ADVANTAGE STEEL

NO 45 SPRING 2013

2012 Quebec Steel Design Awards

+ **Directly applied fire protection for steel structures**

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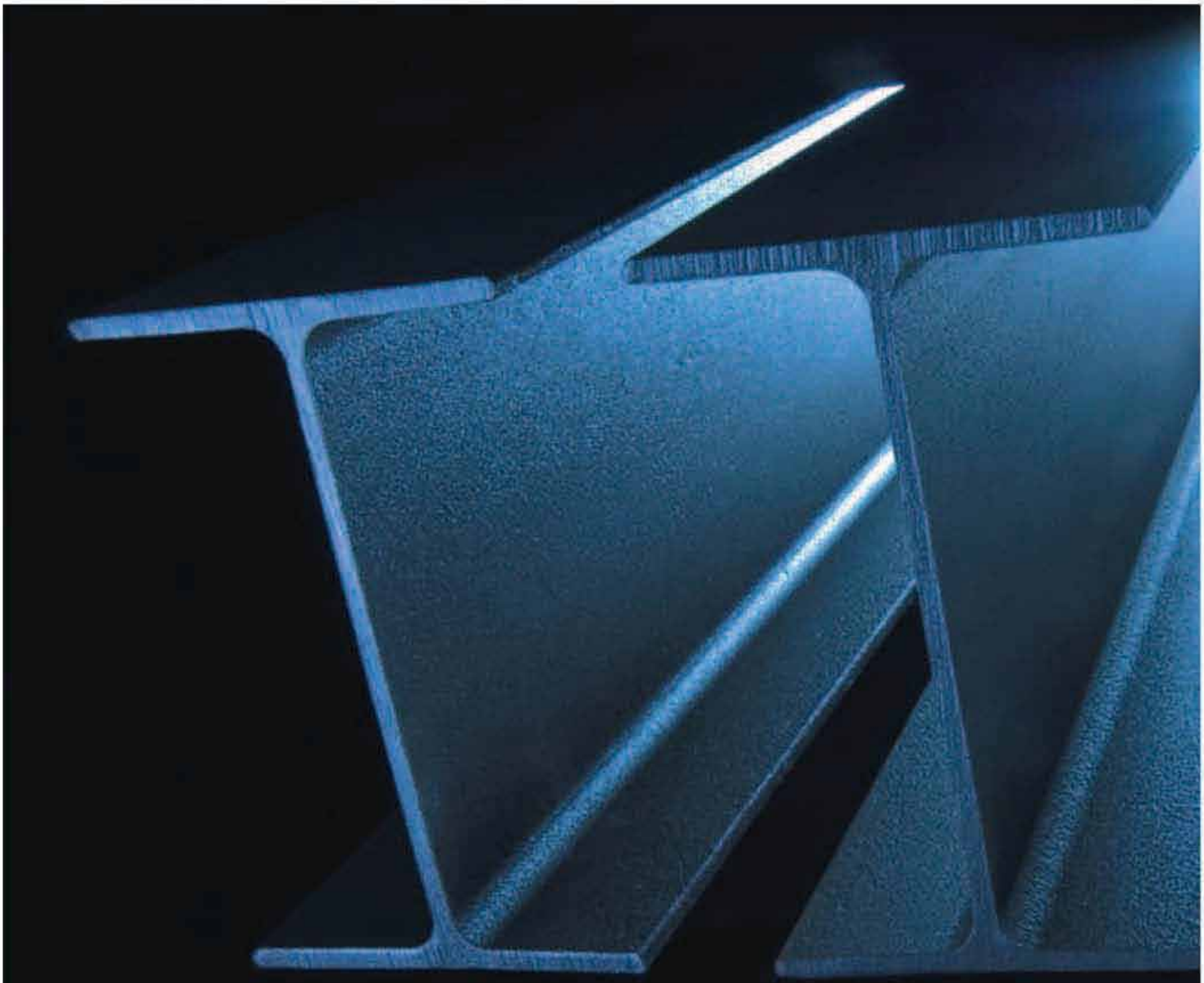

ADVANTAGE STEEL

NO 45 SPRING 2013

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FEATURES

COLUMNS

By Ed Whalen, P.Eng.

Design drawings – Construction industry says enough

I was somewhat surprised, while attending the Canadian Construction Association (CCA) meetings in October, to hear that the construction industry identified the quality of construction drawings issued for tender as one of its biggest concerns.

Wow. And I thought it was only the steel industry that had problems with drawings! The quality of construction drawings has been an issue ever since I began in this industry over 25 years ago, but never on the scale we are seeing now.

If you believe this is a Canadian phenomenon, you are mistaken. In March 2011, at a meeting of the International Steel Constructors Group, the quality of engineering drawings was cited as one of the most concerning issues facing the steel industry worldwide.

So how on earth did we get into this situation globally? And will it only get worse before it gets better?

I have heard all sorts of reasons why we have this state of affairs. Here are a few:

- Owners are not paying engineers enough money to produce quality drawings;
- The projects are fast-tracked and drawings have to be released before the design is finished;
- Global competition for engineering services are putting downward pressure on prices and quality; and
- The typical 'design, bid, build' model is out of date and should be replaced with design-build, P3 or other similar.

To have the entire construction industry agree to set up a task group to address the quality of drawings is a telling story. The challenge now is how to solve the problem. The challenge I see with CCA and their attempt to address the issue is that key players are missing from the table – engineers, architects and owners.

Also, in isolation there are a number of provincial professional engineering associations that presently have task groups already actively addressing this concern. At a minimum, this approach has the engineers at the table, but missing are other key stakeholders.

A presentation by a prominent Canadian construction litigation firm advised that litigation arising from the quality of drawings has risen in recent times. This, they said, has no bearing on whether the consultants are paid handsomely or not, the design is complete or not, or whether the project is your traditional design bid, design build, or other form like P3. They also advised that after litigation the owner was usually the one that paid the penalty, not the consultants.

So, financial accountability may be one of the many reasons we see what we are seeing. This is not limited to steel, but to all construction design and is becoming a structural problem for our industry.

Simply put, we need a paradigm shift.

As BIM becomes more widely adopted, and software to track and cost changes becomes more sophisticated, the power of data will bring more and more potential disputes to the courts. We cannot control what happens globally or with other trades, but CISC will, as an organization of all steel stakeholders, bring everyone to the table to listen, understand and collectively work toward a solution so that our industry can thrive.

If you are interested in participating in a forum or committee related to this topic, please contact us. We would be happy to add you to the list.

ADVANTAGE STEEL

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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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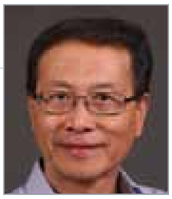


By Alfred F. Wong, P.Eng.

CISC provides this column as a part of its commitment to the education of those interested in the use of steel in construction. Neither CISC nor the author assumes responsibility for errors or oversights resulting from the use of the information contained herein. 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 is the strength reduction factor for multi-orientation fillet welds, M_w, applied? Please show an example.

ANSWER: In the weld configuration shown in Figure 1, 8-millimetre fillet welds are used, X_u = 490 MPa and the plate is G40.21 350W steel. Note that the farside plate is thicker.

In accordance with CSA S16-09 Clause 13.13.2.2:

$$V_r = 0.67\,\phi_w\,A_w\,X_u\,(1.00 + 0.50\sin^{1.5}\theta)\,M_w$$

where:

θ = angle of axis of weld segment with respect to the line of action of the applied force

M_w = strength reduction factor for multi-orientation fillet welds

a) Weld segment at θ = 60°:

Orientation of the weld segment under consideration: θ_1 = 60°

Orientation of the weld segment in the joint that is nearest to 90°: $\theta_2 = \theta_1$ = 60°

$$M_w = \frac{0.85+\theta_1/600}{0.85+\theta_2/600} = \frac{0.85+60/600}{0.85+60/600} = 1.00$$

b) Longitudinal weld segments (θ = 0°):

Orientation of the weld segment under consideration: θ_1 = 0°

Orientation of the weld segment in the joint that is nearest to 90°: θ_2 = 60°

$$M_w = \frac{0.85+\theta_1/600}{0.85+\theta_2/600} = \frac{0.85+0/600}{0.85+60/600} = 0.895$$

c) Weld group resistance:

$V_r = 2 \times 0.67 \times 0.67 \times 8 \times 100 \times 0.707 \times 0.490$
$(1.00 + 0.50 \sin^{1.5} 0°)\ 0.895$
$+ 0.67 \times 0.67 \times 8 \times 120 \times 0.707 \times 0.490$
$(1.00 + 0.50 \sin^{1.5} 60°)\ 1.00$
$= 2 \times 111 + 209 = 431$ kN

For matching electrodes, the base metal resistance need not be checked.

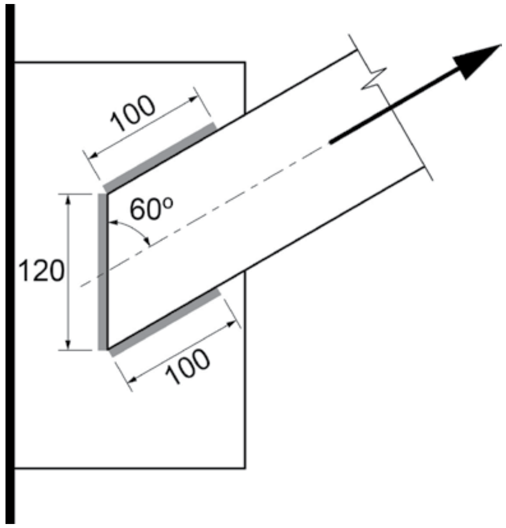


FIGURE 1: Strength reduction for multi-orientation fillet welds

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.

QUESTION 2: Clause 13.11 of S16-09 appears to have omitted the check for shear rupture of net section. What has happened to the shear rupture failure mode and where is the provision for pure shear rupture?

