Modern Steel Construction

March 2021

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISC
FOUNDED 1921


NEACH
PEDDI XDM-630 PROCESSING POWER
RYZA GARBACZ
Managing Director
“The Peddi XDM-630 has increased our production by 30%. By implementing layout marking, NEACH reduced project schedule times by 2-3 weeks on a 12 week schedule. We now have better quality and increased schedule flexibility, which means more customers. There’s no more profile outsourcing as we can rely on ourselves to meet project deadlines. I know my exact hourly machine cost, which is driving my profit margin as well.”
-RYZA GARBACZ
THE PEDDI XDM-630
Peddinghaus
STRONGER THAN STEEL®
www.peddinghaus.com | info@peddinghaus.com | (815) 937-3800


Why let different stand in the way of better?
Tekla Structures's New Offering
Simple, Easy, Flexible!
BIM structural software that allows architectural innovation to flourish - and industrial power plants to double as cascading ski slopes.
It's more than change, it's progress.
Find out more at Tekla.com
Tekla®
A Trimble Solution
CopenHill
Spectacular and different in the true sense of the words. That's CopenHill – an artificial ski slope and recreational hiking area opened in the fall of 2019, built on top of a new waste management center.

Modern Steel Construction

March 2021

in every issue

features

columns

ON THE COVER: One Vanderbilt reaches for the clouds from its high-profile base in Midtown Manhattan, p. 24. (Photo: SL Green/Max Touhey)

MODERN STEEL CONSTRUCTION (Volume 61, Number 3) ISSN (print) 0026-8445: ISSN (online) 1945-0737. Published monthly by the American Institute of Steel Construction (AISC), 130 E Randolph Street, Suite 2000, Chicago, IL 60601. Subscriptions: Within the U.S.—single issues $6.00; 1 year, $44. Outside the U.S. (Canada and Mexico)—single issues $9.00; 1 year $88. Periodicals postage paid at Chicago, IL and at additional mailing offices. Postmaster: Please send address changes to MODERN STEEL CONSTRUCTION, 130 E Randolph Street, Suite 2000, Chicago, IL 60601.

editor's note

What's your story? Well for starters, if you're reading this, I'm guessing you might just be a structural engineer—and if not, you're almost certainly involved in steel design or construction in some capacity. Or perhaps you were just looking to jump out of your comfort zone? (If so, thanks! Tell your friends and neighbors about us.)

Full disclosure: I'm not a structural engineer. Or a steel fabricator. Or an erector, or a detailer, or an architect.

But I have been *Modern Steel*'s senior editor for more than a decade, and I appreciate buildings and bridges. Occasionally, *Modern Steel* Editor Scott Melnick turns this space over to a new voice. And since I like writing and telling stories, it's my turn.

I also like people. In my time with AISC and *Modern Steel*, we've featured countless stories related to steel buildings and bridges—stunning designs, means and methods for making steel projects easier and faster to create, in-depth looks at specific steel framing components, and behind-the-scenes tours of various processes and facilities along the steel supply chain. We've recently made an effort to tell the stories of the people who make steel projects better, many of whom also make the industry, and even the world, better.

And for the past year, we've been doing just that via our Field Notes podcasts. We told the story of how a longtime fabricator became the longtime head judge of AISC's Student Steel Bridge Competition (for more on the competition, visit **aisc.org/ssbc**). And the story of how two engineering students who met sitting next to each other in a class went on to found (forge?) a word-class castings company. And how the CEO of an HSS giant is working to bring manufacturing jobs back to the U.S. And how a psychiatric nurse became the head of a major Northeastern fabrication company. And how two visionary architects developed an inspiring update to a New York icon, one that was impressive enough to win AISC's Forge Prize Award (**www.forgeprize.com**). And several others. (You can find all of the podcasts at **www.modernsteel.com**.)

In this month's issue, we're telling the story of how veteran ironworker Vicki O'Leary is changing the face of the profession and making it a safer, more equitable landscape for all.

Plenty of great stories will also be told by the best minds in the steel industry at the 2021 NASCC: The Virtual Steel Conference, taking place April 12–16. Visit **aisc.org/nascc** to register and take a gander at the more than 150 sessions on offer. (Oh, and you can also see a handful of preview articles—including our SteelWise and Business Issues columns—and the exhibitor list in this issue.)

