

## AIA REPORT

**Billings and Optimism are up, but so is Uncertainty**

Following the first reversal into negative territory in 10 months, in April, the Architecture Billings Index (ABI) bounced back in May, as reported by the American Institute of Architects (AIA) during its National Convention and Design Exposition in June in Denver. As a leading economic indicator of construction activity, the ABI reflects the approximate nine- to 12-month lag time between architecture billings and construction spending.

May ABI's score was 52.9, up dramatically from a mark of 48.6 in April. This score reflects an increase in demand for design services (any score above 50 indicates an increase in billings). The new projects inquiry index was 59.1, up slightly from the reading of 58.5 the previous month.

"This rebound is a good sign for the design and construction industry and hopefully means that April's negative dip was a blip rather than a sign of challenging times to come," said AIA chief economist, Kermit Baker, Ph.D., Hon. AIA. "But there is a resounding sense of uncertainty in the marketplace—from clients to investors and an overall lack of confidence in the general economy—that is continuing to act as a governor on the business development engine for architecture firms."

AISC exhibited at the AIA show, which attracted a lively turnout of approximately 16,000 attendees, according to show organizers.

"Optimism from attendees about the economy and the market seemed pretty high to me in conversations had at our booth and elsewhere," said Larry Flynn, AISC's industry marketing manager. "Housing—both MSR and single-family—were often identified as the hottest markets, as well as healthcare, and

higher education was said to be making a strong comeback from architects I visited with."

Traffic was brisk at the AISC booth this year, where curved steel was the main focus. A wide-flange curved steel sculpture provided by Chicago Metal Rolled Products was a big draw, spurring a lot of questions from architects, whose eyes would light up when they saw the sculpture. Questions usually began with: "Can you really bend steel like that?" Architecturally exposed structural steel (AESS) was another key area of interest. Both AESS and curved steel had architects commenting about the modern aesthetic that steel can bring to design, said Flynn.

During the show, AIA also issued a new report highlighting key trends in the architecture marketplace and their impact on business and growth. Key findings indicated stiffer competition in the design services marketplace is here to stay due to recession pressure; new markets and a growing base of talent for the A/E/C industry is due to the rise of emerging economies, including Brazil, Russia, India, China and South Africa; collaboration among design, engineering and construction disciplines is growing; an increasing push for measuring the effects and benefits of design strategies and providing building performance data; a rise in alternative and complementary services being offered by architecture firms; and a strong market for green products and design.

Next year's AIA show takes place June 26–28 in Chicago. For more information, visit <http://convention.aia.org/event/convention-home.aspx>.

**People and Firms**

- **John Zanieski** has become **EVRAZ North America's** executive vice president of the flat products and recycling groups. Zanieski, who joined EVRAZ in 2011 as president of recycling, will oversee commercial and manufacturing operations for the groups across the U.S. and Canada.
- **Victor Technologies** has launched two contests as part of its celebration of the 100th anniversary of its Victor brand of cutting and gas control equipment. The "A Cut Above" contest is open to students in cutting, welding and related programs at secondary and post-secondary schools, while the "Show Us Your Innovations" 2014 calendar contest will present awards for the best photos and associated captions using any Victor or Victor Thermal Dynamics cutting equipment. Both contests run through September, with winners announced at the Victor Technologies booth at the FABTECH 2013 Expo in Chicago. Visit [www.victortechnologies.com](http://www.victortechnologies.com).
- **Douglas Steel** (AISC member, certified fabricator and advanced certified steel erector) has been awarded the top safety award from the **Associated General Contractors (AGC) of Michigan, The Association of Union Contractors (TAUC), the Central Fabricator's Association (CFA) and AISC** for the second consecutive year in recognition of its fabrication plant and erection division receiving a 2012 DART (Days Away, Restricted or Transferred) rate of 0.00.

## BRIDGES

## Replacement Spans up for Skagit River Bridge

Acrow Bridge (an AISC member), a bridge engineering and supply company, has provided the Washington State Department of Transportation (WSDOT) with two prefabricated modular steel bridges, which are being used side-by-side to replace the damaged section of the Interstate 5 bridge that collapsed into the Skagit River in May when it was struck by a truck with an oversized load.

The temporary spans will allow traffic to safely resume on the bridge while a permanent span is built. WSDOT reopened the Skagit River Bridge last month, less than four weeks after the collapse.