ANSWER: The equation provided in Clause 13.11 of S16-09, as shown below, consists of both the tension and shear contributions to the block shear resistance of a bolted joint.

$$T_r = \phi_u \left[U_t A_n F_u + 0.6 A_{gv} \frac{(F_y + F_u)}{2} \right]$$

The first term accounts for the resistance against tension whereas the second term represents the shear component. An example is shown in Figure 2a. The ultimate resistance of block shear is attained when the net section(s) subjected to tension reaches its fracture capacity. Typically, the deformation associated with this tensile capacity is too small to mobilize complete shear rupture at the same time. As recommended by *Driver et al*, the shear component is based on 0.6 times the mean value of F_y and F_u in this calculation. It should be noted that the gross area in shear, A_{gv} (taken as the area of the plane(s) tangential to the bolt holes), is used in this calculation.

Pure shear rupture, as shown for the example in Figure 2b, should also be considered. The second term of the equation above covers it. In the absence of the above-mentioned deformation incompatibility, larger shear resistance can be attained for pure shear rupture. However, Clause 13.11 provides a simple solution.

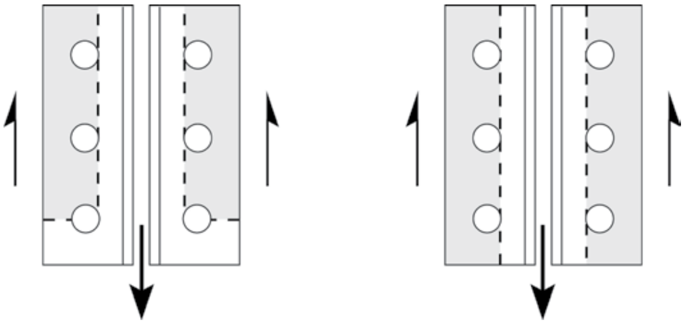
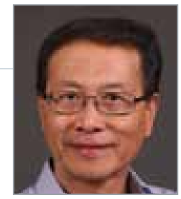


FIGURE 2a: Block shear

FIGURE 2b: Shear rupture



By Alfred F. Wong, P.Eng.

Force redistribution after brace buckling

In general, capacity protected elements are proportioned to resist forces associated with the capacity of the yielding elements in the seismic-force-resisting system. When other factors, such as wind effects, govern the design of the yielding elements, the capacity design forces may become unnecessarily large. NBC 2010 sets the upper limits for capacity design forces as follows:

a) Forces determined with $R_dR_o = 1.0$, or

b) When permitted by the applicable reference design standards, forces determined with $R_dR_o = 1.3$.

The application of forces determined with $R_dR_o = 1.0$, or elastic forces, is quite straightforward. For Type MD and Type LD concentrically braced frames (CBF), these forces are 3.9 times and 2.6 times the minimum NBC earthquake forces respectively.

The forces determined with $R_dR_o = 1.3$ (item b) are smaller: 3 times and 2 times the minimum NBC forces for Type MD and Type LD CBF respectively. However, the determination and application of these forces are more complicated. CSA S16-09, in Clause 27.5.3.4, specifies the probable capacities of braces in Type MD (and Type LD) Concentrically Braced Frames. It requires the consideration of redistribution of forces due to brace buckling when calculating the forces corresponding to $R_dR_o = 1.3$. An example is illustrated in the figure to the right.

The probable capacity of the brace in tension is $A_gR_yF_y$, but need not exceed $T_{1.3}$ (forces corresponding to $R_dR_o = 1.3$).

The storey shear force, $P_{1.3}$, = R_d × minimum NBC storey shear + notional load component.

In order to account for redistribution of forces after brace buckling, $T_{1.3}$ must be calculated by replacing the compression brace with end forces, equal to its probable buckled resistance, C'_u. Since C'_u is always smaller than C_u, $T_{1.3}$ is always greater than the brace force obtained from an elastic analysis using $R_dR_o = 1.3$. In other words, it is possible to have $T_{1.3}$ greater than $A_gR_yF_y$ when $P_{1.3}$ is smaller than P_u. In that case, the probable capacity of the brace in tension is $A_gR_yF_y$.

It should also be noted that connections designed for forces corresponding to $R_dR_o = 1.3$ are required to exhibit a ductile governing mode of behaviour, in accordance with Clause 27.1.2 of S16-09.

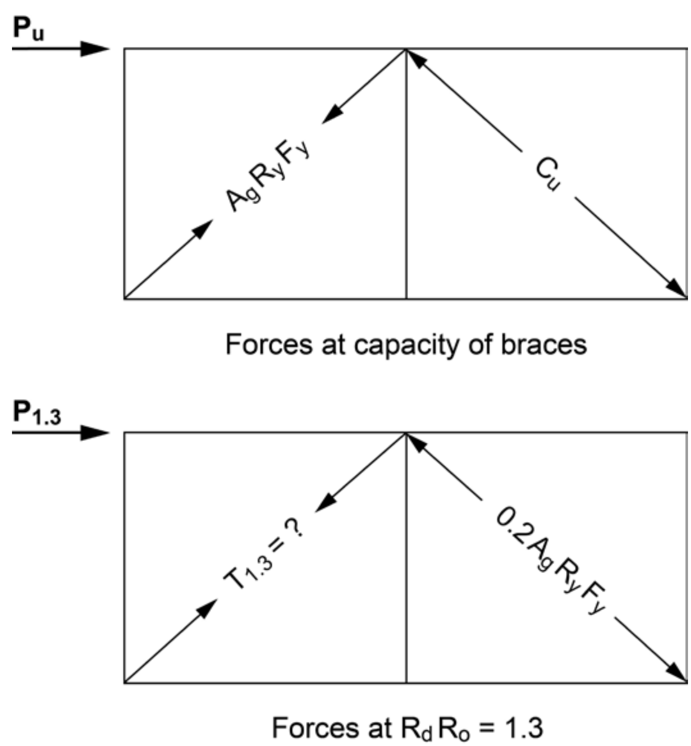


Figure 1

By Tareq Ali

Gearing up for LEED v4

USGBC gets ready to ballot LEED v4 in 2013

The U.S. Green Building Council's (USGBC) LEED rating system is the leading program for the design, construction, maintenance and operations of green buildings. More than 49,000 projects are currently participating in the commercial and institutional LEED rating systems, comprising 9.1 billion square feet of construction space in over 130 countries. In addition, more than 24,000 residential units have been certified under the LEED for Homes rating system, with more than 87,000 more homes registered.

The next update to the rating systems (LEED v4) will incorporate a wider range of building types and manufacturing industries, delivering the benefits of green building throughout the supply chain. It will advance environmental footprint issues like climate change, and encourage optimization of energy and water use.

The USGBC recently completed the fifth public comment period for the proposed update to its LEED Green Building program, LEED v4, allowing the building community to view the most recent draft of the rating system and provide comments on any substantive changes.

The next update to the rating systems (LEED v4) will incorporate a wider range of building types and manufacturing industries

LEED v4, when released in mid-2013, is expected to continue its push for energy efficiency, allocating nearly 20 per cent of points to optimizing energy performance and curbing CO2 emissions. This version will also add more market sectors, including data centres, warehouses, distribution, hospitality, mid-rise residential, and existing schools and retail. It is also expected to provide more options for projects outside the U.S., a step that many see as possibly making LEED the common denominator for sustainability around the globe.

As a result, the credit requirement changes in the proposed LEED v4 rating system are the most extensive in LEED's 12-year history.

Changes from the current version, LEED 2009, can be found in three major categories – new market sectors, increased technical rigour and streamlined services:

- New market sectors: data centres, warehouses and distribution centres, hospitality facilities (i.e., hotels), existing schools and existing retail, and LEED for Homes Mid-Rise.
- Increased technical rigour: revisions to credit weights, new credit categories focusing on integrated design, life cycle analysis of materials, and an increased emphasis on measurement and performance.
- Streamlined services: An improved LEED user experience that makes the LEED Online platform more intuitive and introduces tools to make the LEED documentation process more efficient.

Another change to LEED v4 is an improved user experience to make the certification review and documentation process more intuitive and efficient. A beta testing group made up of early adopters looking to pursue LEED v4 certification will vet the process, allowing project teams to try out the pre-ballot version with guided support from USGBC.

CISC is closely monitoring and assessing the impact that the new LEED v4 will have on our industry, and continues to actively advocate for the sustainability benefits of steel as a building material.

Tareq Ali is the National Marketing Manager at the Canadian Institute of Steel Construction (CISC).

Source: USGBC.

Directly applied fire protection materials for steel structures

A look at primers and coatings, standards for testing and inspection, and application and quality assurance

By Don Falconer, P.Eng.

A/D FIREFILM III thin film intumescent fire resistive material (TFIRM) on steel columns and bracing at Pearson International Airport, Terminal 1 (Courtesy of A/D Fire Protection Systems Inc.)

On March 15, 2012, the Canadian Institute of Steel Construction (CISC) held its 14th Associate Professional & Technical Members Meeting in Toronto. I was privileged to be part of a three-person panel presenting on the topic of "Fire Protection of Steel Structures." This article provides additional information about directly applied sprayed fire resistive materials, based on questions asked during and after the presentation. Topics include an introduction to fire-resistance rated structural steel; primers and existing coatings; specification considerations for thin-film intumescent fire-resistive materials; and standards for testing and inspection, application and quality assurance.