So again, what's your story? A marquee project held up by thousands of tons of steel? A connection you designed that's so genius it borders on crazy? A eureka methodology you developed that can be implemented on multiple projects? Email me (**weisenberger@aisc.org**) and let me know. Let us share it.

Geoff Weisenberger
Senior Editor

Modern Steel Construction

Editorial Offices
130 E Randolph St, Ste 2000
Chicago, IL 60601
312.670.2400

Editorial Contacts
EDITOR AND PUBLISHER
Scott Melnick
312.670.8314
melnick@aisc.org

SENIOR EDITOR
Geoff Weisenberger
312.670.8316
weisenberger@aisc.org

DIRECTOR OF PUBLICATIONS
Keith A. Grubb, SE, PE
312.670.8318
grubb@aisc.org

PRODUCTION SPECIALIST
Erika Salisbury
312.670.5427
salisbury@aisc.org

GRAPHIC DESIGN MANAGER
Kristin Hall
312.670.8313
hall@aisc.org

Advertising Sales
M.J. Mrvica Associates, Inc.
2 W Taunton Avenue
Berlin, NJ 08009
856.768.9360
mjmrvica@mrvica.com

Address Changes and Subscription Concerns
312.670.2401
subscriptions@aisc.org

Reprints
Erika Salisbury
312.670.5427
salisbury@aisc.org


INFRA-METALS
WWW.INFRA-METALS.COM
DELTA STEEL, INC.
WWW.DELTASTEEL.COM
YOUR #1 DOMESTICALLY PRODUCED SUPPLIER
NASCC: THE VIRTUAL STEEL CONFERENCE
EXHIBITOR
2021
EXTENSIVE INVENTORY | FIRST STAGE PROCESSING | INDUSTRY LEADING CUSTOMER SERVICE
Kinetic
K5000xmc
Full Member
AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISC
FOUNDED 1921
INFRA-METALS
Wallingford, CT 800-243-4410
Langhorne, PA 800-899-3432
Marseilles, IL 800-987-5283
Petersburg, VA 800-435-0850
New Boston, OH 877-741-8806
Atlanta, GA INFRA-METALS / IMS 800-833-9175
Tampa, FL 800-693-1361
Hallandale, FL 800-432-1146
DELTA STEEL, INC.
Houston, TX 800-324-0220
San Antonio, TX 800-292-5828
Fort Worth, TX 800-772-2762
Cedar Hill, TX 800-284-7321
Chicago Heights, IL 800-772-2762

If you've ever asked yourself "Why?" about something related to structural steel design or construction, *Modern Steel*'s monthly Steel Interchange is for you! Send your questions or comments to **solutions@aisc.org**.

steel interchange

All mentioned AISC codes and standards, unless noted otherwise, refer to the current version and are available at ***aisc.org/specifications****. All mentioned* Engineering Journal *articles are available at* ***aisc.org/ej****, and AISC Design Guides are available at* ***aisc.org/dg****.*

Restraint Classifications

Figure C-B3.3 in Commentary Section B3.4 of the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360) shows the criteria for a simple shear connection, "PR" moment connection, and "FR" moment connection. But the specifications do not state the source of "2EI/L" or "20EI/L." Can you provide some references regarding this?

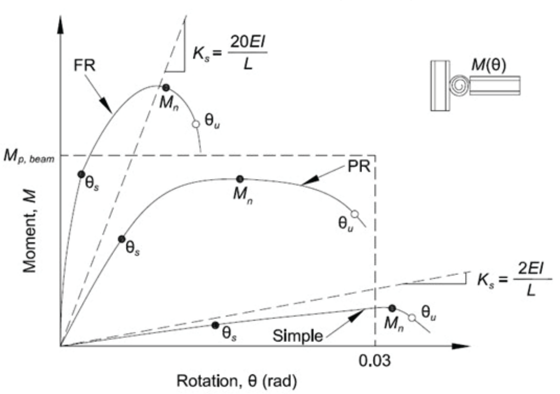


Fig. C-B3.3. Classification of moment-rotation response of fully restrained (FR), partially restrained (PR), and simple connections.

Yes. Several different connection classification systems are available. Commentary Section B3.4 of the AISC *Specification* refers to a paper by Leon (1994). One of the most used systems is summarized in the book by Chen et al. (2011). The basis of the values in Commentary Figure C-B3.3 is the paper by Bjorhovde et al. (1990). The other two primary classification systems were developed by Goto et al. (1998) and Nethercot et al. (1998).

