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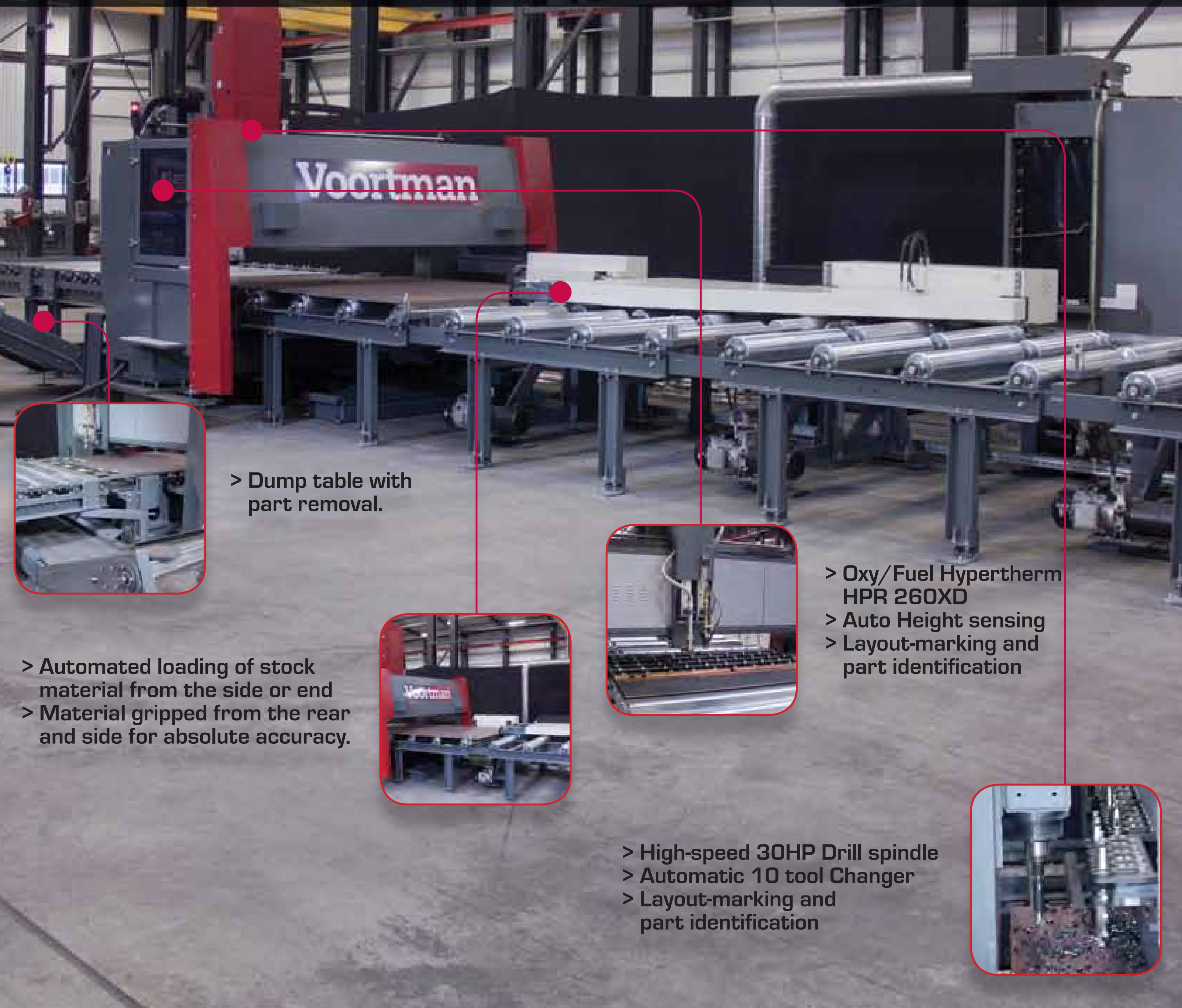

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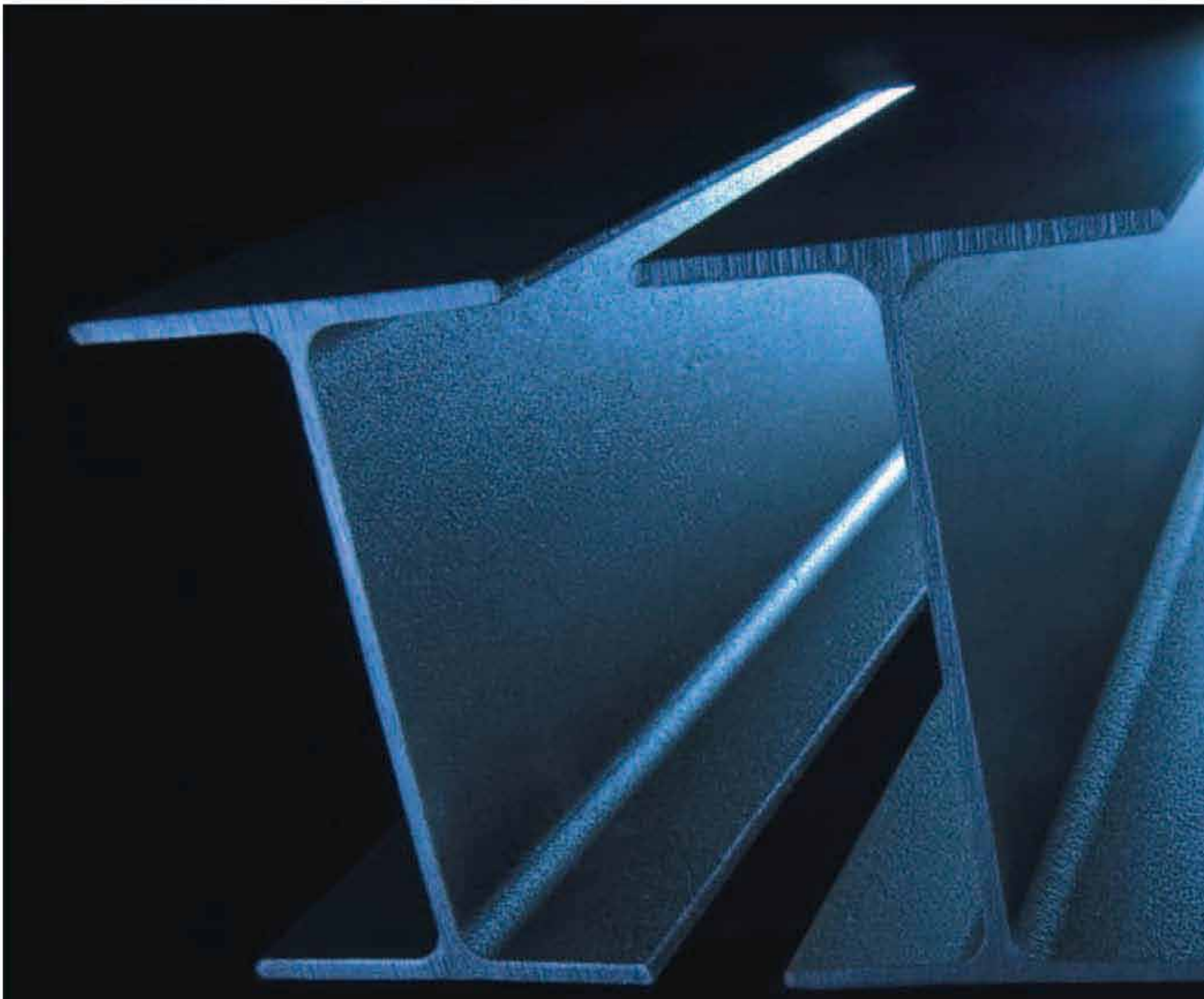

Holiday Inn Hotel, Saskatoon, Canada
Rendering courtesy of Calnitsky Associates Architects

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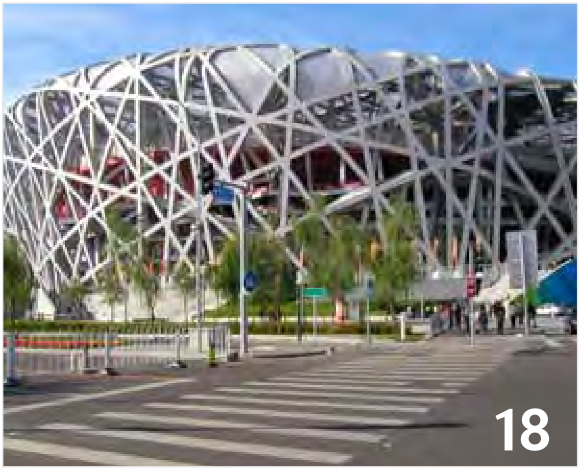

By Ed Whalen, P.Eng.

CISC Certification now available worldwide

CISC Certification is now available to any steel fabricator in any part of the world. Listening to the positive feedback from the construction stakeholders, such as specifiers, ministries, owners and engineers, CISC has now made available its world-class quality programs to all fabricators in order to strengthen the steel industry and improve public safety in Canada.

Consultants, specifiers, ministries and owners can now specify CISC Certification with the knowledge that it is open to any company, not just to CISC members.

There are currently two CISC quality certification programs available: Steel Structures and Steel Bridges. These programs are specifically written for the steel industry and address specific issues related to steel fabrication. The programs are third party audited by two CISC-approved auditing organizations with competency in the steel industry, ensuring a high degree of conformance and standardization. In addition, CISC Certification accepts the applicable AISC quality fabrication programs, eliminating the need to specify both.

In the past, it was confusing for specifiers wishing to include quality requirements in their projects. With the myriad of certification programs on the market, hundreds of registration bodies, and the lack of auditor competency, it was hard to choose. With the new CISC Certification programs, specifiers can now simply spec CISC Certification with the knowledge that it covers all the quality requirements a steel fabricator is required to control.

For more information on CISC Certification and how to specify it on your next job, visit www.cisc-icca.ca/certification

CISC joins National Trade Contractors Coalition of Canada (NTCCC)

The NTCCC brings together construction trade associations addressing national issues of common concern specific to the trades and subcontractors. Steel trades and subcontractors make up the construction industry and together we have a stronger, more powerful voice.

One of the highest concerns of the steel industry at present is getting paid for work performed and getting paid in a prompt and fair manner. The NTCC and CISC have this as one of their top issues to resolve for 2011.

Ed Whalen, P.Eng.
President, CISC

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STEEL STRUCTURES – STEEL BRIDGES

ADVANTAGE STEEL NUMBER 41 FALL 2011

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

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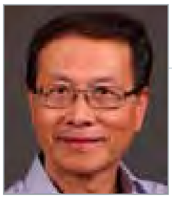
COVER IMAGE: Atrium Building at St Mary's University, Halifax, NS, the 2011 Atlantic Design Award, Architectural Recipient | Photo: Greg Richardson



By Alfred F. Wong, P.Eng.

This column highlights the answers for selected questions received from readers and others seeking technical information on steel structures. 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.

QUESTION 1: How do I calculate the axial compressive resistance of a member subject to elastic local buckling?

ANSWER: Two methods are provided in CSA Standard S16-09, the effective area method and the effective yield stress method.

Effective area method

Engineers are generally familiar with the concept of effective area when designing columns subject to elastic local buckling. Such sections are expected to undergo local buckling before reaching the yield load in axial compression, AF_y. They are designed in accordance with CSA S16-09 Clause 13.3.5 (a) whenever the width-to-thickness ratio of the flanges or web exceeds the limits given in Table 1 of S16-09. When calculating the axial compressive resistance, a portion or portions of the cross-section is considered ineffective and is therefore omitted. Considering a wide-flange section, for example, the effective cross-sectional area, A_e, is computed as follows: If the flanges exceed the maximum width-to-thickness ratio of Table 1, the area of the tips (shaded parts in the figure shown) is removed, such that the remaining effective flange width, b_e, meets the maximum ratio; similarly, the effective web depth is taken as he as shown in the figure. The effective portions of the flanges and web together make up the effective area, A_e.

Effective yield stress method

Perhaps less familiar is the effective yield stress method, which S16-09 also permits for calculating the axial compressive resistance. According to this concept first introduced in S16-01, the cross-sectional area remains intact, but the yield stress is reduced to account for local buckling. The effective yield stress, F_{ye}, is taken as the reduced yield stress determined from the width-to-thickness ratio meeting the limit in Table 1. If both the flanges and the web are subject to elastic local buckling, two separate effective yield stresses are calculated. For simplicity, the member resistance is based on the lower of the two values.

QUESTION 2: Do the methods provided in CSA S16-09 give the same answer?

ANSWER: No, the effective area method and the effective yield stress method, in general, do not give the same answer. An example is presented below to illustrate both methods. Consider a laterally supported W360x72 column (L = 0) made of ASTM A992 steel. The cross-sectional area is A = 9100 mm^2 and the specified yield stress, F_y, = 345 MPa. The factored axial compressive resistance will be determined on the basis of (1) effective area and (2) effective yield stress.

(1) Effective area method

Check the width-to-thickness ratios of the flanges and web:

$$\frac{b_{el}}{t} = \frac{204/2}{15.1} = 6.75 < \frac{200}{\sqrt{F_y}} = 10.8$$

The flanges are not subject to local buckling.

$$\frac{h}{w} = \frac{d-2t}{w} = \frac{350-2(15.1)}{8.6} = \frac{320}{8.6} = 37.2 > \frac{670}{\sqrt{F_y}} = 36.1$$

The web is subject to elastic local buckling. The effective web depth is given by:

$$h_e = \frac{670\,w}{\sqrt{F_y}} = 310 \text{ mm}$$

The effective area is:

$$A_e = A - (h - h_e)w = 9010 \text{ mm}^2$$

And the compressive resistance is:

$$C_r = \phi A_e F_y = 0.9 \times 9010 \times 345 = 2800 \text{ kN}$$

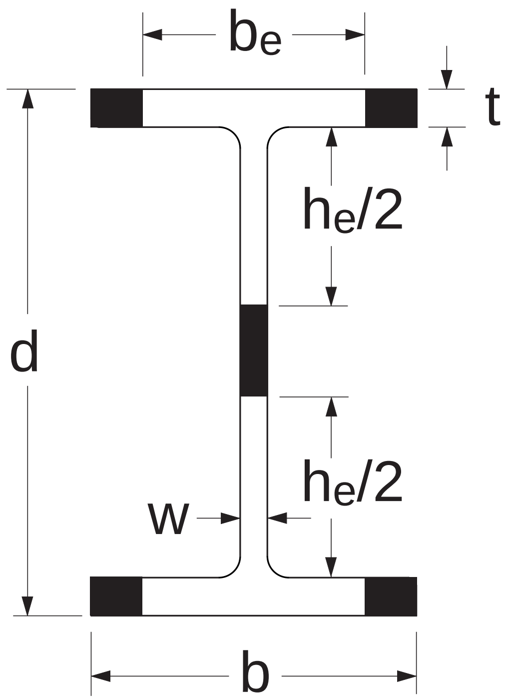
(2) Effective yield stress method

The effective yield stress is based on the maximum width-to-thickness ratio of the web:

$$F_{ye} = \left(\frac{670\,w}{h}\right)^2 = 325 \text{ MPa}$$

And the compressive resistance is given by:

$$C_r = \phi A F_{ye} = 0.9 \times 9100 \times 325 = 2660 \text{ kN}$$



Effective Area – W-Section

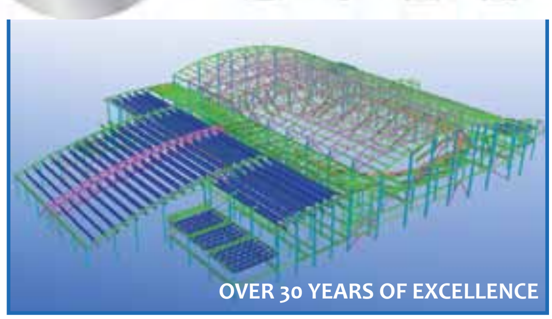
Although only the web is subject to local buckling, the entire cross-section is affected by the reduced yield stress. For this reason, the effective area method results in a greater resistance (for a laterally braced member) than the effective yield stress method in this particular example. However, the effective yield stress method usually gives a larger resistance for slender members.

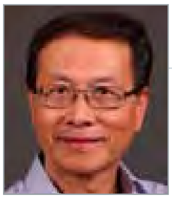
For both methods, the elastic buckling stress, F_e, is determined using gross section properties.

QUESTION 3: Which method is used to calculate the values for sections subject to elastic local buckling in the Column Tables and Angle Strut Tables in the CISC Handbook?