Canadian building codes utilize the concept of fire compartments made of fire separations in order to reduce the risk to life and property of fire in buildings. The level of fire resistance required for a particular fire separation or structural member is expressed in hours, or fractions of hours, such as ¾, 1, 1½, 2 and 3 hours, and generally relates to the level of risk associated with the type, and use and occupancy, of the building. Canadian building codes require the fire endurance ratings of floors, walls, roofs and structural members to be determined on the basis of the results of fire tests of representative assemblies, conducted in accordance with CAN/ULC-S101, *Standard Methods of Fire Endurance of Building Construction and Materials.*[i]

Structural steel must be protected from fire because its strength diminishes at elevated temperatures; by 600°C its strength is reduced by about half. For CAN/ULC-S101 tests of protection for structural steel columns, the limiting individual and sectional average steel temperature criteria are 649°C and 538°C respectively. For tests of loaded restrained beams or joists, the limiting individual and sectional average steel temperature criteria are 704°C and 593°C respectively, and the test specimen must have sustained the applied design load for the duration of the fire endurance period.

Cafco 300 sprayed fire resistive material (SFRM) applied to beams, joists and deck at Waypoint Centre for Mental Health Care (Courtesy of Cafco Industries Inc.)

Structural steel that is required to be fire-endurance rated may be protected by a number of methods. Two of the most common types of directly applied structural fire protection are: 1) conventional sprayed fire resistive materials (SFRM) and 2) thin film intumescent fire resistive materials (TFIRM). SFRMs are an economical method of structural fire protection available in a wide range of density and physical characteristics. TFIRMs provide an aesthetic, relatively thin, paint-like exposed steel finish.

Fire endurance design information is published in the Certification Directories of third party testing and certification agencies like Underwriters' Laboratories of Canada (ULC), Underwriters Laboratories Inc. (UL), and Intertek Testing Services (ITS). The design information is developed on a proprietary basis and for the most part indicates the precise nature and dimensions of the assemblies that were fire-tested. Generic fire endurance design information for non-proprietary fire protection materials, such as Type X gypsum board, masonry and concrete, may be sourced from a number of publications including Appendix D to the National Building Code of Canada and Supplementary Standard SB-2 in the Ontario Building Code.

Whether proprietary or generic information is being used, designers, suppliers, contractors and inspection agencies must understand that variations in the field from the published fire-resistance design information or from tested installation methods can affect performance and may compromise the ratings that have been assigned from the standard tests. Consideration of variations outside of the range of fire test design information requires careful engineering evaluation in the form of an Alternative Solution (or engineering judgment) to demonstrate that the intent and objectives of the building code requirements have been satisfied.

PRIMERS AND EXISTING COATINGS

Conventional SRFM

With few exceptions, the fire test design information published for SFRM has been developed from fire tests conducted on steel that was not primed prior to application of the SFRM. Therefore, structural steel that is intended to be protected with conventional gypsum or Portland cement-based SFRM should be free of primer and any other coating, except as permitted in the listing information and SFRM manufacturer's application instructions.

Steel surfaces may be primed with UL Classified primers/paints, but at the time of this writing there is only one UL/ULC listed primer available.[ii] The listing is limited to any SFRM having a maximum average density of 312 kg/m^3 (19.5 pcf) for wide flange shaped columns and beams with maximum depth of 600 mm (24 in), and maximum width of 450 mm (18 in) and 300 mm (12 in) for columns and beams respectively.

In the field, the presence of an untested primer or coating on steel triggers certain measures in order to ensure the SFRM will remain in place during the life of the building or a fire. Those measures are described in ULC's Online Directory in the section titled, "New Requirements for the Use of Sprayed-Applied Fire-Resistive Materials on Primed Steel Surfaces." (*See article "New Requirements" on page 27.*)[iii]

As indicated in the ULC requirements, the presence of an untested primer or coating on steel surfaces that are intended to be protected by SFRM may necessitate field testing, the installation mechanical breaks of metal lath or studs and disks, or removal of the untested primer or existing coating. In all cases, the SFRM manufacturer should be consulted for recommendations.

TFIRM

Unlike SFRMs, fire tests for thin-film intumescent fire-resistive materials (TFIRMs) are usually conducted on steel that was primed prior to application of the coating. Therefore structural steel that is intended to be protected by a TFIRM must be primed with a compatible primer in accordance with the coating manufacturer's application instructions and the fire test design information.

For all projects, manufacturers of the specified intumescent fire-resistive coatings should be consulted for surface preparation and primer recommendations. The presence of an untested or incompatible primer is more problematic for intumescents than SFRMs because of the question of inter layer bonding during conditions of fire and because a mechanical bond cannot be provided to overcome the problem.

SPECIFICATION CONSIDERATIONS FOR TFIRM

The *Collins World English Dictionary* defines intumescence as, "the swelling of certain substances on heating, often accompanied by the escape of water vapour." When exposed to the heat of a fire, intumescent fire-resistive coatings intumesce, that is, they change from a thin paint-like coating to an insulating ash which provides an insulation layer between the steel and the fire. The ratio between the expanded and the original coating thickness is referred to as the expansion ratio. The expansion ratio is a product-specific characteristic and a function of the chemistry of the intumescent material. Expansion can be very dramatic during standard CAN/ULC-S101 fire exposures, with some products expanding up to 800 times their original dry-film thickness.

Successful performance during a CAN/ULC-S101 fire exposure depends not only on the insulating characteristics of the fire-resistive material but also upon its ability to remain in place, bonded to the steel, at all stages and following the intumescing process. This is no easy feat considering the turbulent environment typical of gas-fired CAN/ULC-S101 furnaces, and considering that load bearing test assemblies experience deflections as temperatures of the structural components increase. Therefore, it is very important that fire-resistive materials be properly tested in full-scale assemblies in accordance with CAN/ULC-S101, as required by Canadian building codes.

TFIRMs being specified and utilized to protect structural steel on projects should be ULC, cUL or ITS listed and certified. The fire-resistance design and listing information must clearly indicate the assembly was tested in accordance with CAN/ULC-S101. Note that:

- Underwriters Laboratories of Canada (ULC) listed TFIRMs are found in the ULC Online Directory under the category (CAVCC) Thin-Film Intumescent Coatings.

- TFIRMs listed by Underwriters Laboratories Inc. (ULI) for use in Canada (cUL) are listed in the UL Online Certifications Directory under the category (CDWZ7) Mastic and Intumescent Coatings Certified for Canada.[iv]

- TFIRMs listed by Intertek Testing Services (ITS) are listed in the Intertek Directory of Listed Products under the category, Roof/Ceiling, Floor/Ceiling, Beam & Column Assemblies. Under each design, "Evaluated to the following:" must include CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building Construction & Materials.[v]

Fire resistive materials versus fire retardant coatings

We continue to see coatings that have not been tested in accordance with CAN/ULC-S101, mistakenly being applied to structural steel where a fire rating is required and a fire-resistive material should have been applied. The consequences can be costly – the incorrect coating must be removed and the surface then properly prepared and primed to accommodate the TFIRM. Removal of the incorrect coating may require sandblasting. Common factors to this problem include having work done by contractors not experienced or trained in the application of SFRM or TFIRMs, and the incorrect use of fire retardant coatings where fire-resistive materials are required.

Fire retardant coatings are coatings that have been evaluated for their surface burning characteristics (flame spread and smoke developed values) when applied to various substrates and tested in accordance with CAN/ULC-S102, *Surface Burning Characteristics of Building Materials and Assemblies*.[vi] To qualify as a fire-retardant coating, the coating must reduce the flame spread of the substrate, such as Douglas Fir, by 50 per cent or to less than 50.[vii] There is no direct relationship between surface burning characteristics and fire resistance ratings – the benefits of low flame spread do not in any way satisfy the need for fire endurance ratings determined in accordance with CAN/ULC-S101.

STANDARDS FOR TESTING AND INSPECTION, APPLICATION, AND QUALITY ASSURANCE FOR SFRM AND TFIRM

For SFRM, the published fire-resistance design information specifies minimum steel sizes, and minimum thickness and dry density of fire-resistive material that is required for a particular hourly fire resistance rating. Similarly, minimum thickness (usually dry film thickness) and primer and topcoat requirements are specified in the fire test design information for TFIRMs. As a minimum, thickness and density of SFRM, and thickness of TFIRM, should be inspected by a third party on every project to ensure the required fire endurance rating has been provided.

Field testing and inspection standards

The following industry standards for field testing and inspection of SFRM and TFIRM are published by and available from the Association of the Wall and Ceiling Industries - International (AWCI), 803 West Broad St., Suite 600, Falls Church, VA 22046, Tel: 703-531-8300, www.awci.org, info@awci.org:

- Technical Manual 12-A, Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; an Annotated Guide; and

- Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

Quality assurance and application standards
The following industry standards for application and quality assurance of SFRM and TFIRM are published by and available from National Fireproofing Contractors Association, PO Box 1571, Westford, MA 01886 Tel: 866-250-4111, www.nfca-online.org, NFCA@NFCA-Online.com:

- NFCA 100 - Standard Practice For The Application of Spray-Applied Fire Resistive Materials (SFRMs);

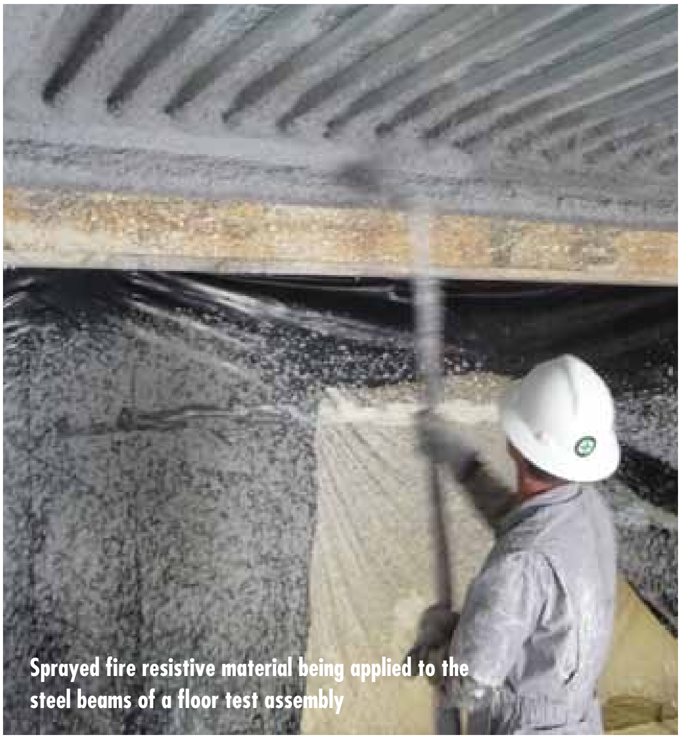
- NFCA 200 – Field Quality Assurance Procedure for Application of Spray-Applied Fire Resistive Materials (SFRMs);

- NFCA 300 - Standard Practice for the Application of Thin-Film Intumescent Fire-Resistive Materials (TFIFRM); and

- NFCA 400 – Field Quality Assurance Procedure for Application of Mastic and Thin-Film Intumescent Fire Resistive Coatings.