References

- Bjorhovde, R., Colson, A. and Brozzetti, J. (1990), "Classification System for Beam-to-Column Connections," *Journal of Structural Engineering*, Vol. 116, No. 11, ASCE.
- Chen, W.F., Kishi, N. and Komuro, M. (2011), *Semi-Rigid Connections Handbook*, J.Ross Publishing.
- Goto, Y. and Miyashita, S. (1998), "Classification System for Rigid and Semirigid Connections," *Journal of Structural Engineering*, Vol. 124, No. 7, ASCE.
- Leon, R.T. (1994), "Composite Semi-Rigid Construction," *Engineering Journal*, AISC, Vol. 31. No. 2, pp. 57-67.
- Nethercot, D.A., Li, T.Q. and Ahmed, B. (1998), "Unified Classification System for Beam-to-Column Connections," *Journal of Constructional Steel Research*, Vol. 45, No. 1.

Bo Dowswell, PE, PhD

Global Warming Potential Difference in an HSS Environmental Product Declaration (EPD)

Why is the global warming potential for hollow structural sections (HSS) different in the AISC environmental product declaration (EPD) than in the Steel Tube Institue's (STI) EPD if the AISC EPD was developed in conjunction with STI?

The EPDs from both organizations were indeed developed together. AISC's adds the impacts from transport to fabricator and final fabrication, whereas the Steel Tube Institue's EPD scope ends at the HSS manufacturer. You can view AISC's HSS EPD at **aisc.org/why-steel/resources/leed-v4**, and STI's at **steeltubeinstitute.org/resources/leed-epd**.

Max Puchtel, SE

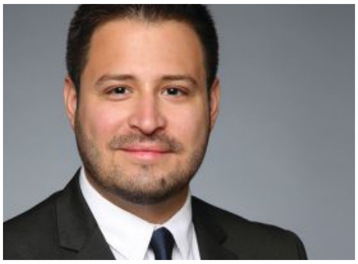
Effective Weld Area of a Flare Bevel Groove Weld

I'm designing a welded connection between the corners of an HSS member to a steel plate and was wondering how I would determine the effective weld area used in determining the available strength per the AISC *Specification*. I know the welding process used, but I am not sure how to calculate the weld metal's effective throat.

Effective weld area will be equal to the effective throat times the length of the weld. Section 17.3.7 in AISC Design Guide 21: *Welded Connections—A Primer for Engineers* states: "Flare V- and flare-bevel groove welds, when filled flush, have throat dimensions that are defined in AISC *Specification* Table J2.2. The throat dimension depends on the welding process and is a function of the radius on the curved member(s). It is often assumed that filling these joints flush is required, but less than flush-filled joints are permitted, provided that the required throat is still obtained. This cost-saving idea is simple—specify only the required throat dimension rather than assuming that the flush condition is required. As the thickness of the curved member increases, so do the radius and weld throat that is achieved for heavier members. As a result, the potential savings can be significant when thicker members are involved (see Section 3.4.5 of this Guide)."

Table 8-2 in the AISC *Manual* provides a detail of a prequalified welded flare-bevel groove weld joint on page 8-62. The effective throat, (E), provided in the table is based on the weld being filled flush and is consistent with the values determined in *Specification* Table J2.2. While only a flush-filled condition is illustrated in Table 8-2, the *Specification* does permit welds less than flush-filled as described in AISC Design Guide 21.

Jonathan Tavarez, PE



Max Puchtel (**puchtel@aisc.org**) is AISC's director of government relations and sustainability, and **Jonathan Tavarez** (**tavarez@aisc.org**) is a staff engineer with AISC's Steel Solutions Center. **Bo Dowswell**, principal with ARC International, LLC, and **Larry Muir** are consultants to AISC.

SCBF Beam-to-Column Connection

When considering special concentrically braced frames (SCBFs) for our beam-to-column connection, we see that Section F2.6b(a) pg. 9.1-67 of the AISC *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341) states that the connection assembly shall be a simple connection meeting the requirements of *Specification* Section B3.4a, where required rotation is taken to be 0.025 rad. Would a bolted-welded single plate connection meet this rotation requirement?

Yes, a single-plate connection designed following the guidance provided in Part 10 of the 15th Edition AISC *Steel Construction Manual* can satisfy this requirement, although the gusset-to-column connection should be considered as well. Significant effort was dedicated to writing Commentary to the *Seismic Provisions* and providing similar language in various portions of the AISC documents to indicate a relationship between these sections relative to this issue.