ANSWER: Both methods are used to calculate the factored compressive resistances, C_r, for W-columns subject to elastic local buckling and the tabulated values are the larger of the two. Only the effective area method is used to calculate the C_r values for other columns and struts. Angle sections that exceed the maximum b-to-t limit in Table 1 are excluded from the star-shaped angle strut tables.

Questions on various aspects of design and construction of steel buildings and bridges are welcome. They may be submitted via email to faq@cisc-icca.ca. CISC receives and attends to a large volume of inquiries; only a selected few are published in this column.





By Alfred F. Wong, P.Eng.

Modern seismic design of steel structures – myths and realities

Sifting through the facts and the fiction surrounding seismic design

Changes introduced in CSA Standard S16 and the National Building Code over the last two decades have revolutionized seismic design of steel structures. Explicit design and detailing requirements for ductile behaviour have replaced the traditional design concept established by consensus generally based on observation of structural performance in past earthquakes.

Capacity design philosophy, instead of implicit recognition of inherent ductility, now prevails. These fundamental changes render some of the past design practices obsolete or unreliable. In this article, some of the salient points are highlighted and discussed.

Myths and realities

1) Myth: Use of a more ductile system always results in a more economical design.

Reality: Although more ductile seismic-force-resisting systems (SFRS) qualify for smaller NBC minimum lateral forces they are not necessarily the most economical choices. Conventional construction or limited-ductility systems may be more cost effective in many applications. In the process of identifying the most economical steel SFRS for a project, factors to consider include:

a) In order to satisfy maximum cross-section and member slenderness limits, the yielding elements in a ductile system are often significantly larger than required to resist the minimum forces;

b) The capacity-protected elements in ductile systems are designed for forces corresponding to the capacity of the yielding elements which are often significantly larger than the NBC minimum forces;

c) The increase in design forces described in item b) can be overwhelming if wind effects dwarf the seismic design forces in the yielding elements;

d) Ductile systems entail more ductile connections (cost premium) or amplified connection design forces; and

e) The upper limit for P-delta effects usually governs the sizing of ductile moment-resisting frames. For low and moderate seismic hazard applications, these ductile frames are seldom economical because the limit for P-delta effects adopted in S16 (i.e. $U_2 \leq 1.4$) and NBC is simply a measure of frame flexibility irrespective of seismic capacity-to-demand ratio.

Conventional construction is usually more economical for low seismic hazard applications (not permitted for post-disaster buildings); limited-ductility systems and, in some situations, conventional construction are sometimes cost effective for moderate hazard applications.

2) Myth: Moment-resisting frames are most ductile.

Reality: Four types of moment-resisting frames are described in NBC and ranked in order of ductile behaviour and overstrength. S16 provides specific design and detailing requirements for these frame types, from Type-D frame, the most ductile, to convention construction. Similarly, braced frames and plate wall systems are also ranked and specific requirements are provided for each type of braced frames and plate walls. Ductile eccentrically braced frame, buckling-restrained braced frame and ductile plate wall, for example, are all ranked distinctively higher than limited-ductility (Type-LD) and conventional-construction moment-resisting frames in the "ductility hierarchy."

3) Myth: Slender braces are permitted in tension-only bracing systems.

Reality: With the exception of braces in single-storey and two-storey limited-ductility braced frames, braces in tension-only braced frames are also required to meet the maximum slenderness limit of 200, and maximum limits for b-to-t ratios also apply.

4) Myth: Roof diaphragm forces in low-rise buildings subject to relatively high seismic hazard are beyond the structural capacity of sheet steel roof diaphragm systems.

Reality: The roof diaphragm forces can be controlled by simply selecting the suitable vertical seismic-force-resisting system. Seismic Corner article "Are your roof diaphragm forces insurmountable," which appeared in *Advantage Steel* Issue No. 32, elaborates on this subject.

5) Myth: A buckled brace has no compressive resistance.

Reality: When a brace buckles, plastic hinging typically develops at the ends and near the mid-length. Its compressive resistance is then reduced substantially in subsequent cycles but does not vanish. This residual resistance is taken as $0.2A_gR_yF_y$ in S16-09. It should be accounted for in the analysis of post-buckling redistribution of forces in the SFRS.

6) Myth: All braces proportioned in accordance with inelastic design will eventually buckle.

Reality: Buckling-restrained braces never buckle. In fact, they typically have larger compressive resistance than tensile resistance. Seismic Corner articles "Buckling-restrained braced frames – Part 1 and Part 2," which appeared in *Advantage Steel* Issues No. 36 and No. 37 respectively, elaborate on this subject.

By Sylvie Boulanger, Ph.D., P.Eng.

Steel's longevity: the unsung hero of sustainability

With its long lifespan, steel is a perfect partner for ecologically friendly construction projects

Steel simply lasts. Period. Why? Because its physical properties don't change over time. Because it can be modified, reinforced, built up. Because of its aesthetic appearance when expressed.

What does steel's longevity have to do with sustainability? Whether it's at the design stage, during use or at end of life, it's about making a material that lasts and amortizes its CO_2 emissions over time, especially if there is considerable flexibility of use.

The Victoria Bridge in Montreal is over a century old. The Triffo Hall at the University of Alberta in Edmonton – its renovation, a LEED project – is nearly a century old. Several of the oldest industrial port facilities of St. John, New Brunswick, have survived multiple uses. Most Fairmont hotels, several major city town halls and dozens of hockey arenas have gone through countless renovations. Hundreds of small commercial buildings have been moved!

At the design stage, a new paradigm that is emerging is a fourth dimension that goes beyond satisfying only safety criteria. Applying a fourth dimension in the collective and integrated thinking of architects, engineers and other design professionals is good news. It means that future building construction has to be planned to ensure long-term static stability and fitness for use at low maintenance effort and high reconversion capability.

As summarized by Peter Maydl in an IABSE publication, in order to develop a sustainable solution, a structure has to satisfy a larger set of criteria, such as: adaptability for changes in use; capability of being repaired; ease of maintenance and cleaning; low operating and removal costs; closed-loop management; capability of being dismantled, separated and recycled; and checkability to ensure long-term safety.

We know, for instance, that an increasing number of steel structures are being designed with bolted connections at key locations and without shear studs for composite action to facilitate dismantling and reuse. Some structures are purposefully relying on larger but fewer and simpler elements to facilitate maintenance. Others are long-spans to accommodate future changes of use.

Several exhibit structures are temporary and find new permanent homes once the exhibit is over. One notable example is the Russian Pavilion of Expo 67 in Montreal. The structure was designed for dismantling and now stands in Moscow. Steel bridges last on average more than 20 years longer than concrete bridges. Most of the concrete bridges that were replaced by steel bridges on Highway 20 near Montreal were barely 40 years old. Many steel bridges crossing the St. Lawrence River are more than 75 years old.

Modernizing buildings

During use, there is a common realization that over time, more buildings will be rehabilitated, modernized and adapted. According to the 2030 Challenge project, that task will become at least as important over the course of the 21st century as building new facilities. In fact, by 2035, approximately 75 per cent of the built environment will be either new or renovated. This transformation

over the next 25 years represents a historic opportunity for the architecture and building community to avoid dangerous climate change.

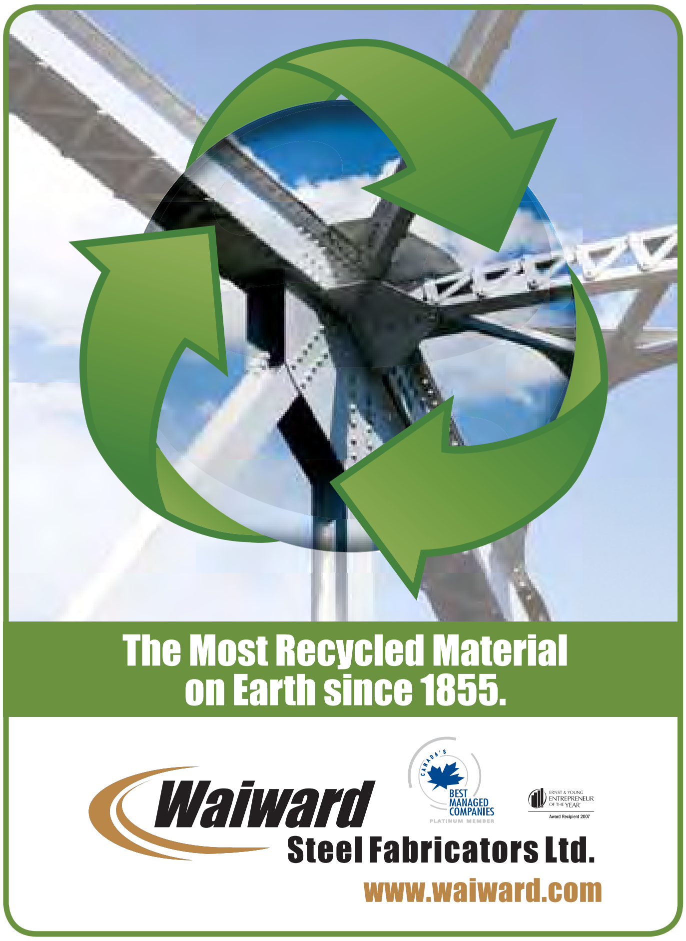
The vast majority of multi-storey structures in the Old Montreal area are today's heritage buildings; they were built between 1880 and 1930 with steel skeletons. The Montreal Forum greeted the Montreal Canadiens/Maroons from 1924 to 1996. After adding deep steel roof trusses, the structure is now the home of a large cinema and shopping complex. The steel industry is so accustomed to their involvement in rehabilitations and renovations that several resources exist. On the CISC website, there are references to historical steel grades, obsolete steel shapes and several technical memoranda under technical resources. AISC has its Design Guide 15 for Rehabilitation and Retrofit. It includes a reference for historic shapes and specifications.

There are recognized and reasonably priced methods of testing existing steel structures that a large number of testing firms can perform. One seldom is in a situation where the steel can't be salvaged. However, after testing and obtaining an equivalent carbon content, it is possible that electrodes need to be adapted to the older steel during welding, in particular for the steel produced before the 1950s. And if that becomes critical, one can always use bolts! With the beautiful expression that riveted structures allow, there is often considerable effort made to leave them exposed. To obtain the elastic limit F_y of the existing steel, again, the testing firm can help. Furthermore, the CSA S16 Standard has a clause that states any unidentified structural steel defaults to a value F_y of 210 MPa.

The end of life of steel structures is anything but an end. The fact that, on average, a steel component contains two-thirds recycled content is a feat. But it's the multi-recyclability of steel that makes it even more valuable. According to the World Steel Association's work on Life Cycle Analysis, for every tonne of steel recycled, this saves: 1.5 tonnes of CO_2, 1.4 tonnes of iron ore and 13 GJ of primary energy. Every tonne of steel reused saves even more. Data from the Steel Recycling Institute confirms that 98 per cent of a steel structure is recovered at end of life either for recycling or reuse.

The reuse rate continues to grow and now constitutes approximately 15 per cent of the recovered steel. A major demolition company estimates that to demolish a three-million-square-foot facility, it will cost over $\$3/ft^2$ for a concrete building compared to $\$0/ft^2$ for a steel structure. This is because most of the steel can be salvaged and becomes revenue, whereas there are only costs associated to the disposal of the concrete. Also, more energy will be needed during demolition of a concrete building.

Creating new buildings that last or making existing ones last longer will only continue to gain importance over time. Integrating longevity into design thinking, rehabilitation efforts and recovery strategies opens up a future of possibilities for sustainable solutions. Steel's history and flexibility of use makes it a key material for achieving longevity – for green's sake.



Example of a tubular structure, Bird's Nest Stadium, Beijing (2008)

Whither hollow structural section publications?

A new international text pulls all the latest HSS design guidance together into one book

By Jeffrey A. Packer

Readers designing with Hollow Structural Sections (HSS) are probably quite familiar with the books that have been published by CISC on HSS connections: first, the Packer and Henderson text on connections in 1992[1], then the expanded and updated treatise on connections and trusses in 1997[2], both by Packer and Henderson.

The 1997 text has been extremely popular world-wide and is still sold by CISC, but users would be aware that certain parts of it are no longer in accord with the current CSA S16-09 steel design standard. In 1997 a translation of the CISC book was even published in Chinese[3] and it has been very influential in China and affected Chinese steel structures codes.

Since 1999 a series of versions of a Windows-based computer program called "HSS_connex" have been available from the University of Toronto and this software for connection design (which follows the Packer and Henderson 1997 book) is used by more than 100 companies in North America. However, like the 1997 CISC textbook, it is starting to look dated; HSS_connex only runs on 32-bit computer operating systems and people are rapidly switching to Windows 7 64-bit PCs now. So the big question has been – where are the updates?!

The science of HSS connection design has been evolving internationally and a great deal of publication effort has instead been expended working on international initiatives and developing contemporary HSS design guidelines abroad. A massive effort was put into HSS connection fatigue research in the 1990s, culminating in CIDECT Design Guide No. 8[4] and International Institute of Welding[5] fatigue design recommendations, with the latter becoming an international ISO standard in 2008[6].

In the 2000s a similar effort was directed towards the static behaviour of HSS connections and two new CIDECT Design Guides were the result: in 2008 a second edition of CIDECT Design Guide No. 1 on CHS (Circular Hollow Sections) was published[7], and in 2009 a second edition of CIDECT Design Guide No. 3 on RHS (Rectangular Hollow Sections) was published[8]. The new status-quo for static design of HSS connections, represented by these two CIDECT Design Guides, is now a draft international standard too (ISO 14346).

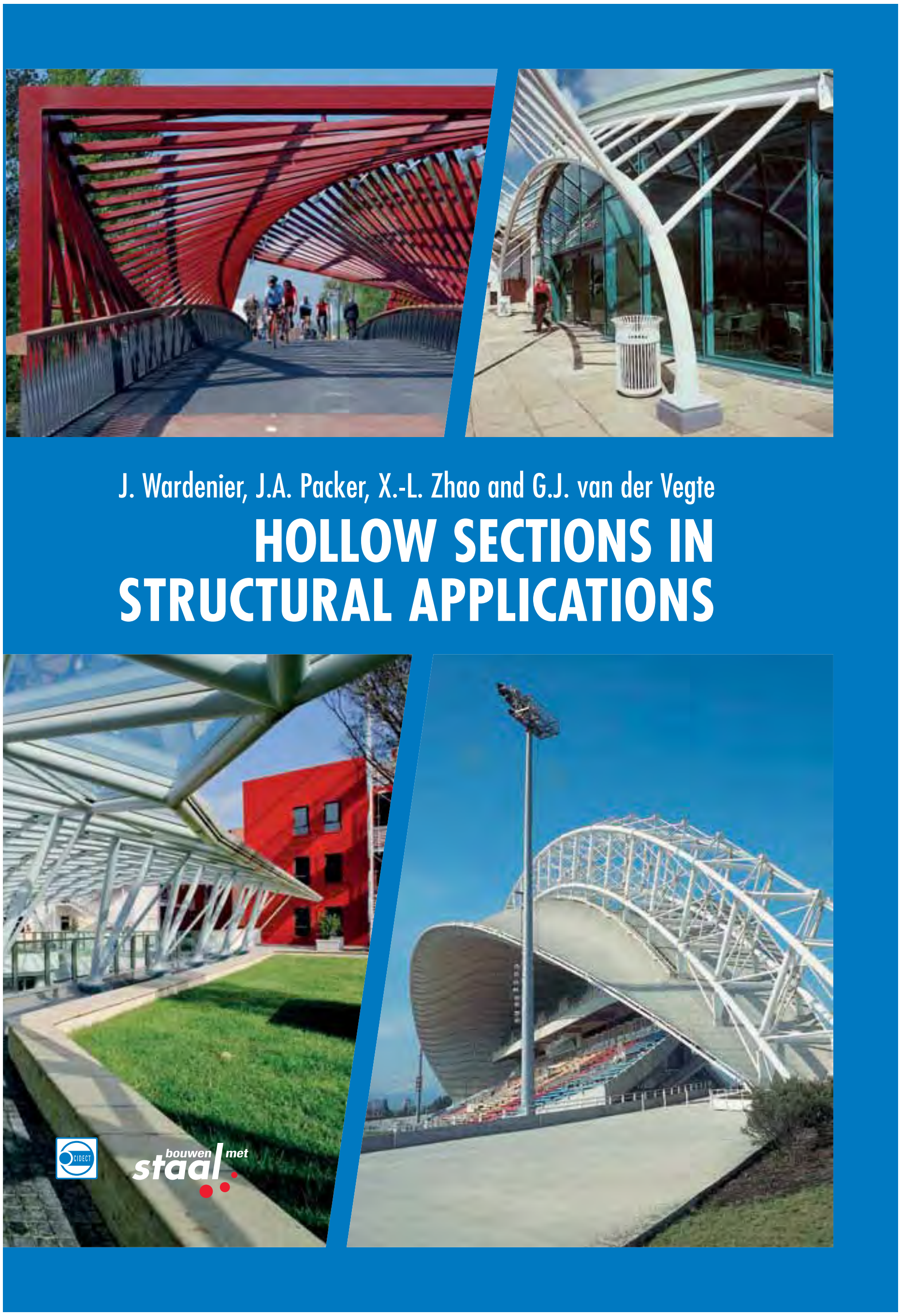
The United States has long lagged Canada in HSS design technology, but they made a bold leap forward by incorporating basic static design rules for common HSS connections in their steel building specification, ANSI/AISC 360-05, in 2005, by adding a new Chapter K on this topic. This Chapter K was re-organized and expanded somewhat in ANSI/AISC 360-10, but still essentially conforms to the relevant parts of the CISC 1997 textbook[2].