SUMMARY
With few exceptions, the fire test design information published for sprayed fire resistive materials (SFRM) is developed from fire tests conducted on steel that was not primed prior to application of the SFRM. Best practice dictates that surfaces of structural steel intended to receive SFRM should not be primed or coated. The presence of an untested primer or coating on the steel triggers ULC requirements for bond testing, dimensional limitations and mechanical breaks.

Fire tests for thin-film intumescent fire-resistive coatings (TFIRM) are generally conducted on primed steel. Structural steel that is intended to be protected by a TFIRM must be



Sprayed fire resistive material being applied to the steel beams of a floor test assembly

primed with a compatible primer in accordance with the fire test design information and the TFIRM manufacturer's application instructions.

Fire retardant coatings tested for surface burning characteristics do not provide fire resistance ratings for structural steel. It is critical that fire retardant coatings not be substituted for fire-resistive materials where fire endurance ratings are required. SFRM and TFIRM products must be applied by experienced commercial applicators that are trained and authorized by the product manufacturer.

As a minimum, thickness and density of SFRM, and thickness of TFIRM, should be inspected by a third party on every project, in accordance with the appropriate industry standards referenced in this article.

Floor test assembly curing

Floor test assembly after fire test in accordance with CAN/ULC-S101 (or ASTM E 119)

Don Falconer, P.Eng., is the President and owner of Falconer Engineering and Testing. He has more than 35 years experience in fire-protection and building construction. Contact: don@falconerengineering.com, 905-767-7752, www.falconerengineering.com.

For more information visit: www.cisc-icca.ca/resources/tech/fireprotection/SFRM/

Photos courtesy of Falconer Engineering and Testing

[i] Available from Underwriters' Laboratories of Canada, 7 Crouse Rd., Scarborough, ON M1R 3A9.

[ii] Underwriters Laboratories Inc. "CGJM.R21193, Primers for Structural Steel." *UL Online Certifications Directory*. 31 Aug. 2008. www.ul.com. 20 June 2012.

[iii] Underwriters' Laboratories of Canada. "BXUVC.GuideInfo, Fire Resistance Ratings, New Requirements for the Use of Sprayed-Applied Fire-Resistive Materials on Primed Steel Surfaces." *ULC Online Directories*. 10 Jan. 2012. www.ul.com. 20 June 2012.

[iv] Underwriters Laboratories Inc. " CDWZ7, Mastic and Intumescent Coatings Certified for Canada." *UL Online Certifications Directory*. 30 Nov. 2009. www.ul.com. 20 June 2012.

[v] Intertek Group plc. " Roof/Ceiling, Floor/Ceiling, Beam & Column Assemblies." *Intertek Directory of Listed Products*. 2010. http://etlwhidirectory.etlsemko.com/.... 20 June 2012.

[vi] Available from Underwriters' Laboratories of Canada, 7 Crouse Rd., Scarborough, ON M1R 3A9.

[vii] Underwriters' Laboratories of Canada. "BMQXC.GuideInfo, Coatings, Fire Retardant." *ULC Online Directories*. 16 Sept. 2008. www.ul.com. 20 June 2012.

New requirements

What is now required for the use of sprayed-applied fire-resistive materials on primed steel surfaces

By Don Falconer, P.Eng.

The surfaces on which the material is intended to be applied must be free of dirt, oil and loose scale. Surfaces may be primed with UL Classified primers/paints covered under Primers for Structural Steel (CGJM).

The following method of determining the bond strength of the spray-applied materials only applies to primers or paints not covered under Primers for Structural Steel (CGJM). Unless specifically prohibited in a design, materials identified as Spray-Applied Fire-resistive Materials (CHPXC) may be applied to primed or similarly painted wide-flange steel shapes and pipe and tube-shaped columns, provided:

A) The beam flange width does not exceed 305 mm;

B) The column flange width does not exceed 406 mm;

C) The beam or column web depth does not exceed 406 mm;

D) The pipe outer diameter or tube width does not exceed 305 mm; and

E) Bond tests conducted in accordance with ANSI/ASTM E736, "Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials (SFRM) Applied to Structural Members," should indicate a minimum average bond strength of 80 per cent and a minimum individual bond strength of 50 per cent when compared to the bond strength of the fire-resistive coating as applied to clean uncoated 3.2 mm thick steel plate. The average and minimum bond strength values should be determined based upon a minimum of five bond tests conducted in accordance with ANSI/ASTM E736.

The bond tests need only be conducted when the fire-resistive coating is applied to a primed or similarly painted surface for which acceptable bond strength performance between the primer or other similar material and the fire-resistive coating has not been measured. A bonding agent may be applied to the primed or similarly painted surface to obtain the minimum required bond strength where the bond strengths are found to be below the minimum acceptable values.

As an alternative to the bond test conducted on control samples applied to an uncoated steel plate, the following method may be used for unknown coatings in existing structures. Sections of painted steel are to be coated with a bonding agent compatible with the sprayed material being used on the project. The treated and untreated substrates should be coated with material, cured and subjected to five bond tests each, in accordance with ANSI/ASTM E736. If the failure mode of the sections treated with the bonding agent is 100 per cent cohesive in nature, it will be acceptable to use this bond test value as the control bond strength. The value obtained on the untreated painted section should be compared to the control value using the minimum 80 per cent average, 50 per cent individual bond strength acceptance criteria established in ANSI/ASTM E736.

If condition E) is not met, a mechanical bond may be obtained by wrapping the structural member with expanded metal lath (minimum 0.927 kg/m^2).

If any of the conditions specified in A), B), C) or D) are not met, a mechanical break should be provided. A mechanical break may be provided by mechanically fastening one or more minimum 0.927 Kg/m^2 metal lath

The average and minimum bond strength values should be determined based upon a minimum of five bond tests conducted in accordance with ANSI/ASTM E736

strips to the flange, web or tube and pipe surface either by weld, screw or powder-actuated fasteners, on maximum 305 mm centres, on each longitudinal edge of the strip, so that the clear spans do not exceed the limits established in conditions A), B), C) or D) as appropriate. No less than 25 per cent of the width of the oversize flange or web element should be covered by the metal lath. No strip of metal lath should be less than 90 mm wide.

As an alternative to metal lath, the mechanical break may be provided by the use of minimum 2.5 mm steel studs with minimum 0.36 mm galvanized steel disks if such a system is described in a specific design (usually bottomless trench in an electrified floor design) for the fire-resistive coating being applied. The studs should be welded to the oversize element in rows such that the maximum clear span conforms to conditions A), B), C) or D) as appropriate. The spacing of studs along each row should not exceed 610 mm and a minimum one stud per 0.165 m^2 should be provided.

Where metal lath strips or steel studs and disks are used, acceptable bond strength as described in item E) should also be provided. A bonding agent may be applied to the painted surface to obtain the required minimum bond strength where bond strengths to a painted surface are found to be below minimum acceptable values.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2012 Steel Structures Education Foundation Program Update

A review of the 2012 SSEF award and research grant recipients

By Maura Lecce

2012 G.J. Jackson Memorial Fellowship Award

The G. J. Jackson Fellowship is awarded annually by the Steel Structures Education Foundation in memory of the late Geoffrey Jackson. Jackson was, for many years, a leader in the Canadian structural steel fabrication industry and a founding member of the Steel Structures Education Foundation.

The award is presented to Canadian engineering students conducting graduate studies in structural engineering, with major emphasis on steel structures. This prestigious award is currently valued at $20,000 over a one-year period. This award is presented at the Annual SSEF – CISC Convention and commemorated with the Geoffrey J. Jackson Memorial Certificate.

The 2012 Jackson Fellowship recipient is Rafiqul Haque, a Ph.D. student who is studying at the University of British Columbia under the supervision of Dr. Shahira Alam. Haque was presented with the award this past June in Ottawa.

Rafiqul Haque (left) presented with his award by Stig Skarborn, Chair of the SSEF G.J. Jackson Fellowship Committee

The main goal of Haque's research is to develop guidelines for the seismic design of industrial rack clad buildings (RCB). **In this type of structure, the steel storage racks are the building structure supporting the roof and exterior cladding, and resisting both gravity and lateral loads.**

Information about the Jackson Fellowship can be found on the SSEF website at www.ssef-ffca.ca/scholarships/jackson.

2012 SSEF University Research Grants

The SSEF has been actively promoting research on topics that are considered to be of interest and importance to the steel industry since 1995. University research grant applications are reviewed and ranked by the SSEF and, at the discretion of the SSEF, are awarded to full-time members of engineering faculties of Canadian universities for a one-year period. The total value of grants awarded in 2012 was $99,300. The principal researcher of the top-ranked SSEF university research grant applications is also awarded the H. A. Krentz Award.