For example, the Commentary to *Provisions* Section D3 states: "Properly designed simple connections are required at beam-to-column joints to avoid significant flexural forces. As per *Specification* Section J1, inelastic deformation of the connections is an acceptable means of achieving the required rotation. Standard shear connections, per Part 10 of the AISC *Steel Construction Manual*, can be considered to allow adequate rotation at the joints without significant flexural moments. Double angles supporting gravity loads have been shown to attain maximum rotations of 0.05 to 0.09 rad and are suitable for combined gravity and axial forces, as are WT connections, which have demonstrated rotations of 0.05 to 0.07 rad (Astaneh-Asl, 2005a). Shear-plate connections (single plates), while inherently more rigid than double angles, have been shown to withstand gravity rotations ranging from 0.026 to 0.103 rad and cyclic rotations of 0.09 rad (Astaneh-Asl, 2005b). Note that reducing the number of bolts in shear plates, and consequently the connection depth, increases the maximum possible rotation. Other connections at beam-to-column joints are acceptable if they are configured to provide adequate rotational ductility. Part 9 of the AISC *Manual* provides guidance on rotational ductility of end plate and WT connections that can be applied to many types of connections to ensure ductile behavior."

The Commentary to the *Seismic Provisions* Section F2.6b states: "The provision allows the engineer to select from three options. The first is a simple connection (for which the required rotation is defined as 0.025 rad). The connections presented in the *Manual*, Part 10, are capable of accommodating rotations of 0.03 rad and therefore meet the requirement for a simple connection. However, it is important to recognize that in many configurations, the gusset and beam behave rigidly relative to one another such that the beam-to-column connection and the gusset-to-column connection should be treated similarly with respect to deformation demands to achieve rotational ductility."

Part 9 of the *Manual* states: "Connections satisfying the parameters discussed in the foregoing can be expected to accommodate rotations in the range of 0.03 rad. The checks are intended for use with connections between 6 in. and 36 in. deep and configured similarly to the connections shown in Part 10. The use of deeper connections, smaller offset distances between the supported and supporting members, or smaller edge distances can affect the ability of connections to accommodate large rotations in a ductile manner. Connections satisfying these parameters satisfy the intent of AISC *Specification* Section B3.4a for simple connections."

Larry Muir, PE

steel quiz

This month's quiz focuses on the new version of the AISC *Standard for Certification Programs* (AISC 207-20), which was published last year. You can download the standard at **aisc.org/publications**.

1 The 2020 edition of the AISC 207 standard contains a new chapter addressing which of the following? (Choose one.)

a. Metal component manufacturer
b. Fracture-critical requirements
c. Hydraulic metal structures
d. Sophisticated painting

2 **True or False:** The quality management system may only address *either* quality control *or* quality assurance so long as the scope is clearly defined.

3 **True or False:** Commonly used shop abbreviations should be included in the detailing standards.

4 **True or False:** AISC, through the *Certification Standard*, sets a required length of time for document retention.

5 **True or False:** Metal component manufacturers who manufacture standard components that are not specific to any particular project are not required to have the design sealed by a registered design professional, so long as the design tables or processes are readily available and included in the component literature.

6 **True or False:** A bridge comprised of haunched built-up plate girders with a radius of 1,200 ft requires a higher level of fabrication expertise and should be classified as an advanced bridge.

7 **True or False:** For fabricators of fracture-critical members, the welding procedure specifications must contain a procedure qualification record for all fracture-critical welds.

8 **True or False:** A fabricator must have at least one Level III and one Level II Certified NDT on staff or available under contract for each nondestructive testing (NDT) method performed in the shop.

9 **True or False:** The fracture-control plan included in a hydraulic metal component fabricator's documented welding procedure shall be in accordance with the AWS D1.5 *Bridge Welding Code*.

TURN TO PAGE 14 FOR THE ANSWERS

steel quiz ANSWERS

1 **c.** Hydraulic metal structures.

2 **False.** Section 1.5.2 states that the quality management system must address both quality control *and* quality assurance as defined in the glossary.

3 **True.** Section 1.7.1 includes commonly used shop abbreviations in the list of items that shall be described in the fabricator's or manufacturer's methods of drawing layout.