Such new directives in the U.S. required complementary design aids, so an American HSS connections design guide, with many examples in both LRFD and ASD formats, was duly produced[9]. This is clearly very pertinent to Canadian engineers performing designs for the U.S. market.

A new text

With so much evolution and publishing activity, Canadian engineers could be forgiven for not moving beyond the bounds of the 1997 CISC text. However, and this is the point of this article, a new international text pulling all the latest HSS design guidance together into one book has just been published in Europe by CIDECT – "Hollow Sections in Structural Applications"[10]. It is hard-covered, well-illustrated in colour, in A4-size, in a two-column format and is an international consensus of contemporary knowledge on the topic (conforming to[4, 5, 6, 7, 8]).

Individual hard copies can be ordered from Bouwen met Staal, P.O. Box 190, 2700 AD Zoetermeer, The Netherlands (www.bouwenmetstaal.nl) for €67.50 (incl. VAT) + shipping. Much lower prices are available for bulk orders (€14.15 per copy for 25 or more; €12.25 per copy for 50 or more, etc.) by contacting



Front cover of "Hollow Sections in Structural Applications"

the publisher, Cor van Eldik, at cor@bouwenmetstaal.nl. Alternatively, free soft copies are available in pdf format from the CIDECT website: www.cidect.com

The 16 chapters of the book cover the following:

1. Introduction
2. Properties of hollow sections
3. Applications
4. Composite structures
5. Fire resistance of hollow section columns
6. Design of hollow section trusses
7. Behaviour of joints
8. Welded joints between circular hollow sections
9. Welded joints between rectangular hollow sections
10. Welded joints between hollow sections and open sections
11. Welded overlap joints
12. Welded I beam-to-CHS or RHS column moment joints
13. Bolted joints
14. Fatigue behaviour of hollow section joints
15. Design examples
16. References


Detail of a complex connection, tubular structure, Bird's Nest Stadium, Beijing (2008)

Thus, it can be seen that the scope is somewhat greater than the 1997 CISC book[2], with chapters on composite members and fire resistance, but there is still a heavy emphasis on "joints." The loading conditions covered are quasi-static, fatigue and fire, but not seismic loading. The chapter headings illustrate that the language used is Euro-English and not in accord with North American terminology (for example the meaning of "joints" and "connections" is transposed), but this should not represent much of a problem.

Many symbols, on the other hand, are very unfamiliar and follow Eurocodes, as do the design methods for steel members (EN1993), composite members (EN1994) and fire resistance (EN1993-1-2 and EN1994-1-2).

The book is written in a "teaching style," not directly for practising engineers, and hence has few design examples. Most attention is paid to the basic understanding of behaviour, limit states/failure modes and analytical models. It is thus an invaluable resource for professors, students and researchers in structural, architectural and civil engineering, explaining the important principles in the behaviour of tubular steel structures with an extensive bibliography. However, it is still a prime reference book too for all structural design engineers involved in tubular structures, particularly those working "beyond the code." The complementary pdf version is certainly unbeatable value for any hard disk library.

Jeffrey A. Packer is a Bahen/Tanenbaum Professor of Civil Engineering at the University of Toronto.

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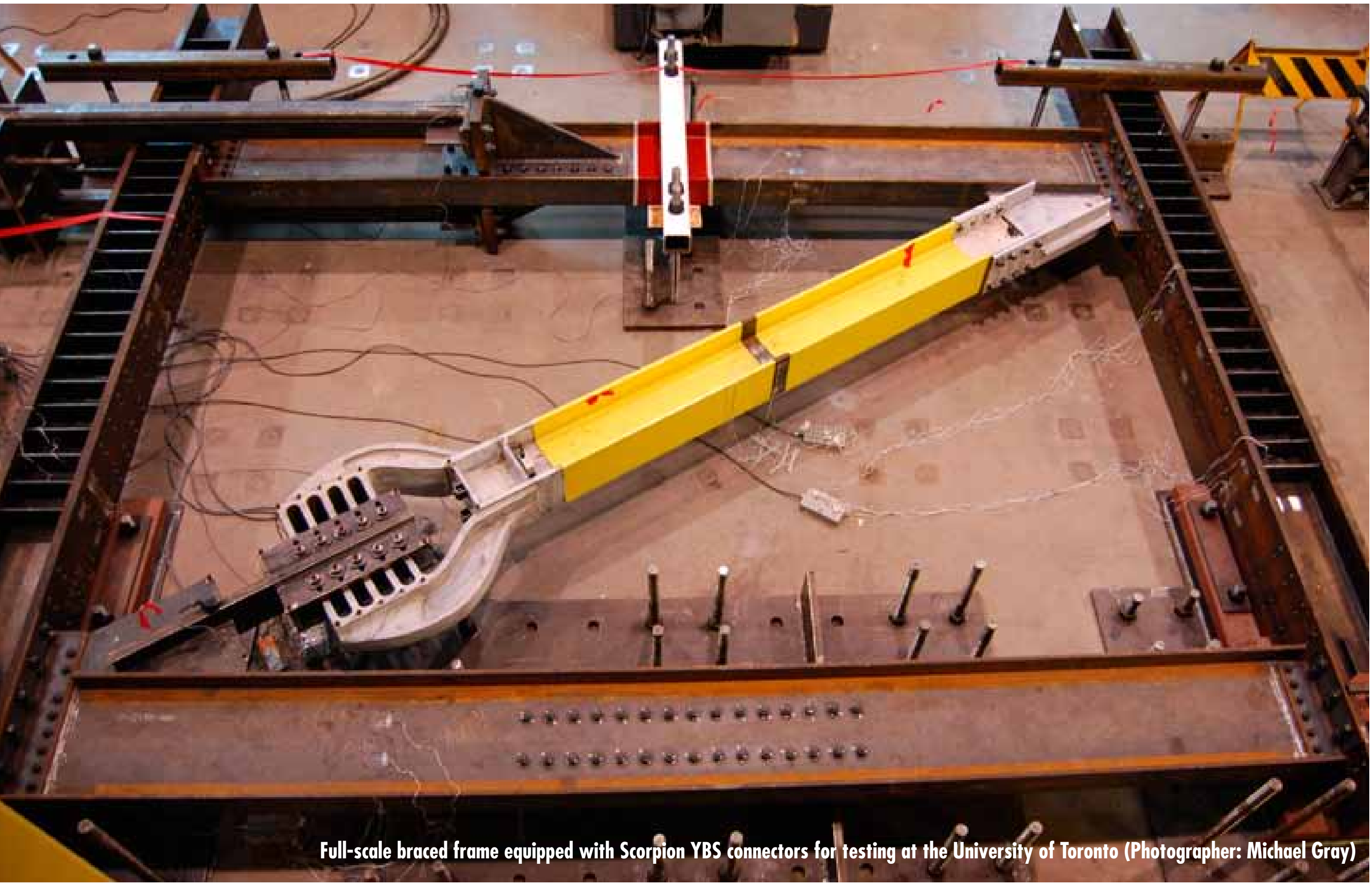


Full-scale braced frame equipped with Scorpion YBS connectors for testing at the University of Toronto (Photographer: Michael Gray)

Up to the challenge

An innovative and groundbreaking seismic-resistant steel Yielding Brace System is about to hit the market

By Michael Gray, Constantin Christopoulos, Jeffrey Packer & Carlos de Oliveira

The recent destructive earthquakes in Christchurch and Conception have again reminded engineers of the need for high-performance seismic-resistant steel structures. And if that's not enough, the looming threat of a potentially devastating subduction earthquake on our country's West Coast, in conjunction with reports warning of a general lack of preparedness, should be cause for serious consideration by owners, designers and government officials.

Since 2004, research at the University of Toronto has focused on the use of steel castings for special applications such as improving the seismic performance of steel structures. This work first led to the development of the High Strength Connector (HSC), which provides a simple, laboratory-proven connection for Type MD moderately ductile concentrically braced frames with circular hollow section braces.

It was a direct evolution of this technology that led to the development of the Yielding Brace System (YBS) – a new and innovative earthquake-resistant system suitable for use in the construction of new concentrically braced frames (CBFs) and in the retrofit of existing structures, which is garnering a lot of attention in the construction industry and even in the mainstream media. The system is intended to be a higher performance alternative to Type MD moderately ductile concentrically braced frames and a significant improvement on Type D buckling restrained braced frames.

CBFs are a popular choice of lateral force resisting system because they are relatively simple to design, fabricate and erect, and they have a very high lateral stiffness. However, in seismic loading, CBFs are not as ductile as other systems. Buckling restrained braced frames (BRBFs) offer an alternative to the CBF that has higher ductility and energy dissipation and thus better seismic performance, but BRBFs can be difficult to use because they require cumbersome coordination between engineers, fabricators and third-party brace manufacturers.

In addition, it is possible that the low post-yield stiffness of a BRBF may lead to an undesirable accumulation of inelastic drifts at a single storey in the overall building, often referred to as a "soft storey" response, which can lead to a rapid deterioration of the response of the structure in large seismic events.

An added complication in the design of a BRBF is that the stiffness and strength are both a function of the cross-sectional area of the brace's core, and the ductility and stiffness of the brace are tied to the length of the core, which itself is limited by the dimensions of the frame. As a result, designers must go through numerous iterations between the required strength, stiffness and ductility while trying to keep these parameters within what is achievable in a BRBF in order to converge to an acceptable design.

Key properties

With the shortcomings of the currently available braced frame systems in mind, the research group at the University of Toronto identified several key properties that would be desirable in a new yielding device and which would enhance the performance of braced frames. An ideal brace would have an elastic stiffness similar to, or greater than, that of a CBF, symmetrical yielding in compression and tension, full hysteretic loops that would maximize energy dissipation, and a response characterized with a post-yield stiffness that would decrease the likelihood of a soft storey collapse under extreme seismic loading conditions.

Another goal was to contain the ductile part of this new bracing system in an off-the-shelf connector that would easily integrate into current structural steel fabrication practices. As a connector, a single YBS could be used in a variety of building geometries without requiring redesign, testing or approval for each new configuration – only testing of each off-the-shelf modular unit would be required.

To achieve all of the above goals, the YBS connector required a complex geometric form. Thus, it was quickly apparent that a steel casting may be a better solution than a complex fabricated detail. Steel castings can be made in virtually any shape and can be quite economical when replacing complex fabrication. Unlike cast iron, cast steel can be very ductile, and unlike rolled steel, cast steel is isotropic. In addition, the casting process lends itself to the mass production of modular, off-the-shelf products.

The final geometry of the YBS was defined through a series of incremental design iterations based on engineering first principles. The resulting system is comprised of two cast connectors that connect a diagonal brace member to a beam-column connection. Each connector resembles a claw, with a heavy "elastic arm" that is to be welded to the brace end and protruding triangular shaped "yielding fingers" that are bolted to a splice plate connection at the beam-column joint.

Close-up of the Scorpion YBS (Photographer: Michael Gray)

Bending of the specially designed yielding fingers of the Scorpion YBS during a large tensile excursion of the frame (Photographer: Michael Gray)

Bending of the specially designed yielding fingers of the Scorpion YBS during a large compressive excursion of the frame (Photographer: Michael Gray)

When the brace is axially loaded, the "yielding fingers" are loaded in flexure and the bolt at the end of each finger bears on two slotted holes in the splice plate. The holes are slotted perpendicular to the brace direction, which is necessary to accommodate the movement at the end of each "yielding finger" when they are subjected to large deformations.

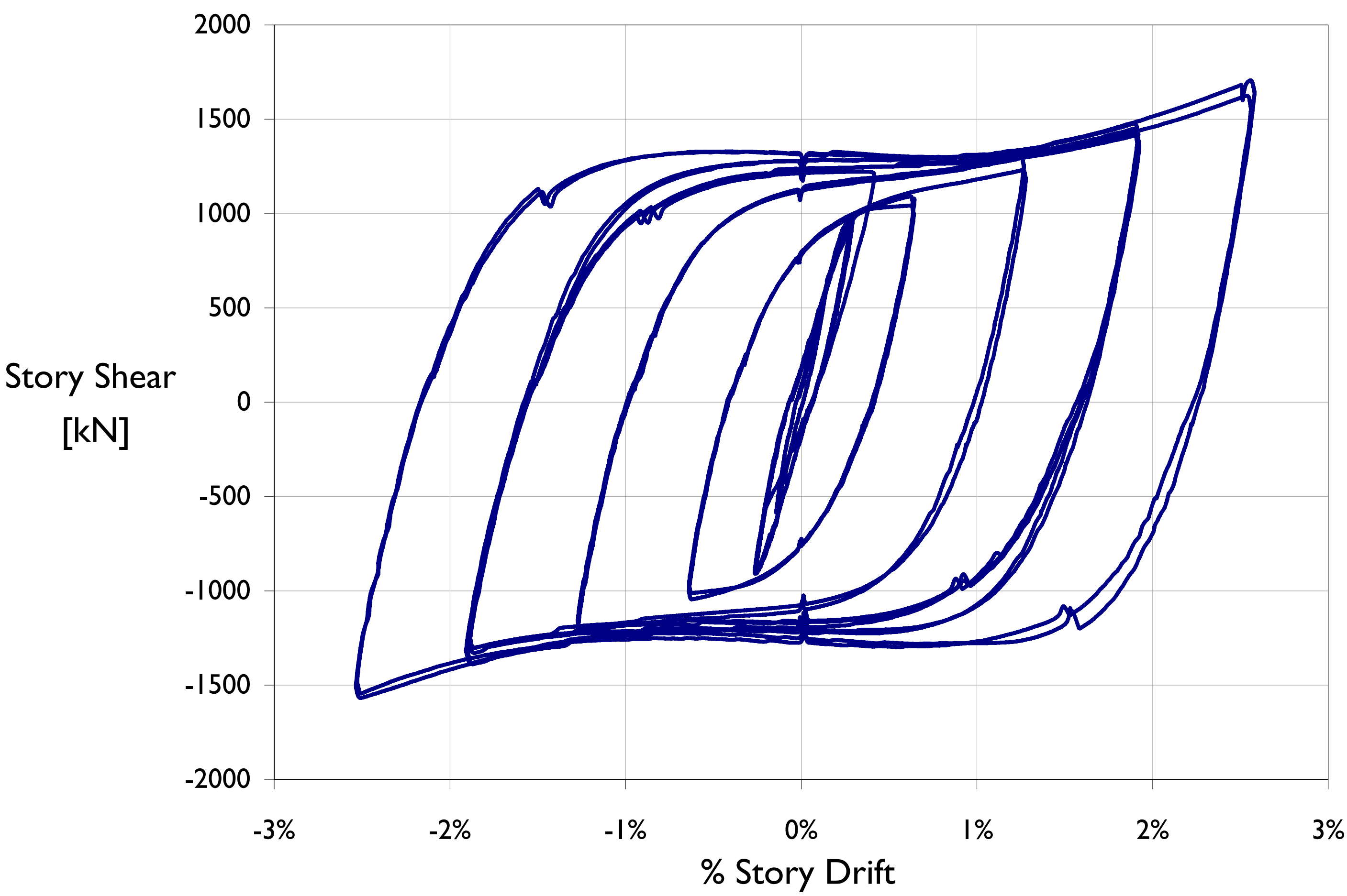
The fact that the YBS dissipates seismic energy through flexural yielding gives the system a very ductile, symmetric, full hysteretic response. There are four geometric parameters of the yielding fingers (width, thickness, length and number of fingers), which allow for the independent control of structural characteristics (elastic stiffness, yield load, ductility and post-peak response). In other words, one can design two different YBS connectors to have the same yield force but each with very different elastic stiffness. Thus, it is relatively simple to ensure that YBS connectors have the required initial stiffness.