“Prefabricated modular steel bridges are used all over the country to transport heavy traffic as permanent structures or temporary detour bridges,” said Bill Killeen, president and CEO of Acrow Bridge. “Their design allows for fast customization, assembly and installation, which is critical

in situations where safe passage and access need to be restored quickly.”

The Federal Highway Administration (FHWA) advocates the use of prefabricated modular systems because they offer significant time and cost savings, safety benefits, environmental advantages and convenience for travelers.

The two Acrow bridges that are being used on the Skagit River Bridge are each 160 ft long, with roadway widths of 24 ft. The bridges are positioned next to each other to support four

lanes of interstate highway traffic. Acrow used some of its \$30 million in inventory from its yards in Camas, Wash., and Lafayette, N.J., to supply these two bridges. Acrow’s offices in Camas and Vancouver, B.C., oversaw the temporary bridge span installation.



Courtesy of Acrow Bridge

▲ The Skagit River Bridge reopened less than a month after its collapse.

## COMPETITIONS

## Steel Sculpture Competition Entries Due Sept. 13

Make your structural steel visions come to life! How? By entering AISC’s third annual Steel Sculpture Competition!

If you’re an AISC full or associate member, enter this year’s competition and create your own innovative steel sculpture for a chance to have your company featured in *MSC* and more.

Here are the rules:

- ▶ The sculpture must be steel (and only steel), but shapes, sizes and steel type can be your personal preference.
- ▶ The sculpture must be made entirely by your staff.
- ▶ The finished sculpture must fit in a 2-ft by 2-ft by 2-ft box (for shipping purposes).
- ▶ All entries must include a title and the name of the company submitting the project.
- ▶ There’s no theme! But keep in mind the characteristics of steel: adaptable, economical, quick and sustainable.

Submit photos of your sculpture by

September 13, 2013 to AISC’s Jenny McDonald at [mcdonald@aisc.org](mailto:mcdonald@aisc.org).

From September 16–27, all entries will be posted to AISC’s Facebook page ([www.facebook.com/AISC-dotORG](http://www.facebook.com/AISC-dotORG)) where they’ll be voted on by fans. The top five finalists will be put on display at the 2014 NASCC: The Steel Conference, March 26–29 in Toronto, where the ultimate winner will be chosen by attendees. The winner will also be featured in *MSC* and receive a catered lunch for their company.

The competition is part of SteelDay, the structural steel industry’s largest educational and networking event, held nationwide. It’s scheduled for October 4 this year; mark your calendars! If you’re interested in hosting or attending an event, visit [www.steelday.org](http://www.steelday.org). Learn more about the competition at [www.steelday.org/sculpturecomp](http://www.steelday.org/sculpturecomp) and read about this year’s winner in the June issue of *MSC* (“No Blues in St. Louis”).

## IN MEMORIAM

## Ira Hooper Dies at 93

Ira Hooper, P.E., a former vice president and chief structural engineer with STV, passed away last month at the age of 93.

Hooper joined STV’s oldest predecessor firm, Seelye Stevenson Value & Knecht, in 1946. During the course of his 56-year career there, he became one of the country’s most widely respected structural engineers.

In 1985, Hooper received the Special Citation Award from AISC (a precursor to the Special Achievement Award). Three years later the Metropolitan Section of the American Society of Civil Engineers named him Engineer of the Year.

Hooper retired from STV in 2005 but continued to be a presence in the office to mentor staff and consult on special projects.

He is survived by his wife of 66 years, Sally Lebofsky Hooper.



## GALVANIZING

**AGA Announces Galvanizing Award Winners**

The American Galvanizers Association (AGA) recently announced the winners of the 2013 Excellence in Hot-Dip Galvanizing Awards. More than 120 projects were submitted, representing a variety of applications of hot-dip galvanizing. All of the projects were judged online by a panel of architects and engineers.

This year's highest honor, Most Distinguished, was given to the U.S. Department of Energy's National

Renewable Energy Laboratory (NREL) parking garage in Golden, Colo. The solar-powered garage required a maintenance-free coating that would last 50 years or more, making galvanizing the optimum choice for corrosion protection. Nearby, Denver Zoo's state-of-the-art Toyota Elephant Passage took home the Recreation and Entertainment award. The Artistic category winner was The Devil's Lake Creature at Regatta Grounds Park in Lincoln City, Ore. A duplex system

was specified for this year's Lifetime Achievement award, which went to the Franklin Park Conservatory Ameriflora in Columbus, Ohio. The 80,000 sq.-ft expansion and renovation project was originally completed in 1992 and served as an example of the longevity and superior corrosion protection provided by paint over hot-dip galvanized steel.