4 **False.** Section 1.9.1 simply states that a documented procedure for the maintenance of quality records shall define the retention policy and provisions for the disposition of the records at the end of the retention period.

5 **False.** The design of both standard and nonstandard components must be reviewed and sealed by a registered design professional. These requirements are discussed further in Sections 3.7.9 and 3.7.10.

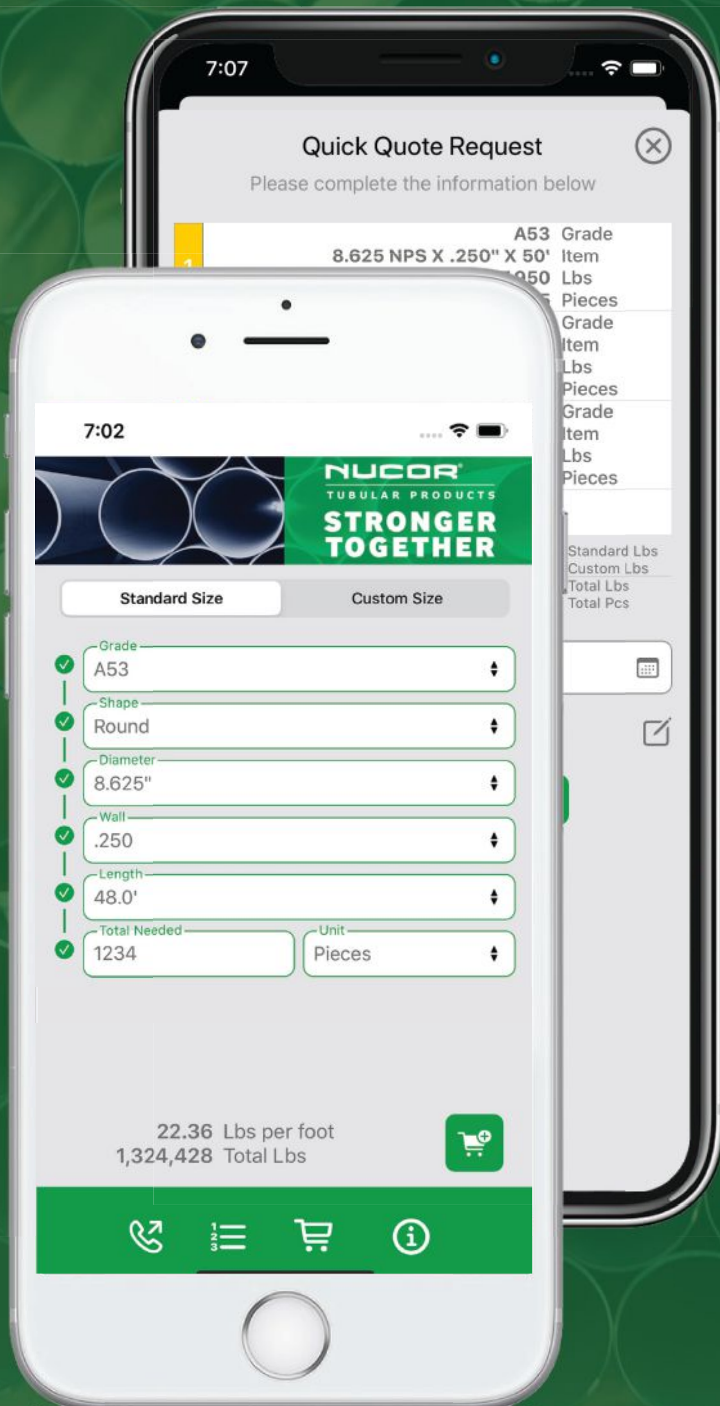
6 **False.** The fabricator would be classified as an "Intermediate Bridge Fabricator." The Commentary to Section 4.2 provides examples of intermediate bridges, the parameters of which are satisfied by the bridge described in the question statement.

7 **True.** This is required per Section 4F.12.1(a).

8 **True.** This is required in Section 6.5.4.1.

9 **True.** This is required in Section 6.F.12.1, except that all instances of the word "bridge" shall be replaced with "hydraulic structure," and the first sentence of the Certification and Qualification section shall be omitted.

Everyone is welcome to submit questions and answers for the Steel Quiz. If you are interested in submitting one question or an entire quiz, contact AISC's Steel Solutions Center at 866.ASK.AISC or **solutions@aisc.org**.