When the fingers are undergoing the large, inelastic deformations expected in a significant earthquake, the curvature of the fingers results in a tensile force in each finger that increases the strength of the brace. This post-yielding increase in stiffness will inhibit the formation of an unwanted "soft storey" and increase the collapse resistance of structures using the YBS system.

The prototype

After the initial conceptual design phase of the Yielding Brace System was completed, a prototype brace was designed for a fictitious 12-storey building located in a region of very high seismicity. The nominal yield force of the brace was 1110 kN and the design level drift was approximately 40 mm. The cast steel grade used was ASTM A352 LCB, which is notch tough and has a minimum yield strength of 240MPa.

In late 2010 and early 2011, two full-scale tests were conducted on YBS prototypes at the University of Toronto's newly renovated Structural Testing Facilities. The YBS-equipped braces were tested in a building frame (two columns and two beams) intended to simulate the actual boundary conditions that would be present in a real structure that utilized the system. The frame was loaded laterally using the lab's new 2,000 kN dynamic actuator. The prototypes were tested according to AISC 341-05 Appendix T - Qualifying Cyclic Tests of Buckling-Restrained Braces, which is the equivalent of about two significant earthquakes.



Hysteretic response of the Scorpion Yielding Brace System when subjected to increasing cyclic deformations up to twice the design level storey drift

The tests were well attended by students, educators and industry professionals from across North America. Canada's premier science news program, the Discovery Channel's "Daily Planet", even covered one of the tests with a headline story on January 27, 2011 (http://bit.ly/eycTwl).

> **The YBS performed** beyond expectations: the prototypes exhibited excellent energy dissipation with full hysteretic loops and distinct post-yield stiffening at large drifts

The YBS performed beyond expectations. The prototypes exhibited excellent energy dissipation with full hysteretic loops and distinct post-yield stiffening at large drifts. In fact, the second test completed the protocol twice. The first protocol was conducted quasi-statically at displacement rates less than 1mm per second. To demonstrate that the system is not prone to any undesirable dynamic effects, the second time through the protocol the entire displacement history was applied in less than 25 seconds. Following the second completion of the protocol, the specimen was cyclically tested at drifts that were three times what is expected in the design level earthquake until failure.

The YBS will be made available as a series of off-the-shelf connectors with incremental yield force capacities. Each connector will have a known yield force, elastic stiffness, post yield stiffness and seismic performance factors. Thus, designers could easily include the YBS properties into the building models they are already using to obtain seismic design forces and drifts. Every prototype YBS connector will be laboratory tested to ensure that it can achieve the assumed level of ductility prior to being commercially available. With well-defined mechanical properties and experimentally validated response and connection performance, the YBS will be quite simple for designers and fabricators to incorporate in the design of seismically loaded steel structures.

Both the YBS, under the Scorpion trade name, and the High-Strength Connectors are available from CISC associate supplier member Cast ConneX (www.castconnex.com).

The research and development of the Yielding Brace System was initially supported by seed funding from the Steel Structures Education Foundation (SSEF) while additional support to this project was provided by the SSEF's G. J. Jackson Fellowship, the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Ontario Ministry of Research and Innovation's (MRI) Early Researcher Award and Ontario Research Commercialization Program.

Michael Gray, Constantin Christopoulos and Jeffrey Packer are with the University of Toronto. Carlos de Oliveira is with Cast Connex Corporation.


Workers installing glazing on the Wintergarden lobby area at Eighth Avenue Place

Taking the LEED

Eighth Avenue Place takes the LEED designation to a whole new level

By Allan Metzger, B.Mgt

After intense deliberation of design, functionality and schedule, Eighth Avenue Place began construction in 2008 and is now towering like a glistening blue mountain on the southwest edge of Calgary's downtown core. The angled planes and sloping surfaces of the tower design evoke the natural beauty of the Rocky Mountains that form the backdrop for Canada's energy capital.

"The structure of the office tower consists of structural steel floors with a concrete core. Lateral stability of the tower in the east/west direction for wind and seismic loads is provided by a composite system of the concrete core engaging outrigger steel floor girders at each floor level and each column line with a unique steel to concrete moment connection. The unique shape of the tower's sloped walls and roofs is accommodated by sloping structural steel columns," says Luke Groeneveld, Project Engineer for Read Jones Christoffersen Ltd.

Phase One, now completing construction, comprises of a 49-storey office tower on a two-level podium with a winter garden, shops, restaurants and five storeys of below-grade parking. Phase Two will accommodate a 38-storey sister tower on the west side of the city block. The initial 1.1-million-square-foot development is Canada's first pre-certified LEED Platinum high-rise office building.

LEED Platinum pre-certified

Eighth Avenue Place has received recognition for its environmental design and has been awarded a LEED (Leadership in Energy and Environmental Design) Platinum pre-certification. It is slated to become Canada's first – and North America's third – LEED Platinum high-rise office building.

There are currently only two high-rise office towers of this size in North America that have achieved a LEED Platinum rating under the Core and Shell rating system. While the project was originally pre-certified Gold in the U.S. Green Building Council's LEED for Core & Shell rating system, it has been pre-certified for the second time at the Platinum level as a result of a series of groundbreaking building innovations.

Hines, which has overseen development of the project and was recently selected as its Property Manager, said, "One of the most remarkable features is the air distribution system, a building component that is typically responsible for a significant portion of annual energy expenses in buildings in northern climates. Eighth Avenue Place is the first building in Canada to utilize heating distribution techniques that decrease construction costs and operating costs while improving thermal comfort for occupants.

Introduced by Hines in 1977 and adopted as an industry standard in most parts of the United States, the system distributes heat through the same overhead perimeter air delivery system that is utilized in cooling during the summer months. More traditional radiant heating systems in Canada pipe hot water into occupant spaces along base boards at the perimeter wall. The high performance glazing systems at Eighth Avenue Place that mitigate cold surface temperatures allowed for the elimination of baseboard radiator systems in the tower. These systems take up more usable space and are less effective at regulating ambient office temperatures."

Other sustainable features and programs include:

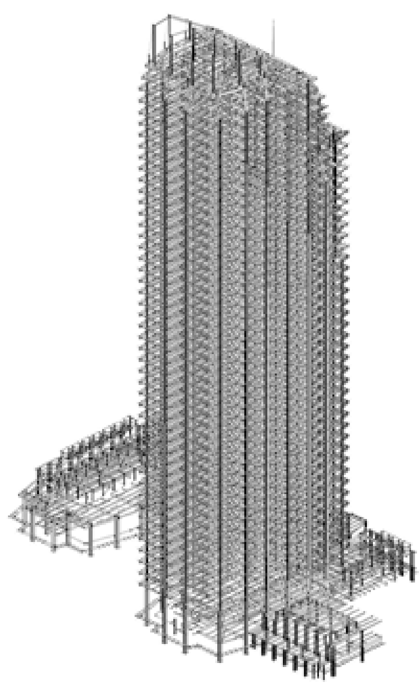
- Utilization of structural steel involved in the structure composing of steel shapes that are made from 90 per cent recycled content;
- Rail shipments of steel;
- Installation of a state-of-the-art building management and control system to monitor and manage energy consumption and tenant comfort requests;
- Reliance on outside air (at certain temperatures) to cool the building;
- 40 per cent reduction in water use through features such as ultralow-flow urinals;
- Provision of enclosed 300-stall bicycle parking with adjacent showers;
- 50 per cent landfill diversion of construction waste including that from the demolition of the previous building;
- Use of low-emitting paints, adhesives and sealants;
- Use of environmentally-sensitive refrigerants;
- Canada's largest green roof encompassing 30,000 square feet; and
- Advanced construction timeline resulting in less construction impact.

Key to the schedule and construction impact was the delivery of 12,000 tons of structural steel, which was produced from three of Supermetal's Canadian facilities including Leduc, Alberta, and the company's two large shops in Quebec.

"Maintaining the floor turnover schedule was one the biggest challenges for Supermetal; we had to deliver one completed floor per week to meet our client's expectations. In addition to the extra care required to maintain the structure plumb within 20mm over the entire height of the building, the large quantity of complete penetration welding required on the moment connections at the concrete core added to the challenge of maintaining the schedule," says Jean-Francois Leclerc, Supermetal's Western Division Vice-President.

"The majority of the steel was transported via rail, allowing Supermetal to use the rail yard in Calgary to sort the steel and

The concrete core/steel frame system steadily rising one floor per week



Before construction, a 3D model was produced by Supermétal. The resulting BIM (Building Information Modelling) system aided the design team throughout construction

Sunset on the tower nearing "topped-out" status

deliver to site in order to keep the three tower cranes erecting at all times. The usage of rail transportation contributed to reduce the environmental footprint of the project," Leclerc adds.

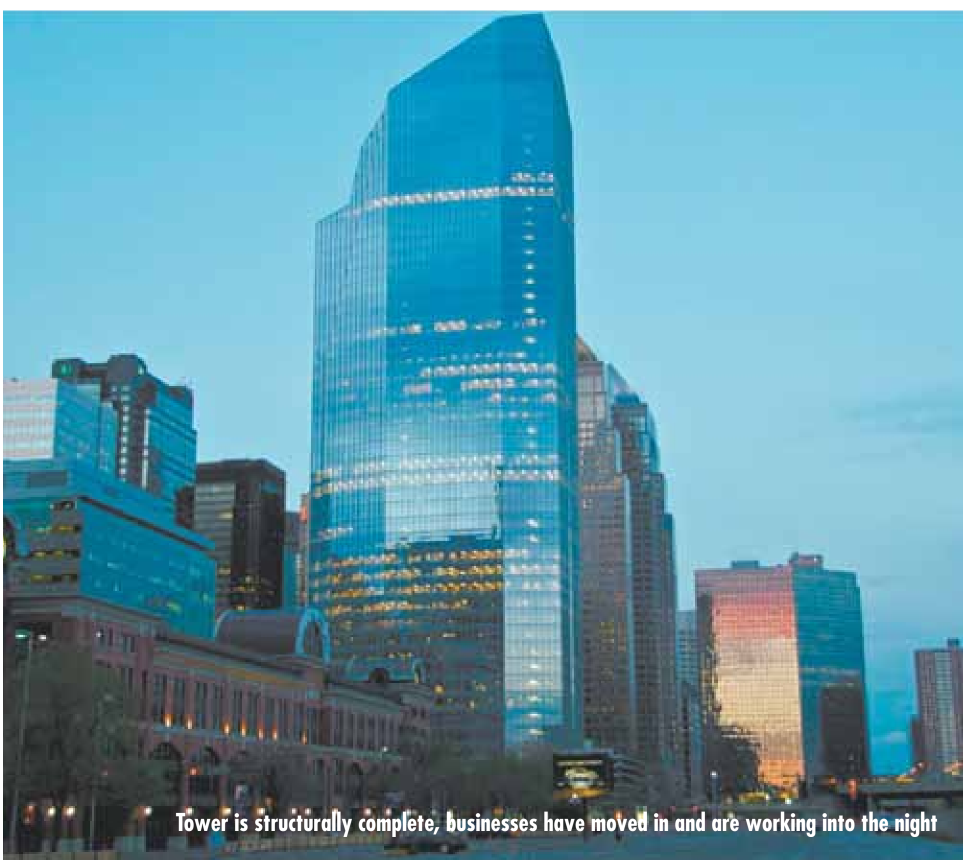
"Calgary is Canada's energy capital and energy companies place particular emphasis on sustainability and responsible energy consumption," notes Avi Tesciuba, Hines' Vice-President. "The emphasis on sustainability and responsible stewardship of energy consumption and the resonance of these issues in the Calgary market motivated the project's owners to raise the bar to a level never achieved before in a large commercial setting in Canada."

The decidedly innovative project demanded cooperation and precision between all stakeholders. Constructed with an advanced timeline in a recessionary period, Eighth Avenue Place has dramatically changed Calgary's skyline. The city's newest skyscraper will provide inspiration for the city to soar like the Rockies and sets the standard in sustainability for other office buildings to aspire to.

Allan Metzger is Sales Manager, Canada with Supermetal.

Eighth Avenue Place

OWNER: Penny Lane II Limited Partnership
ARCHITECT: Architect of Record: Gibbs Gage Architects
ASSOCIATE ARCHITECT: Kendall/Heaton Associates, Inc.
DESIGN ARCHITECT: Pickard Chilton International
STRUCTURAL ENGINEER: Engineer of Record: Read Jones Christoffersen Ltd.
DESIGN ENGINEER: Ingenium, Inc.
PROJECT MANAGER/GENERAL CONTRACTOR: EllisDon Construction Services Inc.
FABRICATOR/DETAILER/ERECTOR: Supermétal Structures Inc.
DEVELOPMENT MANAGER: Hines


Tower is structurally complete, businesses have moved in and are working into the night

2011 Atlantic Steel Design Awards

ARCHITECTURE

Winner
The Atrium Building at St Mary's University

OWNER: Saint Mary's University
ARCHITECT: DSRA Envision Architecture
STRUCTURAL ENGINEER: BMR Structural
CONSTRUCTION MANAGER: Aecon Atlantic Group
CISC FABRICATOR, DETAILER & ERECTOR: Marid Industries Ltd.

The Atrium building at St Mary's University in Halifax is a three-storey building connecting three existing campus buildings. The project features a Global Learning Commons on the main floor, a wireless, student centred, communal learning space that encourages interaction between faculty, students and the community. The second and third floors provide areas for teaching, study, research and offices.

The project features a vegetated roof and a three-storey living bio-wall, flooded with natural light from the continuous skylight above. The relative lightness of the steel structure reinforces the design concept of a sheltered "outdoor" space. The use of castellated steel beams in the roof structure allows light to pass through the structure, maximizing the amount of natural daylight filling the space from the large skylights. It also demonstrates how innovative structural solutions serve to express and enhance architectural ideas. The curvilinear steel stair – a unique fabrication challenge – contrasts with the rectilinear nature of the structure, soars into the atrium space and wraps the concrete core, its lightness playing against the solidity of the concrete.

Judges comments:

- Use of exposed steel in the roof and floor structure and, in particular, in the staircase gives this project an exterior quality which is light and fresh.
- An exciting, playful steel gem featuring creative use of steel throughout from the entrance through curved stairs handrail details and castellated steel ceiling beams featuring a light and airy ceiling. The finished design solution will draw attention to the versatility of steel.

ENGINEERING

Winner
The Cheticamp River Bridge

OWNER: Public Works and Government Services Canada
STRUCTURAL ENGINEER (BRIDGE AND ERECTION DESIGNER): Harbourside Engineering Consultants
GENERAL CONTRACTOR: J&T Van Zutphen
CISC FABRICATOR, DETAILER & ERECTOR: Cherubini Metal Works Ltd.

The Cheticamp River Bridge is the ideal project to showcase the extraordinary advantages of using steel box girders. The long simple span structure that flew over the existing abutments and piers allowed for the implementation of a phased construction method in which a portion of the existing bridge remained as a single alternating lane detour and allowed the new bridge to be built partially within the footprint of the existing structure. This eliminated impacts on private lands, minimized the environmental footprint, and allowed the construction to be completed within one calendar year while respecting the July to October limitation on in stream work.

The total steel weight in the bridge, including girders, bracing and end abutment diaphragms was 350 tonnes; the efficiency of steel weight was achieved by the trapezoidal steel box shape. Maintaining the large skew of 34 degrees reduced steel quantities and the overall cost of the bridge significantly, but it added significant complexity to the design and behaviour of the bridge. The design required sophisticated finite element modeling to verify design load effects and determine deflections for vibration control, cambers, setting elevations for the precast deck panels, and girder deflections under loads to ensure that the girders, after erection, flyover the existing piers.

Judges comments:

- Use of trapezoidal steel box girders provides a clean elegant structural solution.

GREEN STRUCTURES

Winner

The Centre for the Built Environment

OWNER: Nova Scotia Community College
ARCHITECT: Barrie and Langille Architects Ltd.
STRUCTURAL ENGINEER: BMR Structural
CONSTRUCTION MANAGER: EllisDon Corporation
CISC FABRICATOR, DETAILER & ERECTOR: Cherubini Metal Works Ltd.