The 2012 grant recipients and topics include Dr. Mark Gorgolewski, "Life cycle assessment of steel-framed, multi-unit residential construction"; Dr. Robert Driver, "Development of generalized design procedures for steel extended shear tab connections"; Dr. Siegfried Stiemer, "Hybrid (steel-frame/timber in-fill walls) design for mid-rise hybrid systems"; Dr. Yanglin Gong, "Shear tab to hollow structural section column connections"; Dr. Tony T.Y. Yang "Development of high performance sustainable steel truss frames for seismic applications"; and Dr. Dimitrios Lignos (in collaboration with Drs. Robert Tremblay and Charles-Philippe Lamarche), "Dynamic stability of steel columns subjected to seismic loading." Information about these research topics, as well as those from previous grant years, can be found on the SSEF website.

Suggestions for research topics can be made by completing the SSEF Research Topic Suggestion Form found on the SSEF website at www.ssef-ffca.ca/research.

2012 H.A. Krentz Award

The H.A. Krentz Award recognizes a researcher whose research topic has special merit and interest, with promise that it will make a significant contribution to understanding the behaviour of steel structures, or advances in the economy, safety or reliability of steel structures. A gift of $5,000 is part of this notable award.

The 2012 H.A. Krentz Award was awarded to Dr. Mark Gorgolewski, Professor and Program Director for the graduate program in Building Science, Department of Architectural Science at Ryerson University. The SSEF awarded Dr. Gorgolewski a grant of $15,000 for his research on life cycle assessment of steel-framed, multi-unit residential construction.

Dr. Mark Gorgolewski (left) presented with his award by Mike Engestrom, Chair of the University Research Committee

Dr. Mark Gorgolewski, B.Sc., M.Sc., Ph.D., DIP ARCH, LEED AP, has worked for many years as an architect, researcher and environmental consultant to the construction industry. He has published many books, articles and papers on issues concerning sustainable design. He is a Director of the Canada Green Building Council and past Chair of the Association for Environment Conscious Building in the U.K. His research includes sustainable housing, reuse of resources, urban agriculture and the design of cities. He was coordinator for one of the winning teams in the CMHC Equilibrium (net zero energy) Housing Competition and co-recipient of the 2007-2008 ACSA/AIA Housing Design Education Award. Most recently, he has been curator and author of the Carrot City exhibition and book.

2012 National Student Steel Bridge Competition

CISC and SSEF are proud sponsors of the ASCE/AISC National Student Steel Bridge Competition (NSSBC). The competition requires civil engineering students to design, fabricate and construct a steel bridge and encourages them to apply their theoretical knowledge in a hands-on project that addresses the full breadth of steel design requirements, including: aesthetics, speed of erection, lightness, stiffness, economy and efficiency.

The 2012 NSSBC was held May 25 to 26 at Clemson University, Clemson, South Carolina. A total of 47 teams qualified for the national level competition, including three teams from Canadian institutions: Lakehead University, École de Technologie Supérieure and Université Laval.

This year, the team from University of California, Berkeley, placed first overall. Second and third places were earned by teams from Massachusetts Institute of Technology and California Polytechnic State University, respectively. Canadian participants demonstrated good effort at the competition and Lakehead University placed 11th overall, École de Technologie Supérieure placed 19th overall and Université Laval placed 37th overall.

The 2013 NSSBC will be held at the University of Washington, Seattle, Washington, from May 31 to June 1. For more information about the Student Steel Bridge Competition, including detailed competition results of Canadian participants, please visit the SSEF website at www.ssef-ffca.ca/competitions/asce-aisc.

2012 Architectural Student Design Competition

Since it was announced in 2001, the Architectural Student Design Competition has encouraged architectural students to consult with experts, engineers and fabricators to arrive at a true understanding of the structural design and detailing requirements of a steel structure – taking the study of steel beyond the technical and into the realm of supposed application, and arriving at a meaningful realization of architectural ideas. Eligibility for this competition is limited to students registered in professional architectural programs in Canada.

Submissions for this competition are examined by a panel of judges, which includes an architectural educator, a practising architect, a consulting structural engineer and a structural steel fabricator. The top three submissions receive awards.

The 2012 competition challenged students to include the theme of "Recycle" in their designs (see also www.ssef-ffca.ca/competitions/ssef/2012). They were to conceptualize, and realize in detail, a structure that explores the theme of "Recycle" with emphasis on the architectural exploration through form and material and on the essential relationship between architecture and structure. Students were required to include buildable details, primarily using structural steel, and to collaborate with fabricators on those details.

Award winners

The awards were presented at the SSEF - CISC Annual Convention this past June in Ottawa. The award-winning submissions are featured on the SSEF website at www.ssef-ffca.ca/competitions/ssef/2012.

Award of Excellence

Edward Wang and Mark Weiyi Wang, University of Waterloo

Award of Excellence winners Edward Wang and Mark Weiyi Wang presented with their award by Loraine Fowlow, Associate Professor (Architecture Faculty), University of Calgary

Faculty Sponsors: Tammy Gaber and Mark Cichy

Edward and Mark were awarded $3,000 (to share) and the faculty sponsors were awarded $1,500 (to share).

Awards of Merit

Megan Fritzler, University of Calgary

Faculty Sponsor: Bradley Braun

Megan was awarded $2,000 and the faculty sponsor was awarded $1,000.

Jennifer Jiseon Lim and Nina Zhuoran Wang, University of Waterloo

Faculty Sponsors: Tammy Gaber & Mark Cichy

Jennifer and Nina were awarded $2,000 (to share) and the faculty sponsors were awarded $1,000 (to share).

Please visit the SSEF website to view the submissions of the top three award winners and to access information on the 2013 SSEF Architectural Design Competition, "Pop-UP" (www.ssef-ffca.ca/competitions/ssef).

The educational edge

CISC expands its accreditation offerings with two new courses

By Andrew Brooks

The recent addition of two new courses to the CISC Course Calendar – Connections II and Inspection of Steel Building Structures – reflects the organization's continuing work to expand its accreditation offerings, and to build the scope of its educational offerings to cover an increasing range of topics.

Connections II is the latest addition to CISC's accreditation program covering the design of steel connections, and builds upon the Connections I course already in place. Upon successful completion of the course, the student will be awarded CISC's Accredited Steel Connections Designer – Conventional Construction accreditation.

"On the connections side we've run a lot of courses, some targeted at consulting engineers, others at the steel industry," says David MacKinnon, P.Eng., Director of Training at CISC. "The Connections I course is the preliminary to Connections II, and it has been very successful. Connections II is the advanced level and the course you take in preparation for accreditation." The course will commence in the fall of 2013. Like Connections I, it will be offered in the form of a webinar, run in the evenings twice a week for 10 weeks, with a concluding final examination.

The course covers the design of steel connections, MacKinnon says. "This is on the steel fabrication side – it's principally for the fabrication engineers." As MacKinnon notes, every fabricator member of CISC must have an engineer as part of their staff or at least on retainer. These are the people who design the more complex connections required during construction, and they need to have an advanced understanding of how the components of a steel structure go together and how loads are transferred. To gain the accreditation, the student will need to score a minimum of 80 per cent on the final exam.

Both connections courses build on work originally done in French by fabrication engineer Marc Robitaille employed by Supermétal Structures Inc. in Quebec. Robitaille developed the original course material about 10 years ago. CISC translated the material into English, and then consulted with Royce Johnson, a fabrication engineer employed by Waiward Steel in Edmonton, to determine the set of qualifications that would be required for an accredited connection designer. "Royce was a big help for me," MacKinnon says. "He's played a very large part in developing the courses." Johnson will also be the instructor for the course.

Inspection course

The new "Inspection of Steel Building Structures" course is part of CISC's program for accreditation in the inspection of steel structures. Successful completion will lead to CISC's "Accredited Steel Inspector – Steel Structures/Buildings" accreditation. The course was developed after the success of a series of one-day steel inspection courses that CISC ran last year. That success persuaded CISC that there was a need for a more intensive and in-depth treatment of the subject matter.

"The inspection of steel structures is often done by people outside the steel industry – third-party inspectors, structural consultants, municipalities, owners, also some internal steel fabrication people, because they need to know what people will be looking for," MacKinnon says. All of these categories of professionals will benefit from the new course, as will others who aren't necessarily in the steel construction sector but are trying to expand their skill set to increase their employability.

"Across the country there's a great deal of variation in knowledge and application of specifications. We're launching this course as a way of trying to level that playing field across the country," says MacKinnon. The course will not only help people get hired in the industry, but will also give employers added assurance that new employees have the skills needed.

"Inspection is all over the map," MacKinnon says. "The people who wind up doing it can be very junior in an organization. It's a good way for them to learn, but it's also hard on the contractor who is being looked at. We want to make sure that even junior people doing the inspection have the necessary knowledge and skills." Basic college or university programs don't provide the specifics that inspectors need to know about in terms of how steel structures work, or the fabrication and erection processes. "We're there to start filling that gap," MacKinnon says.

The course is offered as a three-day in-class session with a half-day final examination. It will be offered initially in Vancouver, Toronto and Montreal, starting in January 2013. MacKinnon says that locations will be added later as demand increases. The instructor is Robert Shaw, whom MacKinnon describes as an advocate of good steel construction and inspection. Shaw works primarily in the U.S. but has extensive knowledge of Canadian codes and practices, and taught CISC's one-day inspection courses last year.

"We've developed a completely Canadian approach to training a steel inspector," MacKinnon says. "This course does not include the welding component. There are already certification programs in place for welding inspectors, and when they take this course they'll understand the whole structure, not just the welding."

Other likely candidates for the course include personnel from consulting engineering firms that do inspections, and third-party inspectors, who won't necessarily have the welding qualifications but will learn when they need to bring a certified welding inspector on a job. "A lot of the welding is being done in the shops, so that's where the welding inspection is being done," MacKinnon says. "In the field, inspectors are looking primarily at bolting."

