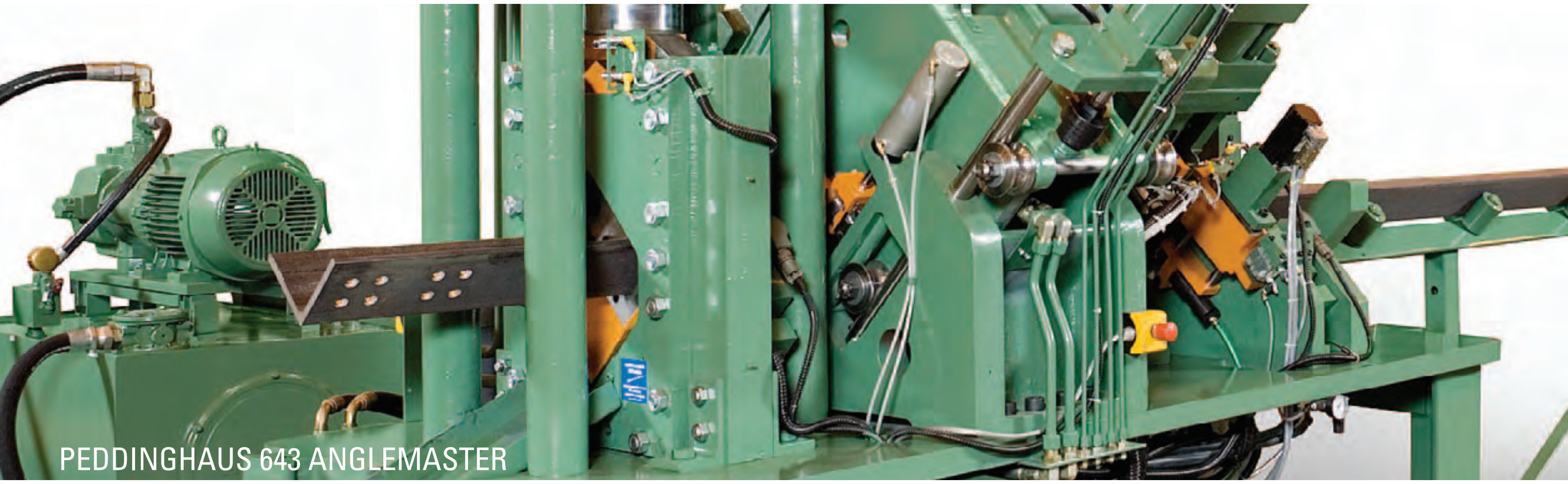
TECHNCIAL - INDIVIDUAL

George Graham, C.E.T., Winnipeg, MB	204 943 7501
Bill McPherson, Campbell River, BC	250 923 1737
Angelo M. Ricciuto, Concord, ON	905 669 6303
Ronald W. Rollins, Burnaby, BC	604 453 4057

Working for you through technology

PEDDINGHAUS FPB 1800/3

FICEP 1101 DZ CNC DRILL LINE


PEDDINGHAUS 643 ANGLEMASTER

Benson Steel has invested in the latest technology to service our clients faster and more economically. We look forward to serving you.

BENSON STEEL

ISO 9001 Registered by QMI/SAI CISC CWB CERTIFIED CSA W47.1

72 Commercial Road, Bolton, Ontario, Canada L7E 1K4 Tel: 905-857-0684 Fax: 905-857-4005

www.bensonsteel.com