7:07
Quick Quote Request
Please complete the information below
A53 Grade
8.625 NPS X .250" X 50' Item
Lbs
Pieces
Standard Lbs
Custom Lbs
Total Lbs
Total Pcs
7:02
NUCOR
TUBULAR PRODUCTS
STRONGER TOGETHER
Standard Size
Custom Size
Grade
A53
Shape
Round
Diameter
8.625"
Wall
.250
Length
48.0'
Total Needed
1234
Unit
Pieces
22.36 Lbs per foot
1,324,428 Total Lbs

steelwise

LASTING LONGER

BY JONATHAN STRATTON, KYLE SMITH, PE, SE, AND JASON B. LLOYD, PE, PHD

A new series of AASHTO/NSBA documents will provide guidance on common repairs to extend steel bridge service life.

Jonathan Stratton (**jstratton@easternsteelworks.com**) is a managing partner with Eastern Steel Works, **Kyle Smith** (**ksmith@gpinet.com**) is vice president/director of structural engineering with GPI, and **Jason B. Lloyd** (**lloyd@aisc.org**) is the Western Market bridge steel specialist with the National Steel Bridge Alliance.

THE 2018 AASHTO/NSBA Steel Bridge Collaboration meeting in Minneapolis involved a spirited discussion amongst the members of Task Group (TG) 12: Design for Constructability and Fabrication—and resulted in a series of G14 documents focused on field repairs and retrofits of steel bridges.

At the discussion's conclusion, a challenge was issued to the group: Define a direction for a potential G12.2 document. (The Guideline "G" documents contain best practices for the design, fabrication, and construction processes, using a common language across all stakeholders, including engineers, owners, fabricators, and erectors. To view all of the Guideline "G" documents, visit **aisc.org/gdocs**.)

The membership passed on large-scale options such as cable-stayed bridges, truss and arched structures, and even the all-encompassing topic of complex bridges. One suggestion from the floor was tubular structures—but that failed to gain traction as well.

The discussion digressed, eventually leading to the sharing of an observation: Just over a decade before the meeting, and only a short distance from its location, one of the most significant bridge collapses in U.S. history had occurred. The I-35W bridge over the Mississippi River collapsed, succumbing to excessive loading while undergoing deck, lighting, and guard rail repairs. Acknowledging the 2007 tragedy, in which 13 were killed and 145 were injured, provided the direction for the guidance document that the group would create: steel bridge repair and retrofit. (The task group that would eventually take on this endeavor is TG 14: Field Repairs and Retrofits of Steel Bridges.)

NSBA had actually considered such an endeavor a decade earlier. The original TG14 was successful in generating a legacy with their development and distribution of a survey with responses from various state DOTs. It was these responses that supported the newly activated TG14 membership to define the content for the upcoming series of documents.

The current TG14's membership consists of a spectrum of industry stakeholders and has an agenda to produce documents that speak to the on-site project team, the steel fabricator, the designer, and all the way up to the bridge owner and every project participant in between. The effort moving forward is to present three distinct but complementary documents.

The initial document will focus on fatigue and constraint-induced fracture (CIF). NSBA recently identified the document *Maintenance Actions to Address Fatigue Cracking in Steel Bridge Structures* (prepared under National Cooperative Highway Research Program (NCHRP) Project 20-07, Task 387) as a candidate for a Collaboration document, G14.1. This document provides relevant insight into the causes, identification, and remediation of deficiencies resulting from fatigue, as well as the potential risk of CIF. (Note that at the time of this article's publication, the NCHRP document is going through the AASHTO balloting process for acceptance as an AASHTO/NSBA Collaboration document and is anticipated to be accepted with some relatively minor comments.) The proposed G14.1 is a synthesis of best practices from published literature, project reports, and past and ongoing research projects, as well as input from industry professionals. Several case studies are discussed, providing context for the different detail susceptibilities and using a mixture of real-world and rendered images to illustrate the problems and solutions. For each case, a suggested sequence of steps is also provided as a "how to."

G14.1

Here's an abridged example of one maintenance action in the proposed G14.1 for fatigue cracking at a cover plate termination detail.