The Centre for the Built Environment is a place of learning, exploration and discovery about the relationship between the built environment and the natural environment. The design and construction of the facility embodies and demonstrates ecological design principles and practices that are regenerative and restorative of natural ecosystems and that reflect the potential for buildings and nature to co-exist in a harmonious and mutually supportive relationship. The planning and design of the project is open-ended and adaptive to change so that, as a "living building" that has the capacity to "learn" and evolve over time, the CBE can continue down the path towards long-term goals such as "net zero energy," "zero footprint," and "carbon neutral" as new technologies and solutions mature and are incorporated.

The composite structural steel system for the CBE was the best fit for the project on the basis of environmental merit, construction expedience and design versatility. The selection of steel as the primary structural system for the project reflected a convergence of benefits and incentives for the design, engineering, construction and management of the unique and innovative building. The project has recently applied for LEED certification at the high end of the "Gold" standard, on the basis of 48 targeted credits.

Judges comments:

- Use of steel was an important aspect of a very green project featuring a number of innovative sustainable aspects.
- A well-integrated design solution.

MERIT

Winner
HRM Canada Games Center

OWNER: Halifax Regional Municipally
ARCHITECT: DSRA Envision Architecture
STRUCTURAL ENGINEER: BMR Structural
CONSTRUCTION MANAGER: EllisDon Corporation
CISC FABRICATOR, DETAILER & ERECTOR: Eascan Building Systems Ltd.

This 175,000-square-foot athletic facility consists of an aquatic centre, field house, fitness centre, associated support spaces and a variety of community gathering areas. The function of the building dictates large un-interrupted spans for the two primary programmatic elements – the field house and the pool. From the beginning, steel was identified as the only logical solution to achieve these spans. Due to the project designation as the host building of the 2011 Canada Games, the design and construction schedule was compressed, resulting in a construction managed, sequentially tendered delivery process. Steel was identified early on as a material that could be adapted to an accelerated fabrication and erection process.

The larger of the two spans, the field house, consists of a 125-foot-long arched truss that varies in depth from 10 feet at the ends to 16 feet at mid-span. Athletic programming on the court surface below dictated a 36-foot clear height to the underside of the truss. Spaced at just over 30 feet on centre, the transverse arched trusses bear on a pair of longitudinal trusses running the entire 300-foot length of the field house. Spanning either two or three bays, these longitudinal trusses allow an un-interrupted span for the running track at the mezzanine level. Similar to the field house, the pool employs a slightly smaller 104-foot-long flat truss. The attention to detail of the steel members and connections is particularly important as both areas use indirect up-lighting to illuminate the spaces below, putting the steel structure on display. As the project is targeting LEED silver, the steel structure plays a significant role in achieving the necessary recycled content credits.

Judges comments:
- Some unique elements draw attention to the clever use of steel in this large facility helping to break down the enormity of the mass.
- Efficient effective use of exposed steel structure complement the building use and function.

SPECIAL

Winner
Tidal Turbine and Sub Sea Base Structure

OWNER: Emera Inc.
STRUCTURAL ENGINEER: RPS Consulting Engineers
PROJECT MANAGER: Open Hydro
CISC FABRICATOR, DETAILER & ERECTOR: Cherubini Metal Works Ltd.

Tidal energy is very predictable and is one of the rarest forms of renewable energy. Tidal turbines are deployed on the sea bed deep enough that they do not interfere with shipping traffic where they cannot be seen or heard. The turbine is secured by a steel frame. For six and one quarter hours the tide flows in one direction through the turbine generating power, the tide reverses and the turbine operates in the opposite direction. The Fundy In-Stream Tidal Project with Nova Scotia Power is at the forefront of tidal energy development in the Bay of Fundy. It is a strong possibility that 200 to 300 of these turbines could be strategically deployed in the Bay of Fundy.

This structure had to be designed to withstand the highest tides in the world and an extremely harsh environment. Ultimate design and subsequent construction resulted in a 10-metre turbine that was attached to a subsea frame that is approximately 15-metres high with the center of the turbine 10 metres off the sea floor. Leading in and out of the turbine structure, steel plate was formed and fabricated into cones to produce a venturi effect. To meet design and environment requirements, large sections of cylindrical hollow structural steel were used to provide strength and longevity and to make the frame base stable. The hollow steel sections were filled with approximately 200 tons of concrete. The structure is engineered as a dynamically loaded structure so welding requirements and subsequent inspection and testing were much more stringent than other types of structures.

The completed structure measured approximately 22 metres by 22 metres by 15 metres placing the overall weight of the steel structure at 200 tons and the entire turbine and subsea structure an approximate weight of 400 tons.

Judges comments:

- A unique and complex steel fabrication designed to be efficient, durable and cost effective for its intended task.


NUCOR-YAMATO
STEEL

2011 Quebec Steel Design Awards

COMMERCIAL / INSTITUTIONAL PROJECTS

Winner
New MSO Acoustic Concert Hall, Montreal

OWNER: Ministère de la Culture, des Communications et de la Condition féminine
ARCHITECT: Consortium Diamond+Schmitt / AEdifica
STRUCTURAL ENGINEER: SNC-Lavalin, Transportation, Infrastructures and Buildings Division
GENERAL CONTRACTOR: SNC-Lavalin Construction
FABRICATOR: Structal-Heavy Steel Construction, a division of Canam Group Inc.
DETAILER: Structal-Heavy Steel Construction, a division of Canam Group Inc., Datadraft Systems

This is a very complex project, because it provides the Montreal Symphony Orchestra with a permanent home that meets its needs in terms of acoustics, conditions of occupancy, space and dimensions to hold concerts and artistic events. The proposed structure limits any transmission of sound, whether by conduction or airborne. The system is composed of a reinforced concrete structure resting against a steel roof. In fact, steel was used for all the large-span members supporting the truss and the roof in order to benefit from its lightness and strength, and for the substructure of the glass exterior walls. The new concert hall will receive basic LEED certification. The jury recognized the project's technical feats of design and execution.

Judges comments:
- For the project's technical feats of design and execution.

Honourable Mention
Atrium of Place Charles-Le Moyne, Longueuil

OWNER: Ville de Longueuil
ARCHITECT: Marosi Troy | Jodoin Lamarre Pratte | Labbé | architectes in consortium
STRUCTURAL ENGINEER: Les Consultants S.M. inc.
CONSTRUCTION MANAGER: EBC inc.
CISC FABRICATOR, DETAILER & ERECTOR: Beauce Atlas, Nico Metal

Judges comments: For attention to detail among the complex tubular members, allowing the direct expression of steel.

Honourable Mention
Centre de Formation Professionelle Gabriel-Rousseau, Lévis

OWNER: Commission scolaire des Navigateurs
ARCHITECT: Consortium Anne Carrier architecte et Poulin architectes
STRUCTURAL ENGINEER: Genivar
CONSTRUCTION MANAGER: Construction Marc Drolet inc.
CISC FABRICATOR, DETAILER & ERECTOR: Sturo Metal Inc., Canam Canada

Judges comments: For a subtle and elegant marriage between steel and other materials within a successful architectural program.

INDUSTRIAL PROJECTS / BRIDGES

Winner
Curved Caisson Bridge over Autoroutes 640 and 15, Laval

OWNER: Ministère des Transports du Québec
LANDSCAPE ARCHITECT: LACASSE Experts-Conseils ltée
STRUCTURAL ENGINEER: Dessau
INTERCHANGE DESIGNER: Consortium Genivar / CIMA+ / Dessau
GENERAL CONTRACTOR: Simard-Beaudry Construction Inc.
FABRICATOR: Structal-Bridges, a division of Canam Group Inc.
DETAILER: Structal-Bridges, a division of Canam Group Inc., Tenca Steel Detailing Inc.

Both impressive and light, this curved bridge now spans Autoroutes 640 and 15 north of Montreal. Its deck is formed by a continuous curved structure of three spans 49-metres, 52-metres and 36-metres long, with an average radius of curvature of 120 metres, and another straight continuous structure of two 45-metre spans. Given the lengths of the spans and the maximum clearance of five metres required under the structure, two steel box girders spaced 4.6 metres centre-to-centre were selected. The cost, the requirement to maintain traffic during construction and the considerations related to maintenance were also arguments in favour of this targeted use of steel. In addition to close collaboration, this project required exhaustive research to obtain the relevant information on standards, requirements, common practices and the latest advances on horizontally curved steel box girders.

Judges comments:
- For targeted use of steel in a large-span curved highway context.

PROJECTS OUTSIDE QUEBEC

Winner

Replacement of the Willis Avenue Bridge, New York City

OWNER: New York City Department of Transportation
STRUCTURAL ENGINEER: Hardesty & Hanover, LLP
GENERAL CONTRACTOR: Kiewit Constructors Inc. / Weeks Marine Co., AJV.
FABRICATOR AND DETAILER: Tenca, Steel Detailing Inc.

Erected at the corner of 127th Street and 1st Avenue on the Harlem River, the Willis Avenue Bridge has linked Manhattan and the Bronx since 1901. In 2001, a study recommended the installation of a new swing bridge. The entire project required over 8,500 tonnes of steel. The mobile part is 106.5 metres long (14 metres longer than the old section), 20 metres high and 23.5 metres wide. The original fixed span was replaced by two approach spans supported by box girders. The new structure was completely fabricated at the plant, assembled on the shores of the Hudson River over 200 kilometres away, and then deposited on two welded barges for delivery. This was a remarkable project because of its unique steel details and the use of innovative erection techniques, both for the structure and the swing platform.

Judges comments:

- For the unique steel details and the innovative erection techniques both for the structure and for the swing platform.

Honourable Mention

Giants and Jets Meadowlands Stadium, New Jersey

OWNER: New Jersey Sports and Exposition Authority
ARCHITECT: Ewing Cole Architect
STRUCTURAL ENGINEER: Thornton Tomasetti
GENERAL CONTRACTOR: Skanska Koch
FABRICATOR: Structal-Heavy Steel Construction, a Division of Canam Group
DETAILER: B.D. Structural Design, Dessins Cadmax, Datadraft Systems

Judges comments: For management of a major project involving large complex steel parts.

GREEN BUILDINGS

Winner

Schlüter Systems (Canada) Inc., Ste-Anne-de-Bellevue

OWNER: Schlüter Systems (Canada) Inc.
ARCHITECT: DCYSA Architecture + Design
STRUCTURAL ENGINEER: BCA Consultants Inc.
GENERAL CONTRACTOR: Broccolini Construction Inc.

The Canadian headquarters of the cladding manufacturer Schlüter Systems, in Sainte-Anne-de-Bellevue, is a 6100-square-metre building. The design incorporates the company's products throughout the interior and, for the first time, even uses a combination of its unique foam panel and granite tile system on a large portion of the siding.

The choice of steel was imposed by the speed of construction, the aesthetic possibilities, the long spans and the recycling options at the end of the building's life cycle, without forgetting the flexibility offered for the dynamic articulation of the components: the volume of the offices, the arched entrance and the atrium. The structure also uses a high percentage of recycled industrial steel, judiciously integrated to enhance the multitude of green solutions used. The project is seeking LEED Gold certification and recently received an Award of Excellence from the Ordre des architectes du Québec.

Judges comments:

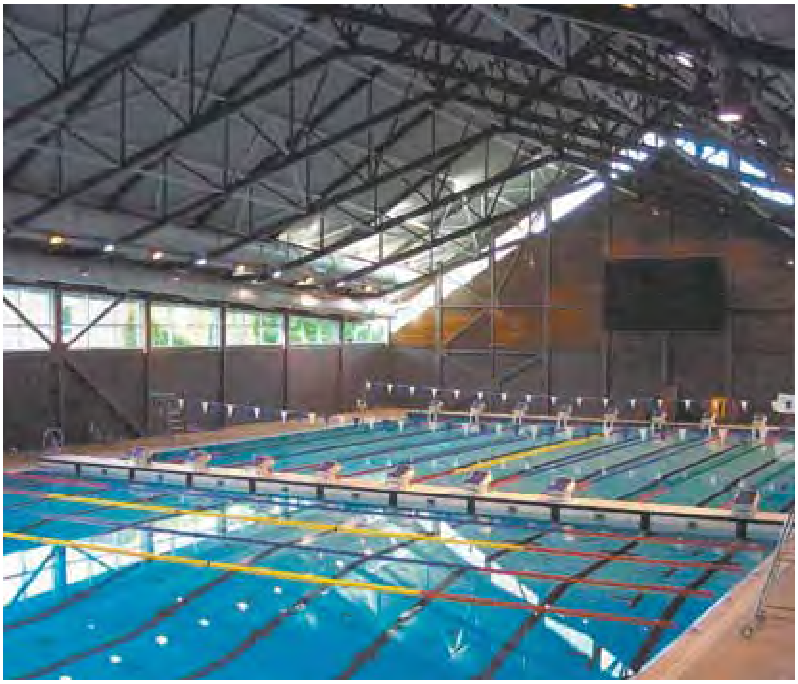
- For judicious integration of steel, enhancing the multitude of green solutions used in the project.

JURORS FAVOURITE

Winner

Malcolm Knox Aquatic Centre, Pointe-Claire

OWNER: City of Pointe-Claire
ARCHITECT: Riopel, Thibodeau et Associés
STRUCTURAL ENGINEER: Pasquin St-Jean et Associés
GENERAL CONTRACTOR: Kingston Byers
FABRICATOR AND DETAILER: Canam Canada



After many additions and expansions, the City of Pointe-Claire decided to modernize the structure of the Malcolm Knox Aquatic Centre, erected in 1965, and to renovate its amenities. The original building was designed to Olympic standards with a massive wooden structure. With this project, the Centre's area increased by 4300 square metres. The new gable roof harmonizes the expansion with the existing building, thus creating uniformity in the shape, the tilt angle and the exterior of both buildings. In addition to welding a high-gauge steel jumper to the roof structure, cross-braces were added to the roof diaphragm to ensure the flow of lateral forces. The building design is unique, with its gable roof and sloping ridge. This undeniably is an original and refined integration of steel, both in the roof and in the fenestration.

Judges comments:

- For original and refined integration of steel, both in the roof and in the fenestration.

Honourable Mention
Clinique Dentaire St-Charles, Longueuil

OWNER: Clinique dentaire St-Charles
ARCHITECT: Jean Verville, architecte
STRUCTURAL ENGINEER: Gauthier Consultants
GENERAL CONTRACTOR: Construction Belfor inc.
FABRICATOR AND DETAILER: Canam Canada

Judges comments: For an original use of steel offsets and cantilevers in a commercial project.

RESIDENTIAL / RENOVATION PROJECTS

Winner
BONE Structure House, 563 Rue des Morilles, Rimouski

ENGINEER: Bureau d'études spécialisées
CONTRACTOR: Les Habitations JMD
SUPPLIER: BONE Structure

The BONE Structure house in Rimouski is a prestigious 30 foot by 30 foot structure with three levels distinguished, in particular, by the 25-foot free spans and extensive fenestration. It was designed with the BONE Structure construction system, using light 11 gauge steel (1/8" thick). The pieces of the frame were designed in 3D on Autodesk Inventor software, cut out at the factory, and then assembled on site.

The posts, a standard 10 feet long, were tongue-and-grooved in modules to structure the perimeter. The joists were then attached at variable heights. The home already won the 2011 Architectural Merit Award in the "Single and Semi-detached Housing" category in Rimouski. It also obtained Novoclimat R2000 certification and is in the process of LEED certification. The jury selected the project for its innovative use of steel in a prefabricated and scalable residential application.

Judges comments:

- For an innovative use of steel in a prefabricated residential solution adapted to the owner's needs.

YOUNG ARCHITECTS / ENGINEERS

Winner

Félix Bédard for the New Entrance to the Stewart Museum, St. Helen's Island

JUNIOR ENGINEER: Félix Bédard, Pasquin St-Jean et Associés
SPONSOR: Normand Leboeuf, Pasquin St-Jean et Associés

As senior designer, Félix Bédard, Jr. Eng. worked on the project from the preliminary phase to delivery of the plans and specifications. In addition to the design, he coordinated the professionals and followed up during construction. He also put his dynamic modelling knowledge to good use. His vibration studies of the cantilevered stairway, based on the finite elements method, made it possible to produce the flight of stairs from a single bent steel plate. He also performed dynamic studies to determine the impact of wind and earthquakes on the structure. The decisions and the creativity he applied to meet the architects' expectations led to the creation of a unique and innovative work in terms of structure and architecture. The jury appreciated his mastery of this daring project, with unusual curved shapes.