Enrolment

As this went to press, neither Connections II nor Inspection of Steel Building Structures had opened for enrolment, but MacKinnon says the enrolment pool is definitely in place. "By the time we run Connections II we will have run two Connections I courses," he says. The graduates of those courses will feed into the new, more advanced course. The previous iteration of the course attracted 50 registrants, and MacKinnon projects that about half that number will sign up for Connections II. "Not everyone who takes Connections I needs or wants to follow up with level II. This is primarily for fabrication engineers, or designers who are at an advanced level."

Accreditation will take the pressure and uncertainty out of the training process, which in many cases has been handled at the fabricator level in the past. "Historically, a lot of people got trained at some of the larger fabricators that had had large engineering and drawing departments and could support training activities," MacKinnon says. "So people got trained there, and then later – not that the fabricator that trained them was happy about it – they entered other firms and spread out into the industry." Many of these well-trained staff wound up at midsized and smaller fabricators that couldn't run their own training programs and depended on what they could get from the programs run by larger firms.

Today, says MacKinnon, there are more small and midsized fabricators in the market than there were a decade or two ago. Accordingly, technical training is even more critical, which is one of the main motivators for CISC in taking on the job of offering training in fabrication skills.

"We hope to keep adding to this training, to help train new people and upgrade skills of existing staff," MacKinnon says. "We're trying to help steel fabrication companies do well in a competitive market."

2012 Quebec Steel Design Awards

The Quebec Design Awards for Steel Construction Gala was held on September 27, 2012, at the Palace Convention Centre, in Laval, Quebec. The dinner Gala was organized by the Quebec Regional Committee and Hellen Christodoulou, CISC Quebec Regional Manager. Master of ceremonies for the event was Sylvie Fréchette, Olympic medalist in synchronized swimming and former member of Cirque du Soleil.

The event was a huge success with hundreds of attendees, including fabricators, associate fabricators, suppliers, detailers, erectors, general contractors, engineers and engineering firm representatives, architects and architectural firm representatives, students, CISC-ICCA staff, and Ed Whalen, President of CISC-ICCA.

As the voice of the Canadian steel industry, CISC provides leadership and promotes design and construction that combines efficiency, quality and innovation. The Steel Design Awards offer a unique opportunity to showcase the outstanding work being done by Canadian steel industry professionals. This year, awards were presented in eight categories.

Montreal Rio Tinto Alcan Planetarium

GREEN BUILDINGS

Montreal Rio Tinto Alcan Planetarium

Owner: Ville de Montréal

Structural Engineer: SNC Lavalin Inc.

Fabricator: Mométal Structures Inc.

Architect: Consortium Cardin Ramirez Julien & Aedifica

General Contractor: Décarel

Draftsman: Mométal Structures Inc.

This natural science museum complex, the biggest in Canada, is a unique focal point that invites citizens to reconnect with nature and invent a new way of living. The use of steel proved to be essential in the design stages; in addition to being light, it offered more possibilities than any other material in producing this daring design. Steel turned out to be the ideal choice to meet the very specific requirements of the project and the site, blending in perfectly. The result is a LEED Platinum building – representing a first in institutional building in Canada – made up of daring shapes. LEED Platinum is the highest certification available in sustainable construction.

Lift Bridge No. 9 over the Chambly Canal

INDUSTRIAL PROJECTS/BRIDGES

Lift Bridge No. 9 over the Chambly Canal

Owner: Parks Canada Agency

Structural Engineer: GENIVAR Inc.

Fabricator: Stel-Bec Produits D'acier Ltée.

General Contractor: OPRON Construction Inc.

Draftsman: Genifab Inc.

Despite its modest dimensions, the construction of this bridge, with its steel design, required high precision calculations and major coordination among the main stakeholders. The new Bridge No. 9 was designed according to a bascule lifting principle that is unique in North America. It allows for construction of a bridge wider than the existing one within a more limited space. This type of structure requires great attention to detail in its design and construction. The bridge is supported on caisson piles and sheet-piles, forming what is commonly known as a "combined wall." The wall continues along the canal to guide the vessels approaching the bridge.

BC Place, Vancouver, BC

PROJECTS OUTSIDE QUEBEC

BC Place, Vancouver, BC

Owner: Province of British Columbia

Structural Engineer: Geiger Engineers

Fabricator: STRUCTAL-Heavy Steel Construction (Division of CANAM Group)

Architect: Stantec Inc.

General Contractor: PCL Constructors West Coast

Draftsman: Steltec Inc.

Draftsman: B.D. Structural Design Inc.

The opening and closing mechanism of this engineering marvel required 35 km of cables 12.7 cm in diameter. The entire cabling network is controlled by a compression ring (the central node) and it takes about 20 minutes to open and close the roof. When the roof is open, the retractable portion slips into a cupola-shaped garage developed under the central node, including walkways and stairs giving the maintenance personnel access to the mechanical system and the roof membrane. The roof frame's complex design required the fabrication of 17,000 tonnes of steel components.


Cap-Rouge Walkway

ARCHITECTURAL STAIRS/WALKWAYS

Cap-Rouge Walkway

Owner: Ville de Québec

Structural Engineer: BPR Bâtiment Inc.

Fabricator: CNSP Charland Inc.

Architect: ABCP Architecture

General Contractor: Construction BSL Inc.

Draftsman: BPR Bâtiment Inc.

This type of walkway was specially chosen to suit the uneven topography of the site. The steel parts forming the towers, the main trusses, the load transfer parts and the guardrails were selected with the objective of using steel components that are easily accessible on the market. The walkway's overall structure was carefully designed to optimize the efficiency of each part and each cable. The foundation members, laid on tubular steel piles, were also laid out optimally on the site to avoid disturbing the floral and aquatic environment of the shores.

ARTOPEX Sports Complex

COMMERCIAL/INSTITUTIONAL

ARTOPEX Sports Complex

Owner: Complexe Sportif Artopex

Structural Engineer: Lainco Inc.

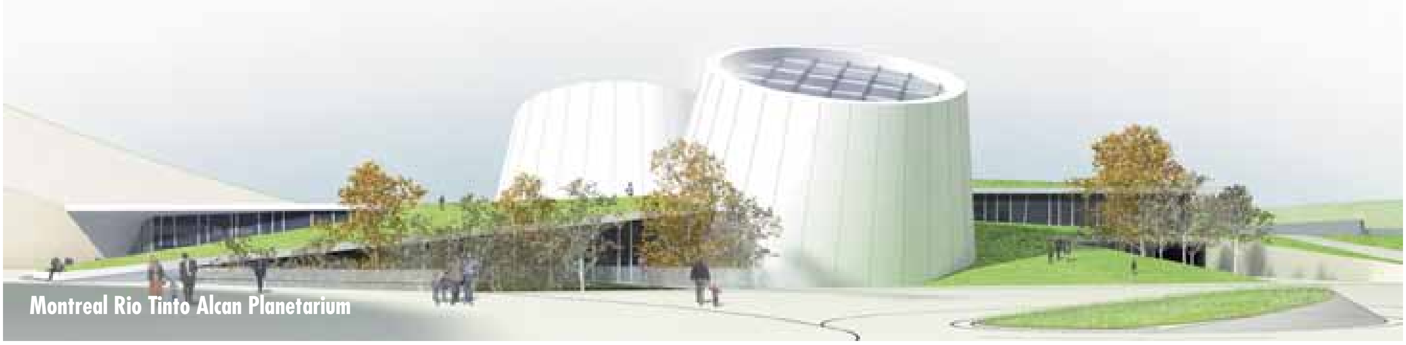
Fabricator: Lainco Inc.

Architect: Dany Langevin Architecte

General Contractor: Syscomax

Draftsman: Lainco Inc.

For this project, a steel structure was chosen for economic reasons and to reduce delays on the site. The main difference between this complex's metal frame and other indoor soccer stadiums is the steel structure supporting the roof. The original arched design of the roof trusses allows a height of 54 feet at the centre of the building, which offers players an impression of higher clearance than stadiums of traditional design.


Montreal Rio Tinto Alcan Planetarium

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Architect: Consortium Cardin Ramirez Julien & Aedifica

General Contractor: Décarel

Draftsman: Mométal Structures Inc.

With its Biodome, Insectarium and Botanical Gardens, the Montreal Planetarium forms a "Space for Life" – an attractive location that invites citizens to reconnect with nature and invent a new way of living. The use of steel proved essential in the design stages; in addition to being light, it offered many more possibilities than any other material to produce this daring design. Steel turned out to be the ideal choice to meet the very specific requirements of the project and the site, blending in perfectly. The result is a LEED Platinum building – representing a first in institutional building in Canada – made up of daring shapes. LEED Platinum is the highest certification available in sustainable construction.

Centre de Découverte Parc du Mont Tremblant

JURORS' FAVOURITE

Centre de Découverte Parc du Mont Tremblant

Owner: Société des établissements de plein air du Québec

Structural Engineer: CLA Experts Conseils Inc.

Architect: Smith Vigeant Architects

General Contractor: Construction Raynald Tisseur Inc.

Draftsman: Les Métaux Feral Inc.

With its daring irregular structural frame, varied roof sections with multiple crisscrossed slopes to integrate light wells, and a thin (12-inch) cantilever section more than 14 feet long, structural steel was greatly favoured as this building's material of choice. The optimum use of tubular steel and rolled steel allows lightness and minimal depth in the entire roof structure, while simplifying integration into the architectural requirements. The rigidity of the sections used for the columns and stringers maximizes the building's glassed-in space.

ContemPLAY Pavilion

YOUNG ARCHITECTS/ENGINEERS

ContemPLAY Pavilion

Award presented to members of the team: Hamza Alhbian, Simon Bastien, Justin Boulanger, Elisa Costa, Evguenia Chevtchenko, Nicolas Demers-Stoddart, Andrew Hruby, Olga Karpova, Shelley Ludman, Diandra Maselli, Courtney Posel, Dina Safonova, Dieter Toews, Sophie Wilkin

Participant: McGill University School of Architecture

Engineers: ARUP

Fabricator: CANAM Group

Fabricator: Proto Plus Précision

Supplier: Altitube Steel Inc.