All submitted projects and winners are featured in the AGA Project Gallery at [www.galvanizeit.org/project-gallery](http://www.galvanizeit.org/project-gallery).

## PUBLICATIONS

**Companion Materials for *Manual* Updated**

The Design Examples and Shapes Database material, both resources for use with the 14th Edition AISC *Steel Construction Manual*, have been updated.

Version 14.1 of the Design Examples can be found at [www.aisc.org/designexamples](http://www.aisc.org/designexamples). The PDF includes more than 160 examples illustrating the application of both the 2010 AISC *Specification for Structural Steel Buildings* and the tables in the 14th Edition AISC *Steel Construction*

*Manual*. This update includes six new examples demonstrating use of some of the provisions in AISC *Specification* Appendix 6, Stability Bracing for Columns and Beams and a new example applying the Chapter E provisions for eccentrically loaded single angles in compression.

The updated AISC Shapes Database V14.1 can be found at [www.aisc.org/shapesdatabase](http://www.aisc.org/shapesdatabase). It includes most of the dimensions and properties of the

shapes listed in Part 1 of the *Manual*. One improvement worth noting is the addition of single-angle dimensions  $w_a$ ,  $w_b$ ,  $w_c$ ,  $z_a$ ,  $z_b$  and  $z$ ; these dimensions are used to determine the section modulus about various points on a single angle. Also, the width-to-thickness ratio and section dimensions for square and rectangular HSS were redefined in a consistent manner. See the readme file for Shapes Database V14.1 for specific details of all changes.

## PROJECTS

**Early Completion for Cleveland Convention Center**

Turner Construction Company recently announced the early completion of the \$465 million Global Center for Health Innovation and Cleveland Convention Center building program; completed three months ahead of the original schedule and millions under budget.

About 12,200 tons of structural steel went into the project. Schuff Steel (an AISC member and AISC certified fabricator) coordinated the fabrication of the \$40 million contract across 15 plants in the U.S., including two of its own.

To coordinate a project of this size and scope at a busy downtown site, Turner worked closely with the property owner, Merchandise Mart Properties Inc., as well as 168 local SBE contractors.

"Turner was able to complete this project ahead of schedule because of

our collaboration with MMPI and other partners," said John Dewine, construction project executive at Turner. "By working together with local contractors and using technology like BIM, we were able to identify creative ways to save time and money."

The project broke ground in January of 2011 and was completed in June. Covering 14.6 acres in downtown Cleveland, the facility spans more than one million sq. ft. The Global Center for Health Innovation fills 235,000 sq. ft with showroom, ballroom and retail space. The Cleveland Convention Center, at 767,000 sq. ft underground, features exhibit halls, flexible meeting rooms and column-free ballroom space.

During the first 12 months of the project, almost 99% of the demolition material was recycled as was more than 2,600 cubic yards of construction

waste. While the initial goal was to be 20% more energy efficient than baseline, the project is currently at nearly 30% above baseline and is pursuing LEED Silver certification.

The Cleveland Convention Center recently opened for its first event, and the Global Center for Health Innovation will host its first event in October. To learn more about the project, visit [www.clevelandmedicalmart.com](http://www.clevelandmedicalmart.com).



## Engineering Journal Q3 Now Online

The Third Quarter 2013 issue of *Engineering Journal* is now available online. Papers in E7 Q3 include:

► **A Simplified Approach for Joist Girder Moment Frame Design Using Equivalent Beam Theory**

*Phillip A. Knodel, Andrea E. Surovek and Joseph J. Pote*

The design of building structures has become a highly automated, computer-based process in which designers depend on the capabilities of commercial software for member strength checks and determination of deflections, drifts and member weights. Most commercial structural design software packages allow the user to build custom beam tables. The use of custom beam tables for joist girders requires the application of equivalent beam theory (EBT). Using EBT, section properties are determined in such a way that joist girder limit states are appropriately captured by strength checks employed by the software. By building custom beam tables, representing approximations of joist girders based on typical available chord sizes and typical ratios of weights, appropriate joist girder section properties can be estimated from almost any commercial structural software program. This paper presents the methodology for developing approximate section properties for steel joist girders that allow commercial software results to closely compare to joist manufacturer's designs.