Judges comments:

- For showing great mastery of a project with unusual curved shapes.

Honourable Mention

Steve Chamberland for the Atrium of Place Charles-Le Moyne, Longueuil

JUNIOR ENGINEER: Steve Chamberland, Les Consultants S.M. inc.
SPONSOR: Yves Levesque, Les Consultants S.M. inc.

Judges comments: For a rigorous approach to design of complex exposed parts.

2011 Ontario Steel Design Awards

ARCHITECTURE

Award of Excellence
Queenston Plaza Border Crossing Facility, Phase 1 & 2

OWNER: Niagara Falls Bridge Commission
ARCHITECT: Moriyama & Teshima Architects
STRUCTURAL ENGINEER: Halsall Associates Limited
GENERAL CONTRACTOR: Aecon Group Inc.
CISC STEEL FABRICATOR & ERECTOR: M&G Steel Ltd. / Tresman Steel Industries Ltd.
CISC STEEL DETAILER: Base Line Drafting Services Ltd.
CISC STEEL SUPPLIER: Vixman Construction Ltd.

In keeping with the overall plaza design concept, finely detailed AESS walkways evoke rows of arbours found at the local wineries. Security fences were created as vine-growing trellises by suspending recycled plastic wood on steel tension rods spanning between the main AESS members. The buildings are wrapped in different cladding types: perforated metal growing screens, curtain wall glazing printed with maple leaf ceramic frit patterns, precast insulated concrete panels, standing seam zinc panels, and natural stone veneer. All the steel framed inspection canopies are edged in aluminum sunshades with central skylights over each lane, evoking rows of greenhouses found throughout the region.

The following factors made structural steel the ideal choice for this project:

- In keeping with the overall design concept, elements of the plaza such as the canopies, walkways and fences were designed to evoke the Niagara Region with its strong winery and green house industries. Using Architecturally Exposed Structural Steel, we were able to achieve finely detailed elements using closely spaced framing, delicate steel sections and steel tension cables.
- The use of steel facilitated the aggressive design and construction schedule.
- Future flexibility for interior layout changes in this 50-year plus facility made structural steel, and specifically moment-resisting frames, ideal to provide a bracing-free floor layout.

Award of Merit
Li Ka Shing Knowledge Institute, St. Michael's Hospital

OWNER: St. Michael's Hospital
ARCHITECT: Diamond and Schmitt Architects
STRUCTURAL ENGINEER: exp. Services Inc.
GENERAL CONTRACTOR: Eastern Construction
CISC STEEL FABRICATOR: C_ore Metal Inc.

ENGINEERING

Award of Excellence
The Ritz-Carlton Hotel

OWNER: Graywood Developments Inc
ARCHITECT: Page + Steele/ IBI Group Architects
STRUCTURAL ENGINEERS: Halcrow Yolles
GENERAL CONTRACTOR: EllisDon Corporation
CISC STEEL FABRICATOR & DETAILER: C_ore Metal Inc.

With distinctive architecture, often the challenge is finding structural solutions that balance performance requirements for strength and serviceability with respect to the visual expression. To achieve that balance for Toronto's Ritz-Carlton, structural engineers Halcrow Yolles opted for steel.

The five-storey podium at the tower's base features a largely glass exterior designed to create a sense of interaction between the street and the lobby, and mediate between the pedestrian scale and the larger urban scale of the tower. The podium holds two large ballrooms, fine-dining restaurants, conference and meeting rooms, and a fitness centre and spa, Toronto's largest and most luxurious facility of its kind. The podium cantilever provides cover for a porte-cochere at the hotel's entrance.

At street level, the pedestrian's initial experience with the Ritz-Carlton is through the podium, in which interlocking projected and recessed volumes and cantilevered surfaces combine, providing an exciting place to see and to be seen within. Here again, steel was the only material versatile enough for the challenging geometrical configurations.

Award of Merit
Chukini River Bridge Replacement

OWNER: Ministry of Transportation Ontario
STRUCTURAL ENGINEERS: McCormick Rankin Corporation
GENERAL CONTRACTOR: Bruno's Contracting (Thunder Bay Limited)
CISC STEEL FABRICATOR & DETAILER: Capitol Welding Corporation


Our flagman

GREEN BUILDINGS

Award of Excellence
Centre for Green Cities, Evergreen at the Brick Works

OWNER: Evergreen
ARCHITECT: Diamond and Schmitt Architects
STRUCTURAL ENGINEERS: Halsall Associates
GENERAL CONTRACTOR: Eastern Construction
CISC STEEL FABRICATOR & DETAILER: Norak Steel Construction Limited

The project involved renovating a group of heritage industrial buildings and the construction of one new structure – the Centre for Green Cities – a five-storey LEED Platinum office building. The Centre incorporates a visitor welcome centre, retail and amenity space, administrative offices and workspace for the program partners.

It was determined that the only foundation system that could be installed in close proximity to the existing heritage buildings and also extend through the poor quality soils was a steel micropile system. Steel and micropiles made it possible to retain the existing brick walls that make up the building's perimeter. In addition to the physical constraints of the site, the client was also very interested in sustainability, particularly in constructing a building that integrated architectural, structural and mechanical systems to produce the most efficient product possible. In this case, the lightest weight structure that could be built, integrating mechanical and architectural systems, was a steel framed building supporting precast concrete floor slabs. Steel was economical and elegant in the original heritage structure and found to be so again in 2010. To visually connect the retained heritage elements to the new building, steel was exposed wherever possible by using intumescent paint. Steel was also used dramatically as laser-cut sunshades, decoratively as layers of perforated plate, and expressively in the practical and beautiful engineering in the front entry canopy.

PROJECTS CONSTRUCTED OUTSIDE OF ONTARIO

Award of Excellence
The Bow

OWNER: H&R REIT
ARCHITECT: Foster + Partners in collaboration with Zeidler Partnership Architects
STRUCTURAL ENGINEERS: Halcrow Yolles
GENERAL CONTRACTOR: Ledcor Construction Ltd.
CISC STEEL FABRICATOR & DETAILER: Walters Group in joint venture with Supreme Steel

This innovative 58-storey mixed-use development is a ground-breaking structure, representing many "firsts" as well as providing an environmentally sustainable headquarters for leading Canadian corporation Encana, and a generous social space for Calgary. It is Calgary's tallest building and first steel skyscraper. It also incorporates the first use of a triangular diagonal grid (diagrid) system in a curved building design in North America. Visually, the diagrid pattern is repeated on the building's exterior every six storeys and provides superior structural efficiency while significantly reducing the overall steel weight, as well as the number and size of interior columns.

The tower's heavily-windowed, bow-like shape was used to maximize perimeter office space, greatly reduce wind loads, maximize natural light, harness the sun's heat energy, and provide unobstructed views to the majestic Rocky Mountains to the west.

One of the first examples of a truly modem and sustainable high-rise tower for Calgary, The Bow successfully fulfills the owners' goals of a distinctive tower that is both a progressive and sustainable office space and a vibrant cultural, civic and shopping destination for Calgary residents and visitors. Three sky gardens divide the building into distinct zones, forming a series of destination floors with lobby areas, meeting rooms, communal spaces and a high-speed lift service running between the lobbies.

2011 Alberta Steel Design Awards

ARCHITECTURE

Winner
Art Gallery of Alberta

ARCHITECTS: Randall Stout Architects, Inc. and HIP Architects, Associate Architect
ENGINEER: DeSimone Consulting Engineers and BPTEC-DNW Engineering Ltd.
GENERAL CONTRACTOR: Ledcor Construction Limited
CISC FABRICATOR, DETAILER & ERECTOR: Empire Iron Works Ltd.

The project, on the edge of Edmonton's downtown Churchill Square, is a renovation of the existing concrete building to create expanded, flexible, museum quality space for the gallery's permanent collection and major travelling exhibitions. The renovation consisted of a two-storey vertical addition above the existing building to contain gallery space and offices, and the addition of an atrium that exhibits the creative and dramatic use of steel to invoke the borealis.

Structural steel was the obvious choice for the vertical addition because it minimized the impact on the existing structure, reduced loads on the foundation, and provided unimpeded column-free interior space to maximize flexibility for exhibitions. The entire addition is supported by only six columns located on the north and south perimeters. The building envelope of the atrium is formed from angular, transparent glazing planes penetrated by curving, reflective metal-clad elements that create the borealis. "You couldn't do that with anything other than structural steel because of the complexity of the shapes," says Trevor Hobbs, detailing and technical lead, Empire Iron Works.

ENGINEERING

Winner
The Bow

OWNER: HR Real Estate Investment Trust / Matthews Southwest
ARCHITECT: Foster & Partners / Zeidler Partnership Architects
ENGINEER: Halcrow Yolles
GENERAL CONTRACTOR: Ledcor Construction Limited (Construction Manager)
CISC FABRICATOR, DETAILER & ERECTOR: Supreme / Walters Joint Venture

The Bow, the iconic crescent-shaped office tower rising on the east side of Calgary's downtown core, has provided a spectacular show for Calgarians during its construction. Spectators might not have realized they are also witnessing a North American first. The structure is unique on the continent in its application of a triangular steel diagrid system to a curved building. The diagrid, composed of six-storey-high diagonal elements, creates a perimeter frame of linked equilateral triangles curved to match the bow of the building on the north and south faces.

The external structural system frees up more floor space than a traditional building, and the diagrid design also significantly reduces the amount of steel required compared to a conventional structure. The crescent-shaped floor plan increases the number of perimeter offices that are possible and improves access to natural light. Another unique aspect of The Bow is the series of three multi-storey "sky gardens" located at each of the elevator transition floors. The sky gardens provide all the common use facilities such as copy shops, coffee and snack kiosks, and generous seating areas.

INDUSTRIAL

Winner

Shell Canada Energy Reactor Building Modifications

OWNER: Shell Canada Energy
ENGINEER: BPTEC-DNW Engineering Ltd.
GENERAL CONTRACTOR: Eskimo Steel Ltd.
CISC FABRICATOR, DETAILER & ERECTOR: Eskimo Steel Ltd.

As industrial construction goes, designing and building overhead crane runway support systems is nothing out of the ordinary. But the project to retrofit the Shell Canada Energy Reactor Building into a fabrication facility presented the design-build team with unique challenges requiring creative design and installation solutions.

Shell wanted to convert a large empty pre-engineered steel building into a fabrication facility to support a scheduled shutdown and for future use. The building was to accommodate three interior overhead crane runways supporting one five-ton, one ten-ton, and two 20-ton cranes. Shell specified that the support system was to be independent of the existing building structure. In addition, the company wanted the system to achieve maximum hook height.

The team's solution was a series of three-dimensional tower columns made of HSS and recessed between the existing pre-engineered building columns. The towers support not only the gravity loads but also the lateral loads imposed by the cranes, eliminating the need for horizontal trusses and maximizing overhead crane span and lateral hook travel.

STEEL EDGE

Winner

Whitemud Drive – Quesnell Bridge Widening

OWNER: The City of Edmonton
ENGINEER: CH2M HILL Canada Limited
CISC DETAILER: M&D Drafting Ltd
CISC FABRICATOR AND ERECTOR: Waiward Steel Fabricators Ltd.

The Quesnell Bridge is located on Edmonton's busiest traffic corridor, the Whitemud Freeway, with volumes of more than 120,000 vehicles per day. When this section of the freeway needed widening, rerouting that traffic onto a detour was not an option. This presented a particular challenge with respect to widening the bridge. Early analysis determined that there was some reserve capacity for additional weight on the existing piers and foundations, indicating that pier cap extensions were a feasible approach for supporting a widened bridge deck. A more conventional pier widening scheme would require construction from the foundation level up.

Extending the pier caps was not without technical design and installation challenges. Selecting structural steel as a primary component of the extensions turned out to be a key factor in addressing the challenges. Ten steel cap extensions were designed, two for each of the five piers. Each extension consisted of a compartmentalized pier cap top element, an inclined strut and a pier shaft bracket connection – all fabricated from steel to minimize weight while meeting geometric, stiffness and strength requirements.

SUSTAINABILITY

Winner

Dawson Bridge Rehabilitation

CISC MEMBERS: DIALOG and Empire Iron Works Ltd.
OWNER: City of Edmonton
GENERAL CONTRACTOR: ConCreate USL Ltd.
ENGINEER: DIALOG
STEEL ERECTOR: Steel Design and Fabricators Ltd.
FABRICATORS & DETAILERS: Empire Iron Works Ltd. and Steel Design and Fabricators Ltd.

After almost a century of use, Edmonton's Dawson Bridge needed significant repair including total deck replacement and truss repainting. Numerous truss members required strengthening or replacement to provide an appropriate level of safety and extend the service life of the bridge. The Dawson Bridge is listed on the Inventory of Historical Resources in the City of Edmonton. This designation means that any modifications to the bridge must be carried out in a manner that respects historical aspects of its appearance.

The design team chose a lightweight composite steel plate and elastomer deck system using a technology originally developed for the marine industry and only recently applied to bridge construction. The system basically consists of two thin steel face plates connected by an injected elastomer core, for a total thickness of only 45 mm in the case of the Dawson Bridge. The bridge scored another technological first with its connection details. Costly field welding was eliminated by using an innovative bolting system that involves using splice plates to connect adjacent deck panels with countersunk bolts, allowing the panels to be quickly bolted into position on the bridge.

The use of the innovative deck system on the Dawson Bridge project has successfully advanced the state of the art in bridge technology and has achieved cost savings for the City of Edmonton, while allowing the rehabilitation work to be completed within a single construction season.


We've Got You Covered
CWB
CWB Group serves the steel construction industry and fully supports the CISC Quality Certification Program.
Through our audit services under the CISC Quality Guidelines for Steel Structures and Steel Bridges, we offer risk assessment, opportunities for improvement and access to new business. Let us help you grow and sustain your business.
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• Practical welder training
• Productivity audits
• Safety assessments
• Health and safety training
• NDT training courses
• Welding information resources

News and Events

CISC 80th Annual Convention

This past June, CISC hosted its 81st CISC Annual Convention and General Meeting in beautiful Mount Tremblant, Quebec. Along with keeping many past traditions, some new elements were added to this year's assembly. Based on our members' feedback, this year marked the continuation of more educational forums and seminars while still offering plenty of events for networking.

Lifetime Achievement Awards

The conference concluded with the celebration of our first ever Lifetime Achievement Awards, which showcased the lifelong contributions of some of the most outstanding contributors to our industry! The CISC Lifetime Achievement Awards honoured individuals that have made a significant contribution to the development, advancement and success of the Canadian steel industry over a sustained period of years.

These individuals have made a positive impact on advancing the use of structural steel; earned recognition by other industry groups; earned the respect of professional peers; have been generally acknowledged as having reached the pinnacle of their profession or industry; and demonstrated, over an extended period of time, leadership, innovation and/or originality in design, construction or academic concepts in structural steel design.

Please join CISC in congratulating and thanking the following Lifetime Achievement Award winners: Mr. John Leder, Mr. Kenneth Benson, Mr. Geoff Kulak and Mr. Laurie Kennedy.

Mr. John Leder

Mr. Kenneth Benson

Mr. Geoff Kulak

Mr. Laurie Kennedy

Don Beam Award

We also presented our second ever Don Beam Award at this year's annual conference. This award is named after Don Beam, who joined CISC in 1949 as Chief Engineer and later became the General Manager. In 1968, he became a Special Engineering Consultant until 1970. Don was a leader and played a pivotal role in the development of the National Building Code of Canada, first published in November 1941. He served on the Administrative Committee, Steel and Fire sub-committees. While at CISC he continued working in developing the NBCC, fire protection issue, model steel specifications for use by engineers and architects. The 2011 CISC Don Beam Award was presented to another leader:

Mr. Joe Schneider

We thank and congratulate all of our winners. The next CISC Lifetime Achievement Awards will take place in 2013.

Thanks to Sylvie Boulanger!

Sylvie Boulanger has spent over 14 years working for the Canadian Institute of Steel Construction. She has been the voice for CISC-Quebec since 2002. She strengthened the Quebec Steel Design Awards and coordinated a full-day symposium. Sylvie led the development of the Quebec and national websites. She initiated CISC efforts in sustainability and coordinated CISC's AESS (architecturally exposed structural steel) document development.