Supplier: Corbec

The ContemPLAY Pavilion project is an excellent demonstration of the DRS program at Montreal's McGill University. The program allows students to integrate and synchronize contemporary architectural theories with tectonics. The project is part of the Community Design Workshop course offered to graduate students obtaining their master's degree in architecture at McGill University.

For performance and esthetic reasons, the project structure is a hybrid, composed of either steel or wood. Working with a hybrid structure allowed the creators to explore different materials and deepen their knowledge of the characteristics of each between the design phase and the fabrication phase. The structural strength of steel and its potential for manipulation and formal transformation correlated with the desired design.

A B.C. facility participating in SteelDay 2012

SteelDay 2012

Across the country, thousands of industry professionals and students attended CISC's annual SteelDay for a firsthand look at the steel trade

The CISC family of members and associates hosted yet another fabulous SteelDay on September 28, 2012!

With a variety of activities ranging from plant and shop tours to 3D modelling and virtual welding demonstrations, and even a steel column climbing challenge, attendees were treated to an exciting, informative and enjoyable day to tour and learn about the steel construction industry.

Many of the tours also ended with a bit of socializing over a barbecue lunch and/or refreshments, and some locations provided a memorable steel souvenir to their guests!

While measuring the success of SteelDay includes many qualitative and quantitative considerations, attendance numbers continue to be a key metric. This year was a resounding success, shattering last year's attendance record with nearly 3,000 attendees, and also a 30 per cent increase in the number of hosts to 37 hosts across the country. British Columbia led the charge with 735 attendees, closely followed by Alberta with 672 attendees.

We also ran a national SteelDay 2012 iPad promotion which brought some additional excitement to the event with random draws for five iPads for registered attendees.

Feedback from host organizations across the country reflects the value that SteelDay provides: an opportunity to host customers, consultants and the local community to showcase and promote your business, raise awareness of the performance and versatility of steel, and demonstrate the commitment and innovation of our industry.

We recognize that planning and hosting a successful SteelDay requires considerable time and resources, and we are once again very thankful to our generous hosts this year.

Congratulations to everyone, and to the winners of the CISC SteelDay 2012 iPad promotion:

Herb Moor – St. Catherines, Ontario
Winston Lowe – Regina, Saskatchewan
Scott Cordell – Edmonton, Alberta
Adam Revitt – Saskatoon, Saskatchewan
Vianney Bergeron – St-Celestin, Quebec

Mark your calendars for another successful SteelDay on October 4, 2013!

Below is a snapshot of SteelDay 2012 across the various CISC regions:

CISC SteelDay Alberta

Alberta offered a diverse selection of activities that were held across numerous facilities for SteelDay. Students, contractors, architects and engineers attended tours of plant facilities and fabrication shops and were treated to exciting welding, drafting and 3D modelling demonstrations. Students from the Northern Alberta Institute of Technology also participated in hands-on activities, including steel column climbing, and experienced a welding simulator in a virtual reality environment. Other specialized tours included visits to the modular yards. These presentations emphasized innovation in the construction industry while highlighting the automated processes and use of precision technology at each facility.


Local students participating in SteelDay Alberta


SteelDay in Alberta offered many exciting hands-on activities for students

Special thanks to all hosts of the region, including:

- Collins Industries Ltd., Edmonton
- NorthWest Fabricators Ltd., Athabasca
- Quality Fabricating & Supply, Edmonton
- Supreme Group, Acheson
- Supreme Steel Bridge Division, Edmonton
- TSE Steel Ltd, Calgary
- Vicwest, Edmonton
- Waiward Steel Fabricators Ltd., Edmonton

CISC SteelDay Atlantic

In Atlantic Canada, SteelDay hosts included fabricators, erectors, galvanizers and service centre locations in Nova Scotia and New Brunswick. Our hosts took the lead in organizing and promoting their events, and generated some great buzz about the steel industry. SteelDay guests encompassed a mix of trade school, community college and university students. They were provided with tours and presentations, experienced real-world health and safety requirements, and had opportunities to engage with and learn from a mix of industry leaders and professionals in the steel community.

Students in Alberta try their hand at one of many activities on offer

Special thanks to all hosts of the region including:

- Cherubini Metal Works Limited, Dartmouth
- G3 Galvanizing, Dartmouth
- Marid Industries Limited, Windsor Junction
- RKO Steel, Dartmouth
- Ocean Steel & Construction Ltd, Saint John
- Russel Metals, Saint John

CISC SteelDay Quebec

The Quebec Region held their Annual Steel Workshop/SteelDay events with participation in the hundreds. Exhibition kiosks were set up by fabricators, suppliers and other members in the main hall of the Palace Convention Centre in Laval. These kiosks showcased the versatility of steel and the steel industry's leadership and innovation to visiting engineers, architects, contractors, professors and students. Workshops

Attendees attend a cocktail reception at SteelDay in Quebec

Attendees at SteelDay in Quebec

were conducted throughout the day for all guests to participate in.

Special thanks to all hosts of the region, including:

- International Paint & DRYTEC, Terrebonne
- Sherwin-Williams & DRYTEC, Terrebonne

CISC SteelDay British Columbia

SteelDay hosts in British Columbia were keen to teach guests by conducting ongoing tours at their facilities. The "scrap car" with the heavy beam extending from it demonstrated the never-ending recyclability of steel and further highlighted steel as a sustainable construction material. Participants were more than willing to take a


One of many sites participating in SteelDay in British Columbia

few swings with sledgehammers to ready the car for the recycler. The investment of time and resources, along with the expertise, was increasingly apparent in the tour featuring the manufacturing of bolts. This helped the students relate to what they've already learned in school and they were able to take some samples home with them. An assortment of the past (forging demo) and the present (demo by Lincoln Electric and a 3D computer drafting demo), along with food and a gift of steel for each attendee, helped secure a successful turnout for SteelDay.

Special thanks to all hosts of the region, including:

- Al Industries, Surrey
- Canron Western Constructors LP, Annacis Island, Delta
- Corrcoat Services Inc., Surrey
- Custom Plate & Profiles A Division Of Samuel, Son & Co., Delta
- Dymin Steel Western, Abbotsford
- George Third & Son, Burnaby
- M&D Drafting, Surrey
- Macform Construction Group Ltd., Langley
- Pacific Bolt Manufacturing, New Westminster


A demonstration at SteelDay in B.C.

- Solid Rock Steel Fabricating Co. Ltd., Surrey
- Wilkinson Steel and Metals, Burnaby

CISC SteelDay Saskatchewan

SteelDay hosts in Saskatoon generated excitement for their events by inviting families of their employees to engage in the day's activities. Guests explored sophisticated systems through numerous plant tours that showcased the strength and versatility of structural steel in the construction industry. Overall, the hosts were pleased with the amount of participation and the guests took away indispensable knowledge of how steel is fabricated.

Special thanks to all hosts of the region, including:

- Provincial Galvanizing Ltd., Saskatoon
- Supreme Steel, Saskatoon
- Weldfab Ltd., Saskatoon

CISC SteelDay Ontario

This year, seven facilities in Ontario opened their shops to the public for SteelDay. Hosts showcased their various capabilities and technology by providing tours of the facilities for all attendees. Students as well as consultants from all over Ontario got an overview of the importance of structural steel construction. Buses were also arranged to pick up consultants throughout Toronto to ensure that they were able to attend the day's events. Overall, students and consultants were impressed by the state-of-the-art technology and the use of collaborative tools such as BIM and 3D Modelling


A scrap car in B.C. ready for the recycler

while gaining knowledge of best practices in the construction industry. The region will continue to work with members to expand the opportunity to provide tours of the facilities throughout the year.

Special thanks to all hosts of the region, including:

- ACL Steel Ltd., Kitchener
- Blastech, Brantford
- Pittsburgh Steel Group, Mississauga
- Samuel, Son & Co., Limited., Hamilton
- Tresman Steel Industries Ltd., Mississauga
- Vicwest, Hamilton
- Dymin Steel, Brampton

CISC SteelDay Manitoba

Quality vs. Quantity!

The Manitoba region enjoyed the increased volume of participants this year at SteelDay. Students from the University of Manitoba architecture and engineering departments, along with civil engineering students from Red River College, generated a large educational presence. Architects and engineers were most impressed with tubular laser and rolling demonstrations provided by the hosts as they were unaware of this advanced technology. As a result of the successful tours, the hosts have plans to continue to collaborate with educators to move forward and build upon the development of the region.

Special thanks to all hosts of the region including:

- Russel Metals Inc., Winnipeg

News and Events

Continuing Education Courses

Along with our ongoing calendar of courses, CISC is pleased to present two new English language courses in 2013 that lead to CISC Accreditation in a specific field. This is new for CISC and supports our commitment to quality steel construction. The three-day Inspection of Steel Building Structures course and exam leads to a CISC Accredited Steel Inspector – Steel Buildings qualification, and the Connections II course and exam leads to a CISC Accredited Steel Connections Designer – Conventional Construction qualification. An accreditation program for the inspection of steel bridges is under development.

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

Inspection of Steel Building Structures
– New Course and Accreditation Program –

This three-day, all-Canadian course will prepare inspectors, designers, building officials, fabricators, erectors and other specialists for the inspection of steel-framed buildings in the field. An optional three-hour final exam is conducted the morning of the fourth day to qualify as a CISC Accredited Steel Inspector – Steel Buildings.

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, erection and shop drawings for steel-framed buildings will be explained. Material identification, tolerances, bolting and welding processes and procedures will be reviewed. Included are OWSJ, floor and roof deck, shear studs, surface preparation and coatings.

Course Leader: Robert E. Shaw, Jr., PE, President, Steel Structures Technology Center, Inc.