**Keywords:** joist girder, beam theory, steel joist design

► **Stability Design of Cross-Bracing Systems for Frames**

*Eric M. Lui and Xiaoran Zhang*

In this study, the inelastic load-carrying capacity of the compression diagonal of a typical cross-bracing system used in concentrically braced frames under gravity and wind loads is investigated, taking into consideration its interaction effect with the tension diagonal. Depending on the lateral stiffness of the tension diagonal, the compression diagonal can be fully or partially braced by the tension diagonal at their intersection point. An expression for the transition lateral stiffness,  $k_{sp}$ , that demarcates the fully and partially braced conditions is derived. When the compression diagonal is fully braced, its maximum load-carrying

capacity is a function of its member slenderness,  $L/r$ , only. However, when the compression diagonal is partially braced, its load capacity is dependent upon both its member slenderness,  $L/r$ , and the lateral stiffness,  $k_s$ , of the tension diagonal. Once the equations for the maximum load-carrying capacity of the compression diagonal are established, design guidelines are proposed and design examples are given to demonstrate how the proposed guidelines can be used for the design of cross-bracing systems in steel frames. The consideration of the lateral bracing effect will result in a more economical and logical design for such bracing systems.

**Keywords:** cross-bracing systems, steel frames, inelastic analysis, stability design

► **Notes on the Nodal and Relative Lateral Stability Bracing Requirements of AISC 360**

*Louis F. Geschwindner and Andres Lepage*

The requirements for stability bracing of columns and beams have been included in AISC specifications since 1999. These requirements are intended to permit properly braced columns and beams to attain the buckling strength of the member as if braced by immovable supports and thus be designed as braced members according to the requirements of the *Specification*. The *Specification* addresses lateral stability bracing of columns and beams and torsional stability bracing of beams. This paper will address only the requirements for lateral stability bracing.

Although these requirements appear to be fairly straightforward, one question is regularly asked by those trying to put them into practice: What is the difference between "nodal" and "relative" bracing? This paper looks at the background of the provisions, describes how they have been obtained from the theoretical equations and then suggests how best to distinguish between these "nodal" and "relative" braces. It also shows that the approach taken by the *Specification* is safe and permits simple rules to be applied to a wide range of bracing problems. In addition, recommendations are made for revision of the requirements.

**Keywords:** beam bracing, column bracing, brace force, brace stiffness, lateral bracing

► **A Flexibility-Based Formulation for the Design of Continuity Plates in Steel Special Moment Frames**

*Andy T. Tran, Patrick M. Hassett and Chia-Ming Uang*

This paper introduces a rational approach for the design of continuity plates and associated welds in steel special moment frame (SMF) connections. The current AISC *Seismic Provisions* require welds attaching continuity plates to develop the full strength of the plate, resulting in the need to use complete-joint-penetration (CJP) groove welds. The combination of continuity plate thickness requirements, welding process and weld inspection often leads to costly detailing that may be overly conservative. The proposed design procedure, which is based on the relative flexibility between the column flange and continuity plate, aims to quantify the seismic force demand on continuity plates, thus allowing designers to efficiently size both the continuity plate thickness and the associated welded joints. In addition, the design procedure may allow the use of fillet welds or partial-joint-penetration groove welds as opposed to CJP welds, leading to a more economical design and fabrication. Formulation of the design procedure through analytical studies, including finite element analysis, is outlined.

**Keywords:** special moment frame, continuity plate, relative flexibility, RBS, WUF-W

### PROJECTS

## One World Trade Center Tallest in the U.S.

With the erection of One World Trade Center's spire, the building is now the tallest building in the Western Hemisphere and the third-tallest in the world, standing at a symbolic 1,776 ft high.

Eighteen barrel-shaped sections of steel make up the tower's spire, which weighs nearly 760 tons and will function as a world-class broadcast antenna.

One WTC is set to open in 2014. More information on its construction progress, as well as photos and video, can be found at [www.panynj.gov/wtcprogress](http://www.panynj.gov/wtcprogress).