Since 2003, Sylvie has edited and written articles in *Advantage Steel*, including two special issues plus her *Ask Dr. Sylvie* and *For Green's Sake* columns. Sylvie represented the industry at the Ministry of International Trade, the Senate and other government levels to fight against Buy American and Wood First initiatives. She has answered hundreds of questions, given over twenty talks a year and coordinated/moderated dozens of meetings. Sylvie had a soft spot for her Quebec members. She always maintained that the greatness of the steel construction industry is its people – the source of her passion and enthusiasm. We wish her all the best!

Congratulations to Lakehead University!

CISC is a proud sponsor of the Lakehead University team, which walked away with first prize at this year's ASCE/AISC National Student Steel Bridge Competition. This is the first time in the history of the NSSBC that a Canadian team has received top honours. This year's competition took place at Texas A&M University, May 20 to 21, 2011.

The competition requires civil engineering students to design, fabricate and construct a steel bridge and encourages students to apply their theoretical knowledge in a hands-on project that addresses the full breadth of steel design requirements, including construction speed, lightness, display, stiffness, economy and efficiency. This year's competition was particularly challenging with the design requirement of a cantilever portion of the steel bridge and also with heavier lateral load yet less allowable deflection than in previous competition years.

Lakehead University was the first qualifying Canadian team that participated at the National Competition level in 1999. At that competition, they placed first in the category of Aesthetics. They have qualified for the Nationals every year since then, except for one.

This year, the Lakehead University team was ranked first place in the categories of Construction Speed (at 4.74 minutes), Lightness (at 141 lbs) and Efficiency.

Corbec Corporation, double winner

Corbec Corporation won two awards at the American Galvanizers Association's Excellence in Hot-Dip Galvanizing Awards. The company collected two Excellence Awards: for the Hambro modular parking system in the "Most Distinguished" category and Oeuvre Coburn in the "Civic Contribution" category. They will have the honour of adding these two awards to six other awards won over the past few years: Churchill River Bridge (2007), Expocité (2008), Kuujjuaq Airport (2008), Canaport (2009), Calypso Water Park (2010) and Women of the Future (2010).

Presented annually, the award program recognizes projects that utilize after-fabrication hot-dip galvanized steel in an ideal, creative, monumental or otherwise impressive fashion. Whether an artful sculpture glinting under the sun or a sturdy bridge arcing over the waves of a rushing river, galvanized structures can be seen standing strong and corrosion-free across the continent. Winning projects represent the finest achievement in the use of hot-dip galvanizing in a project design and concept.

Eighth Avenue Place Tower recognized for Environmental Design

The 49-storey high-rise office tower of Eighth Avenue Place in Calgary has received LEED Platinum pre-certification and is slated to become Canada's first and North America's third LEED Platinum high-rise office building. Please see the article on page 26 which explores the LEED aspects of the structure.

New Publications

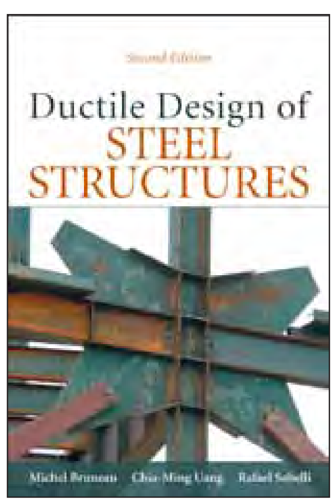
Look for two new CISC publications later this fall:

- English translation of "Calcul des charpentes d'acier"
- "Fundamentals of Structural Shop Drafting, 6th Edition"

Also now available is:

- "Ductile Design of Steel Structures," Second Edition

Thoroughly revised throughout, "Ductile Design of Steel Structures, Second Edition," reflects the latest plastic and seismic design provisions and standards from the American Institute of Steel Construction (AISC) and the Canadian Standard Association (CSA). The book covers steel material, cross-section, component and system response for applications in plastic and seismic design, and provides practical guidance on how to incorporate these principles into structural design.



Three new chapters address buckling-restrained braced frame design, steel-plate shear wall design, and hysteretic energy-dissipating systems and design strategies. Eight other chapters have been extensively revised and expanded, including a chapter presenting the basic seismic design philosophy to determine seismic loads. Self-study problems at the end of each chapter help reinforce the concepts presented. Written by experts in earthquake-resistant design who are active in the development of seismic guidelines, this is an invaluable resource for students and professionals involved in earthquake engineering or other areas related to the analysis and design of steel structures.

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Consultants, specifiers, ministries, and owners can now specify CISC Certification with the knowledge it is open to any company, not just the CISC members.

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Thanks to our AGM Sponsors

Many thanks to the Diamond Level Sponsors who helped make our 2011 Annual General Meeting such a success!

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Continuing Education Courses

We have two new English language courses available this fall – "Connections I for Steel Detailers" and "Seismic Connections for Steel-Framed Buildings" – and two significantly updated and enhanced courses – "Steel Bridges – Design, Fabrication, Construction" and "Seismic Design of Steel-Framed Buildings."

There is also a new French language course available this fall – "Assemblages pour structures en acier" – and a significantly updated and enhanced course – "Conception, fabrication et construction de ponts en acier."

For full course schedule, information, online registration and the latest updates please visit our website www.cisc-icca.ca/courses, or request a copy of our course calendar.

Connections I for Steel Detailers
– New Online Course –

This course is the first in a two-level series intended to develop the skills necessary for the design of steel connections as related to the construction of steel-framed structures.

The main objective is to assist steel industry personnel in their understanding of basic connection design principles, and to design simple welded and bolted connections suitable for fabrication. They will also understand the origin of the rules and standards used in the steel industry.

This training has the following goals:

- Understand and apply the major principles of the static forces and strength of materials in connection design;
- Recognize the properties and characteristics of steel;
- Use the appropriate connecting elements (bolts and welds); and
- Develop curiosity and critical judgment.

The course leader is:
Marc Robitaille, M.Sc.A., P.Eng., Vice-President Engineering, Supermétal Structures Inc.

Webinar Format (20@2hrs)

Tuesdays and Thursdays, 7:00 p.m. to 9:00 p.m. EST, Starting November 1

Seismic Connections for Steel-Framed Buildings
– New Course –

Held in tandem with the "Seismic Design of Steel-Framed Buildings" course (see below), this course prepares consulting structural engineers and steel fabrication engineers for the design of connections in ductile Seismic Force Resisting Systems in steel-framed buildings to the requirements of the 2010 National Building Code of Canada and Clause 27 of CSA Standard S16-09. The critical connections in the design examples developed for the Seismic Design of Steel-Framed Buildings course are used.

Capacity design requirements, now well entrenched in Clause 27 of S16-09, have virtually revolutionized the design, detailing and construction of connections for seismic applications. These requirements make it almost impossible to design Seismic Force Resisting Systems in isolation since the overall behaviour of these frames is highly dependent on the configuration and proportioning of these connections. The course will take participants through the detailed design of connections for moment connections covered in the CISC publication "Moment Connections for Seismic Applications," links and brace connections in Eccentric Braced Frames, tension-compression brace connections, tension only brace connections and more.

Seismic Design of Steel-Framed Buildings
– Updated Course –

Held in tandem with the "Seismic Connections for Steel-Framed Buildings" course (see above), this course is intended to provide understanding on design theory and the rationale behind code provisions as well as the application of specific Code formulae and requirements. It will cover the design of seismic resisting systems for steel-framed buildings to the requirements of the 2010 National Building Code of Canada and the pertinent provisions of CSA Standard S16-09.

New topics include ductile plate walls, buckling-restrained braces and higher limits for conventional construction. Updated topics include tension-only braced frames, concentrically braced frames, ductile eccentrically braced frames, Type LD moment resisting frames, ductile moment resisting frames, notional loads, P-delta effects and diaphragms.

Course leaders are:
Alfred F. Wong, M.Eng., P.Eng., Director of Engineering, CISC
Augustin Dukuze, Ph.D., P.Eng., Principal, AnalytiXal Designs

	Seismic Design	Seismic Connections
Calgary, AB	October 17	October 18
Vancouver, BC	October 19	October 20
Fredericton, NB	November 7	November 8
Halifax, NS	November 9	November 10
Toronto, ON	November 21	November 22
Ottawa, ON	November 23	November 24

Steel Bridges – Design, Fabrication, Construction – *Updated Course* –

This course covers the design, fabrication and construction of steel bridges based on the 2010 Canadian Highway Bridge Design Code. The practical and economical aspects of fabrication, erection, choice of material and their impact on design will also be emphasized. The presentation and the Course Notes include four design examples illustrating extensive design calculations for I-girders and box girders of straight and curved configurations. Topics receiving greater emphasis in 2011 include fatigue and brittle fracture, integral abutments, aesthetics and sustainability.

Course leaders for the English language edition are:
Gilbert Grondin, Ph.D., P.Eng., Professor of Civil Engineering, University of Alberta
James Montgomery, Ph.D., P.Eng., LEED® AP, Principal, DIALOG
Paul J. King, P.Eng., VP Engineering, Rapid-Span Structures Ltd.

St. John's, NF	October 4 & 5
Moncton, NB	October 6 & 7
Toronto, ON	October 31 & November 1
Calgary, AB	November 29 & 30
Victoria, BC	December 1 & 2

Course leaders for the French language edition are:
Gilbert Grondin, Ph.D., P.Eng., Professeur de génie civil, Université de l'Alberta
Jean de Gaspé Lizotte, M.Sc., ing., Directeur, Projets spéciaux, Dessau Soprin inc.
Richard B. Vincent, B.Eng., ing., Vice-président, recherche, Groupe Canam Inc.

Québec, QC	10 et 11 nov
Moncton, NB	October 6 & 7

Assemblages pour structures en acier (en Français) – *Nouveau* –

Ce cours est conçu pour offrir des conseils pratiques aux concepteurs et clarifier le rôle complémentaire du fabricant et de l'ingénieur en structures pour la conception des assemblages. L'accent est placé sur les assemblages et leurs conséquences sur les coûts et l'économie.

Le principal objectif est d'aider les concepteurs à mieux comprendre comment les assemblages influencent la conception des éléments de charpente et vice-versa, et d'insister sur l'importance de réfléchir au choix des assemblages et des éléments de charpente pour une économie optimale.

Les sujets abordés incluent les principales modifications à la norme S16-09, les boulons à haute résistance, les soudures, les boulons en traction et avec effet de levier, les assemblages anti-glissement, les assemblages mixtes soudures-boulons, les assemblages excentriques, les assemblages en cisaillement simple, les sièges, les assemblages au béton, les assemblages de poteaux, les assemblages rigides (profilés W et HSS), les assemblages de contreventements, les goussets et les assemblages de fermes.

The course leaders for the French language edition are:
Serge Dussault, M.Eng., ing., Vice-président, ingénierie, Groupe Canam
Danilo D'Aronco, M.Ing., ing., Associé et directeur de l'ingénierie, DPHV

Montréal, QC	21 septembre
Québec, QC	22 septembre

Continuing education courses in development include:

Inspection of Steel Structures

This course will prepare designers, building officials and other specialists for the inspection of steel-framed buildings in the fabrication shop and the field. It is presented online in four two-hour live sessions over one or two days. Applicable sections of the National Building Code of Canada, CSA S16 plus referenced material, product and quality standards, CISC Code of Practice and CISC Certification guidelines will be addressed. Typical structural design, erection and shop drawings for steel-framed buildings will be explained. Material identification, tolerances, seismic connections, bolting and welding processes and procedures will be reviewed.

The course developer and leader is Robert E. Shaw, Jr., PE, President, Steel Structures Technology Center, Inc. with delivery expected in February 2012.

New Members

At the June meeting the CISC Board of Directors elected the following organizations as new members. Welcome all!

Fabricators

AAA Steel Limited, Calgary, AB
AAP Steel, Vaughn, ON

Detailers

Apex Structural Design Ltd., Sylvan Lake, AB

Associate Suppliers

AGT, Trois Rivières, QC
All Fabrication Machinery Ltd., Leduc, AB

Metal Fabricators and Welding Ltd., Edmonton, AB
Cast Connex Corporation, Toronto, ON
ITW Welding North America, Mississauga, ON

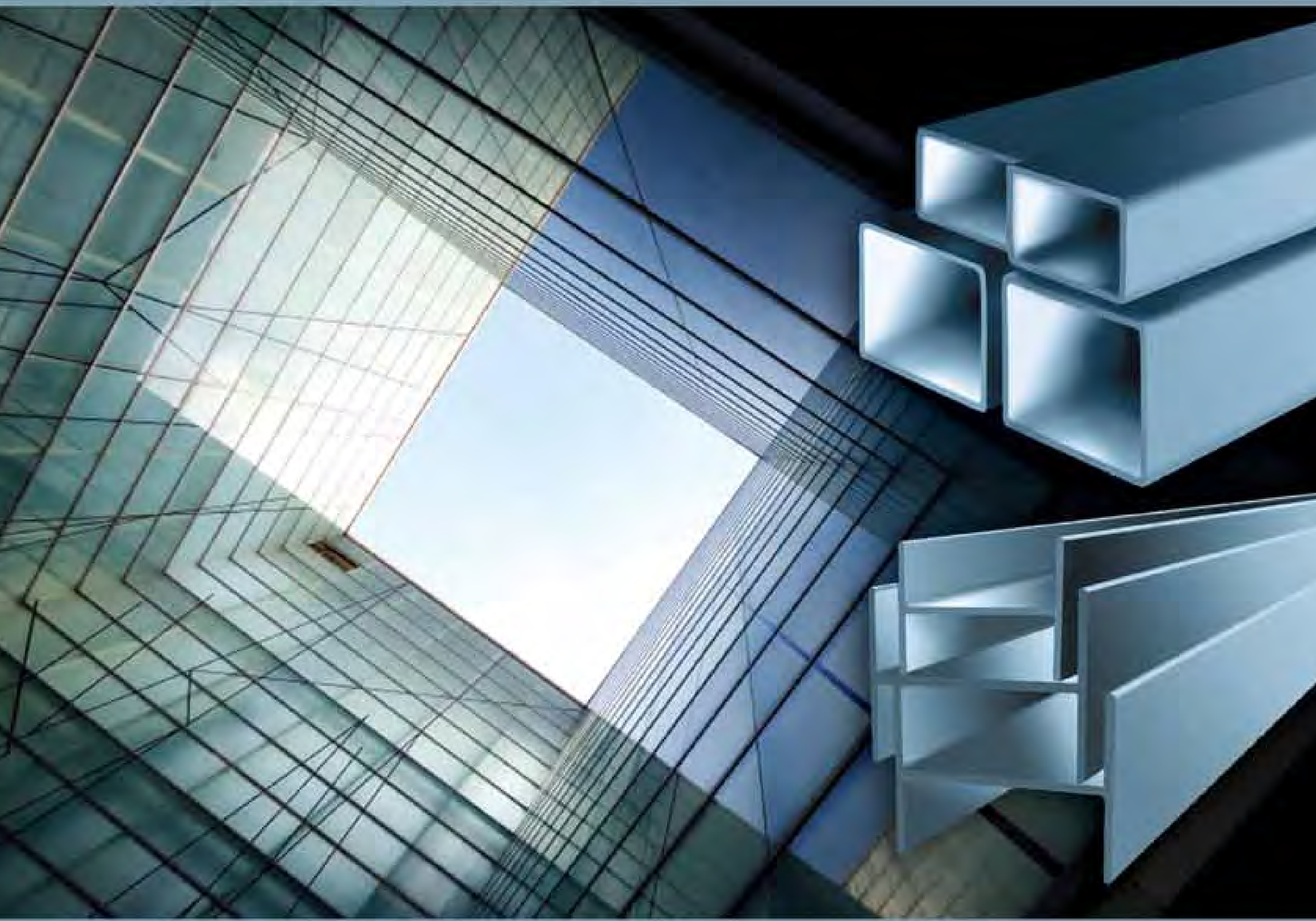
Events

CWA Annual Conference
September 19 to 20, Banff, Alberta
www.cwaconference.org

SteelDay
September 23, 2011 - Various locations across Canada
www.steelday.ca

NASCC – The Steel Conference
April 18 to 21, 2012, Grapeview, Texas
www.aisc-org/nascc

International Symposium on Tubular Structures
September 12 to 14, 2012, London, England
www.istructe.org



CISC FABRICATOR MEMBERS

CISC Member Directory - Listing as of August 2, 2011

Legend:
*sales office only
B Buildings
Br Bridges
S Structural
P Platework
J Open-web Steel Joist