Vancouver, BC	January 29 to February 1
Toronto, ON	February 5 to February 8
Montreal, QC (E)	February 12 to February 15

Connections I
– Online Course –

This course is the second in a three-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.

Course Leader:
Royce Johnson, Waiward Steel Fabricators Ltd.

Webinar Format (20@2hrs)
Tuesdays and Thursdays, 7:00 p.m. to 9:00 p.m. ET, starting March 5, 2013

Hot Topic Webinars
– Online Series –
This series of 1.5-hour webinars is intended to provide information on the most heavily discussed topics in the construction industry today, but not covered in any detail in continuing education courses. Guest speakers are subject matter specialists with the necessary knowledge and experience to provide insight and solutions.

The presenters define the problem, list the issues and positions, provide background information, explain regulatory requirements, use case studies to illustrate how they or others have dealt with the issues and provide references to additional resources.

Budget Pricing of Steel
January 23, 1:00 - 2:30 p.m. ET
Thor Gaul, TPG Enterprises Ltd.

Steel Design for Low Seismicity
May 22, 1:00 p.m. - 2:30 p.m. ET
Alfred Wong, CISC

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

Bolting: The purpose of this segment of the course is to provide the designer with the information necessary to select suitable high-strength bolts, specify the methods of their installation and inspection, and to understand the basis of the design rules in CSA S16.

Welding: This segment of the course covers welded joints, weld types, criteria for selecting weld types, matching and under-matching filler metal strength, and the procedures needed to determine welding capacity. Principles of welded connection design will be reviewed, along with case studies and solutions to field problems.

Course Leaders:
Peter C. Birkemoe, Ph.D., P.Eng., Professor Emeritus, University of Toronto
Yvon Sénéchal, Operations Manager, Quebec, CWB Group

Toronto, ON	April 30
Halifax, NS	May 1
Fredericton, NB	May 2
Regina, SK	May 14
Calgary, AB	May 15
Fort McMurray, AB	May 16

Changes to CSA S 16-09 & Steel Handbook Highlights
- Online Course -
This course covers the changes in CSA S16-09 and the design of steel members and elements using the recently published 10th Edition of the Handbook of Steel Construction. It is presented online in four two-hour sessions. Registration can include all four sessions with 0.8 CEUs awarded upon completion, or the CSA S16-09 session alone with 0.2 CEUs awarded upon completion. In addition, discounted bundles with the Handbook and CISC membership are available at registration.

Course Leaders:
David MacKinnon, CISC
Charles Albert, CISC

Webinar Format (4@2hrs)
June 5 - 6, 12:00 - 2:00 p.m. and 3:00 - 5:00 p.m. ET

Assemblages en acier pour ingénieurs concepteurs
Ce cours est concu pour offrir des conseils pratiques aux concepteurs et clarifier le role complementaire du fabricant et de l'ingenieur en structures pour la conception des assemblages. L'accent est place sur les assemblages et leurs consequences sur les couts et l'economie.

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

Les sujets abordes incluent les principales modifications a la norme S16-09, les boulons a haute resistance, 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 sieges, les assemblages au beton, les assemblages de poteaux, les assemblages rigides (profiles W et HSS), les assemblages de contreventements, les goussets et les assemblages de fermes.

Conferenciers:
Serge Dussault, M.Eng., ing., Vice-president, ingenierie, Groupe Canam
Danilo D'Aronco, M.Ing., ing., Associe et directeur de l'ingenierie, DPHV

Montréal, QC	12 avril
Québec, QC	13 avril

Conception parasismique des charpentes d'acier – *Cours Amélioré* –

Présenté en tandem avec le cours Assemblages sismiques pour bâtiments à charpentes en acier, ce cours a pour but d'aider à mieux comprendre la théorie de conception et les principes à la base des dispositions du Code, ainsi que l'application de certaines formules et exigences du Code. Il traite plus particulièrement de la conception de systèmes de résistance aux forces sismiques pour les bâtiments à charpente d'acier selon les exigences du Code national du bâtiment 2010 et des dispositions pertinentes de la norme CSA S16-09.

Plusieurs sujets nouveaux seront abordés, parmi lesquels refends ductiles, contreventements avec diagonales ductiles confinées et limites supérieures pour construction classique. Parmi les thèmes actualisés, citons les contreventements en tension seulement, les contreventements concentriques, les cadres à contreventements excentriques ductiles, les cadres résistants au moment de Type LD, les cadres résistants au moment ductiles, les charges théoriques, les effets et diaphragmes P Delta.

Assemblages parasismiques pour les charpentes d'acier – *Nouveau Cours* –

Présenté en tandem avec le cours Conception parasismique des charpentes d'acier, ce cours prépare les ingénieurs-conseils en structures et les ingénieurs de fabrication en acier au calcul des assemblages au sein de systèmes de résistance aux forces sismiques ductiles dans des bâtiments à charpente d'acier en vertu des exigences du Code national du bâtiment du Canada 2010 et de la Clause 27 de la norme CSA S16-09.

Les calculs par capacité, solidement établis dans la Clause 27 de la norme S16-09, ont révolutionné la conception, le détaillage et la construction des assemblages pour applications parasismiques. Ce cours donnera aux participants un aperçu des calculs détaillés des assemblages rigides traités dans la publication de l'ICCA intitulée « Moment Connections for Seismic Applications », des liens et des assemblages de contreventements dans des cadres à contreventements excentriques, des assemblages de contreventement en tension-compression, des assemblages de contreventements en tension seulement, et plus.

Conferenciers:
Robert Tremblay, Ph.D., ing., Professeur, École Polytechnique de Montréal
Danilo D'Aronco, M.Ing., ing., Associé et directeur de l'ingénierie, DPHV

	Conception parasismique	Assemblages parasismiques
Montréal, QC	9 mai	10 mai
Québec, QC	14 mai	15 mai

Conception de bâtiments industriels en acier

Ce cours permet de mieux comprendre la méthode de conception et le fondement des dispositions de code spécifiques aux bâtiments industriels à charpente d'acier. L'accent sera mis sur les solutions pratiques et économiques pour la charpente d'un bâtiment industriel type, conformément au Code national du bâtiment du Canada 2010 et aux dispositions pertinentes de la norme CSA-S16-01.

Conferenciers:
RichardVincent, ing., VP recherche, Groupe Canam Inc.
Julien Richard, M.Sc.A., ingénieur, Groupe Civil-Structure, Hatch

Montréal, QC	19 juin
Québec, QC	20 juin

Events

NASCC: The Steel Conference
April 17 - 20, 2013, St. Louis, Missouri
www.aisc.org/nascc

NASCC will be held in America's Center Convention Complex in St. Louis, Missouri. The show features more than 2,700 industry professionals – more than any other industry event of its kind. You can count on the Steel Conference to help you maintain a competitive edge.

New Members and Associates

The CISC Board of Directors elected the following organizations as new members and associates. Welcome all!

Fabricators
Hranco Industries Ltd.
Belair Fabrication Ltd.

Detailer
BBK Steel Detailing

Associate Fabricator
Ganawa Bridge Products and Services

Associate Suppliers
Transport Hervé Lemieux (1975)
AMEC Americas Limited Trail Office

Associate Builders/Stakeholders
Ontario Erectors Association

Associate Consulting Companies
Nouvell Autoroute 30 S.E.N.C
Poyry (Montreal) Inc.
GENIVAR inc.
Dessau inc.

Associate Professionals
Ian M. Kier, P. Eng.
Namvar Moazzami, P. Eng.
Lauchlin Smith, P. Eng.
Vassily Verganelakis, ing
Sinisa Pavlovic, P. Eng.
Edward H. Champman, P. Eng.
Keshava Arun Kumar, P. Eng.
Timothy P. Fraser, P. Eng.
Paul-Maurice LeBlanc, ing.
Vitomir M. Acimovic, P. Eng.
Ray T. Bailey, P. Eng.
Elie El-Chakieh, ing.
Michel Walsh, ing.
Michael Rakowski, PEO

Associate Technical
Roger Vino, Civil Engineer – EIT

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	S6S3-13	2013
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	S6.1S3-13	2013
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]	W59-13	2013
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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S Structural
P Platework
J Open-web Steel Joist

FABRICATOR
ATLANTIC

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www.cherubinigroup.com

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

Gerry's Welding & Fabrication Inc. B, S
St-John, NB 506-642-3704

Groupe Canam inc.
Moncton, NB 506-857-3164
www.canam.ws

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

Marid Industries Limited S
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www.marid.ns.ca

Modular Fabrication Inc.
Miramichi, NB 506-622-1907
www.modularfab.com

MQM Quality Manufacturing Ltd. P, S
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Ocean Steel & Construction Ltd. Br, P, S
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Spartan Steel S
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www.supermetal.com

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www.supermetal.com

Supreme Steel Ltd. [Edmonton]
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www.supremegroup.com

Supreme Steel LP., Bridge Division P, S
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www.trianglesteel.com

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www.tsesteel.com

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www.wfwelding.com

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www.whitemudgroup.ca

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www.belairfabrication.com

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www.canam.ws

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www.ismbc.ca

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www.samuel.com

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www.devoecoatings.com
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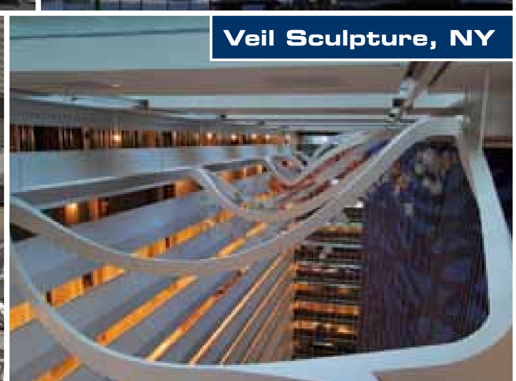

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