ATLANTIC

Canam–Canada
Moncton, NB 506 857 3164
www.canam.ws

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

Eascan Building Systems Ltd.
Truro, NS 902 897 9553
www.eascan.ca

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

QUÉBEC

Acier Fortin Inc. S
Montmagny, QC 418 248 7904
www.acierfortin.com

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

Canam–Canada S, J
Ville de St-Georges, QC 418 228 8031
www.canam.ws

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

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

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

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

Les Aciers Fax inc. B, S
Charlesbourg, QC 418 841 7771

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

Métal Moro inc S
Montmagny, QC 418 248 1018

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

Mometal Structures Inc. B, S
Varennes, QC 450 929 3999
www.mometal.com

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

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

Produits Métalliques PMI S
Rimouski, QC 418 723 2610
www.pmibuilding.com
Bâtiments modulaires et structures d'acier

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 Metal Joliette Ltée S
Joliette, QC 450 753 4228

Structal – Bridges, A Division of Canam Group Inc. S, P
Québec, QC 418 683 2561
www.structalponts.ws

Structal-Heavy Steel Construction – A division of Canam Group Inc. S, J
Boucherville, QC 450 641 4000
www.canam.ws

Sturo Metal 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 Metal Inc. B, S, P
Lac St-Charles, QC 418 849 6919
www.sm–inc.com

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

ONTARIO

AAP Steel Inc.
Vaughan, ON 905 669 2274
www.aapsteelinc.net

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

Arkbro Structures S
Mississauga, ON 905 766 4038
www.arkbrostructures.com

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
www.casteel1983.com

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

Canam Canada – A division of Canam Group inc. (Mississauga) S, J
Mississauga, ON 905 671 3460
www.canam.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

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

IBL Structural Steel Limited B
Mississauga, ON 905 671 3301
www.iblsteel.com

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

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

Norak Steel Construction Limited S
Concord, ON 905 669 1767
www.noraksteel.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
Mississauga, ON 905 362 5097
www.pittsburghsteel.com

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

Quest Steel Inc. B, Br, S, P
Mississauga, ON 905 564 7446

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

Steel 2000 Inc. S
Chelmsford, ON 705 855 0803

Steelcon Fabrication Inc. B
Bolton, ON 416 798 3343

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

Times Iron Works Ltd. S
Pickering, ON 905 831 5111

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

C & C Pneumatics S, P
Saskatoon, SK 306 374 8228
ww.ccindustries.ca

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 Group Inc. S, P
Saskatoon, SK 306 975 1177
www.supremesteel.com

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

CISC FABRICATOR, SERVICE CENTRE, MILL AND DETAILER MEMBERS

ALBERTA

AAA Steel Limited
Calgary, AB 403 236 4625
www.aaasteel.com

Anglia Steel Industries (1984) B, S, P
Calgary, AB 403 720 2363
www.angliasteel.ca

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. S, J
Calgary, AB 403 252 7591
www.canam.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

GAR-DON Steel Industries Ltd. S
Nisku, AB 780 955 8034
www.gardon.ca

Garneau Manufacturing Inc. S
Morinville, AB 780 939 2129

JV Driver Fabricators Inc. B, S
Nisku, AB 780 955 1746
www.jvdriver.com
Industrial

Leder Steel Limited S
Edmonton, AB 780 962 9040
www.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
St. Romuald, QC 418 834 1955
www.supermetal.com

Supreme Group Inc. S, P
Edmonton, AB 780 483 3278
www.supremesteel.com

Supreme Group Inc., 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

Canam – Canada (BC Region)
Coquitlam, BC 604 524 0064
www.canam.ws

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

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

Impact Ironworks Ltd. B, S
Surrey, BC 604 888 0851

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 Co. S, J
Surrey, BC 604 596 1747
www.xliron.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

Samuel, Son + Co., Limited
Chomedey, QC 514 384 5220
www.samuel.com

Delta, BC 604 524 8000
www.customplate.net

Hamilton, ON 905 573 8100
www.samuel.com

Mississauga, ON 905 279 5460
www.samuel.com

Nisku, AB 780 955 4777
www.samuel.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.
Vancouver, BC 604 324 6611
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
www.russelmetals.com

MILL

Atlas Tube Canada ULC
Harrow, ON 519 738 5000
www.atlastube.com

Essar Steel Algoma Inc.
Sault Ste. Marie, ON 705 945 2351
www.essarsteelalgoma.com

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

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

DETAILER

A-1 Detailing and Engineering Ltd. B, P
Nackawic, NB 506 575 1222

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

Apex Structural Design Ltd.
Sylvan Lake, AB 403 864 2000
www.apexstructural.ca

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

Cadmax Detailing Inc. / 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. B
Levis, QC 418 835 5140
www.structuredca.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

iGL inc.
Trois-Rivieres, QC 888 573 4982

IKONA Drafting Services Inc.
Regina, SK 306 522 2650

IRESCO Ltd. B
Edmonton, 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

M&D Management Consulting Ltd. B
Parksville, BC 250 248 4871
www.detaileddesign.com

M-Tec Drafting Services Inc. B, Br, P
Sherwood Park, AB 780 467 0903
www.mtecdrafting.com

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

CISC DETAILER, AFFILIATE, ASSOCIATE FABRICATOR, ERECTOR AND SUPPLIER MEMBERS

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

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

SDE Structure D'Acier B, S
Trois-Riviéres, QC 819 376 9089
www.sde-draft.com

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

TDS Industrial Services Ltd. B, P
Pitt Meadows, BC 640 465 6085
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

AFFILIATE

CWB Group/Le Groupe CWB
Milton, ON 905 542 1312
www.cwbgroup.org

ASSOCIATE FABRICATOR

I & M Welding & Fabricating Ltd.
Saskatoon, SK 306 955 4546

ASSOCIATE ERECTOR

E.S. Fox Limited B, Br, S, P, J
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. Br, P
Laval, QC 450 727 5800

Niagara Rigging & Erecting Company Ltd. B, Br, S, J
Niagara on the Lake, ON 289 296 4594

ASSOCIATE SUPPLIER

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

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

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 sect

AGT S
Trois-Rivieres, QC 819 692 0978
www.agtech.qc.ca

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

Akhurst Machinery
Edmonton, AB 780 435 3936
www.akhurst.com

All Fabrication Machinery Ltd.
Leduc, AB 780 980 9661
www.allfabmachinery.com
Steel and plate fabrication – machinery

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

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

Amercoat Canada
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

Blastech Corporation
Brantford, ON 519 756 8222
www.blastech.com
Abrasive blasting, glass bead

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

Cast Connex Corporation
Toronto, ON 416 806 3521
www.castconnex.com

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
www.corrcoat.ca
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
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Common Codes and Standards for Design and Construction of Steel Structures

Current Status and Future Publication Targets

CODE/STANDARD SUPPLEMENT/COMMENTARY	CURRENT EDITION	NEXT EDITION/ REVISION	PUBLICATION TARGET
National Building Code of Canada (NBC)	NBC 2010	NBC 2015	2015
NBC Structural Commentaries (Part 4 of Div. B)	NBC 2010 Str. Comm.	NBC 2015 Str. Comm.	
CSA S16 Design of Steel Structures	CSA S16-09	S16-14	2014
CISC Commentary on CSA S16 (Part 2 of CISC Handbook of Steel Construction[1])	CISC Handbook 10th Edition[1]	CISC Handbook 11th Edition	2015
CSA S6 Canadian Highway Bridge Design Code	CSA S6-06	S6-14	2014
- Supplements to CSA S6	CSA S6S2-11	S6S3-12	2012
CSA S6.1 Commentary on Canadian Highway Bridge Design Code	CSA S6.1-06	S6.1-14	2014
- Supplements to CSA S6.1	CSA S6.1S2-11	S6.1S3-12	2012
CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel	CSA G40.20-04 CSA G40.21-04 (R2009)[2]	G40.20-13 G40.21-13	2013
CSA W59 Welded Steel Construction (Metal Arc Welding)	CSA W59-03 (R2008)[3]	W59-12	2012
CSA W47.1 Certification of Companies for Fusion Welding of Steel	CSA W47.1-09	W47.1-14	2014
CSA S136 North American Specification for the Design of Cold-Formed Steel Structural Members	CSA S136-07	S136-13	2013
- Supplements to CSA S136	CSA S136S2-10		
CSA S136.1 Commentary on CSA S136	CSA S136.1-07	S136.1-13	2013

[1] CISC Handbook of Steel Construction - 10th Edition includes CSA S16-09, its Commentary, CISC Code of Standard Practice - 7th Edition, and design and detailing aids in accordance with CSA S16-09.
[2] Reaffirmed in 2009.
[3] Reaffirmed in 2008

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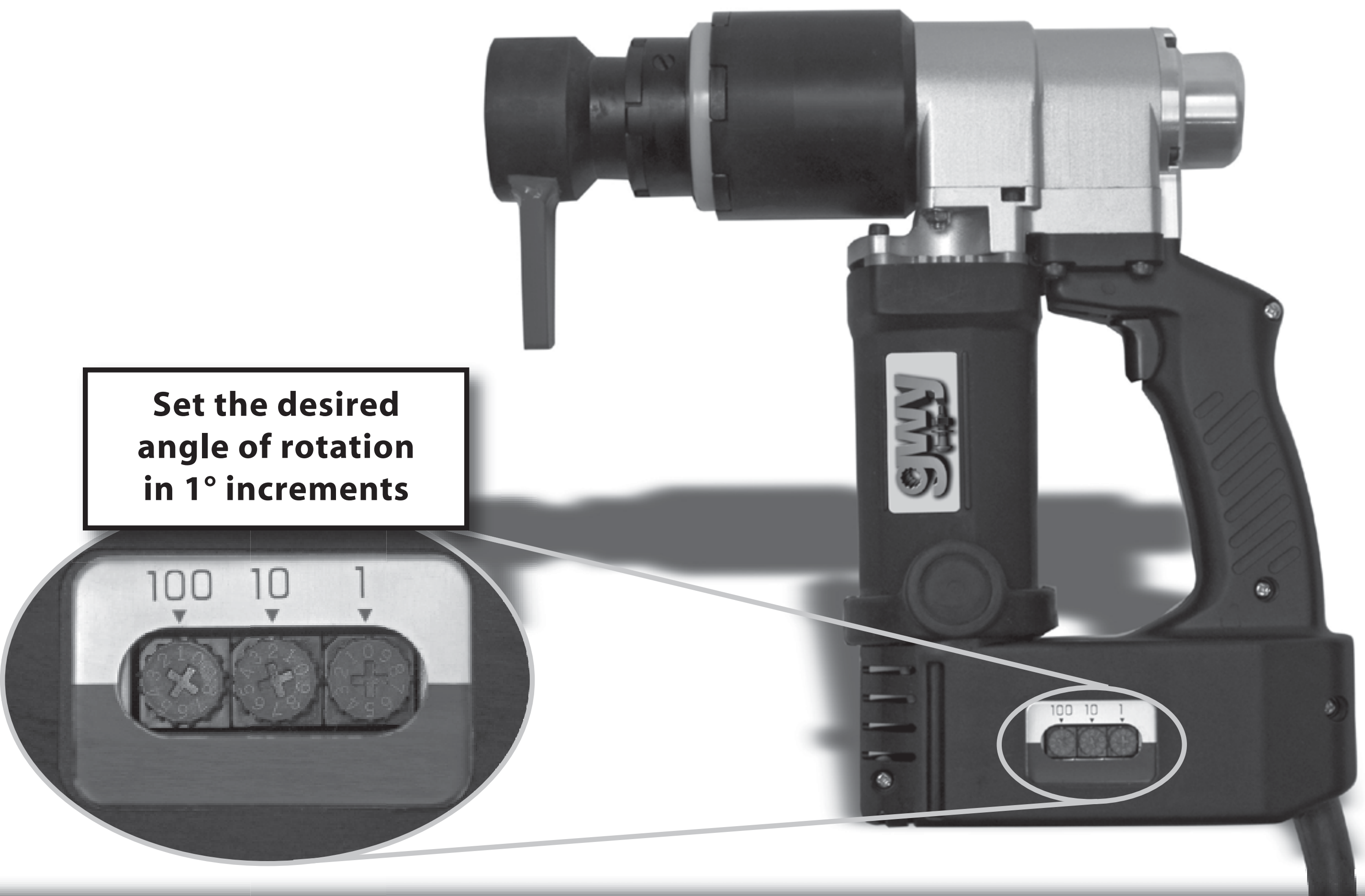
The installation torque is absorbed by the reaction arm of the light weight tool … not by the worker. **Greater production – Less fatigue**

Installation <u>IS NOT</u> affected by torque. **Eliminates all torque-related problems**

No more match marking. **Faster – More efficient installation**

The tool can be pre-set to 1/3, 1/2 or 2/3 turn – or any angle of rotation desired, in 1° increments. **Maximum flexibility**

Light weight, constant speed and electric. **No noise – No compressor – More reliable than conventional pneumatic wrenches**



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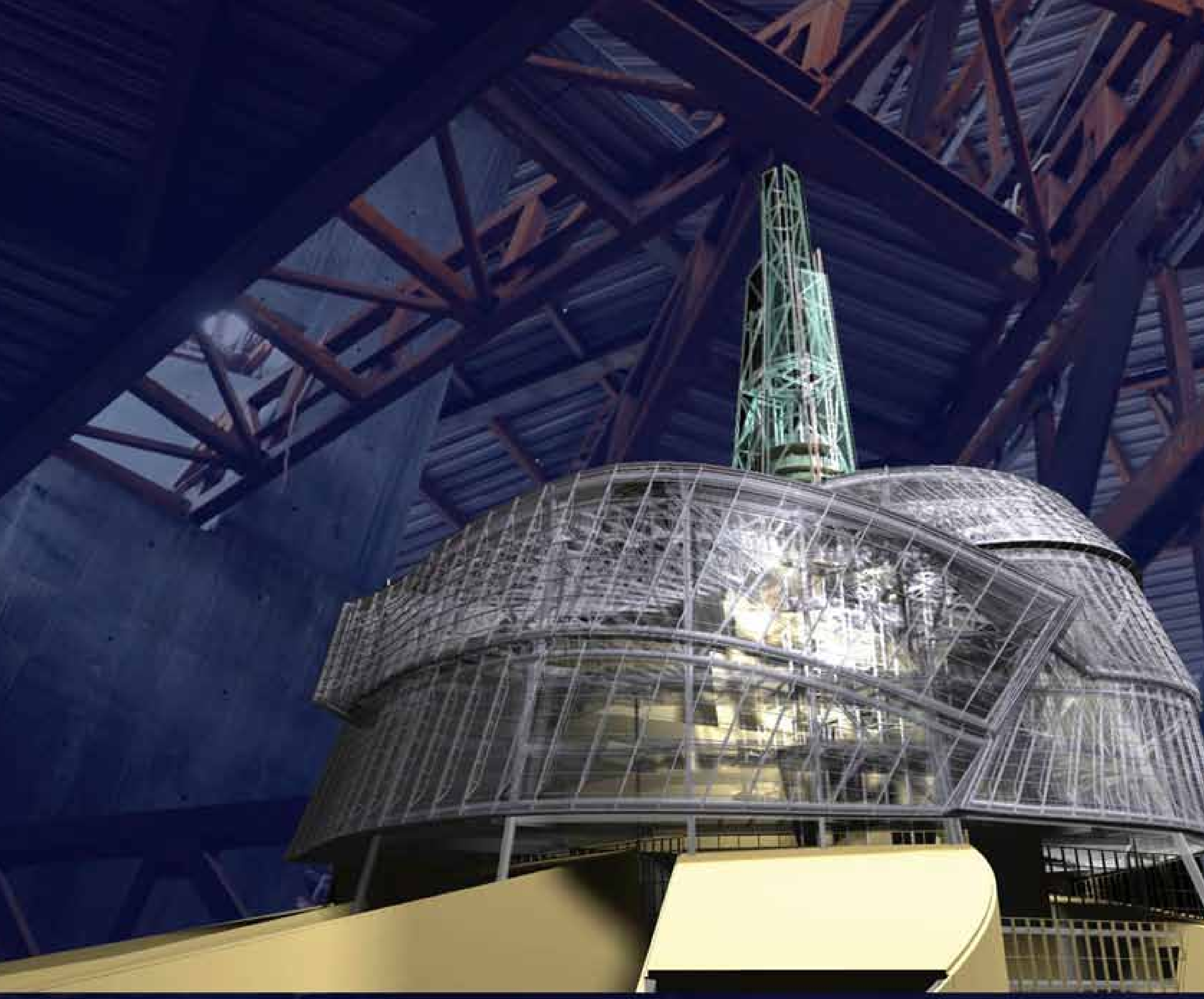

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