A slip-critical bolted splice is a reliable retrofit that can be installed at a cover plate detail. As seen in Figure 1, an existing fatigue crack has propagated into the web plate. A web and flange splice is recommended, sufficiently designed to carry the full moment of the girder at that location. It would also be highly recommended to drill a hole at the crack tip(s) to arrest the crack, as research has shown that a bolted splice installed after fatigue cracking has initiated may not prevent subsequent crack growth. Adding a 2-in- to 4-in.-diameter drilled hole in the web directly above (or below in cases where the cover plate is on a top flange) the cover plate weld toe could also be done to ensure that any future crack growth cannot extend into the web plate. Figure 1 shows a fatigue crack that has grown through the thickness of the flange plate and is arrested in the drilled hole. Figure 2 renders what a typical fully bolted flange splice over the cover plate termination might look like.

G14.2

The second document, G14.2, will add to a broad spectrum of repairs and retrofits—including damage from vehicle impact, overloading, and section loss—while also providing guidance for unique component-specific repairs such as bearings and truss members. Damage can vary widely in type and scope, and defining an efficient plan to remediate the damage can be challenging. G14.2 will offer guidance to engineers for repair alternatives that have been successfully implemented. For example, Figure 3 shows the aftermath of an over-height vehicle that struck a through-truss, damaging several members. The portal strut reflects initial contact, and severe deformation of the second and third struts was caused by the front end of the garbage truck being lifted while the rear end was snagged by the first strut. In some cases, member replacement is the only option (as was the case for this bridge). However, heat straightening or mechanical straightening techniques can sometimes be implemented to quickly and safely restore a member to its original geometry without compromising strength and durability. G14.2 will provide the guidance to help owners and designers when faced with a similar scenario.

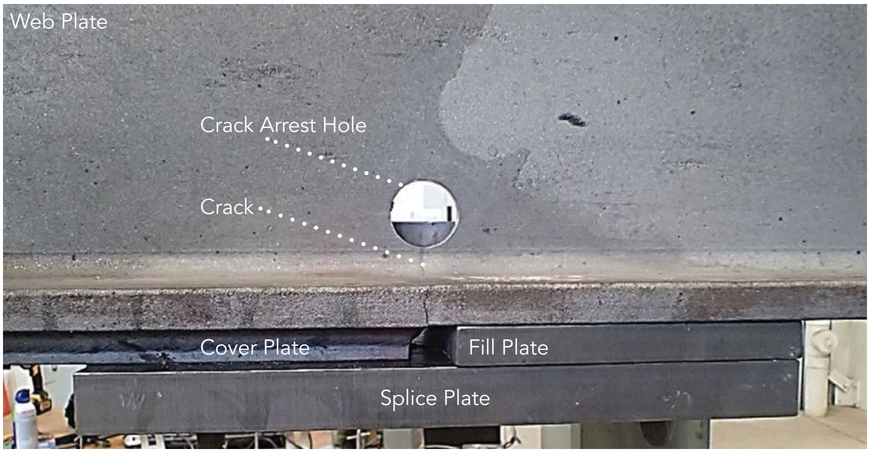


Fig. 1. A crack-arrest hole preventing a crack from propagating into the web plate.

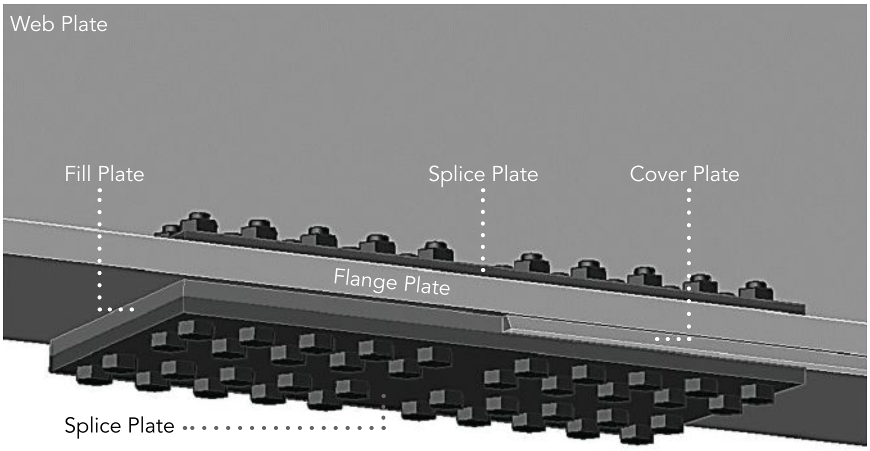


Fig. 2. A detail of a full-flange splice at a cover plate.

Fig. 3. Impact damage to through-truss struts by an over-height vehicle.

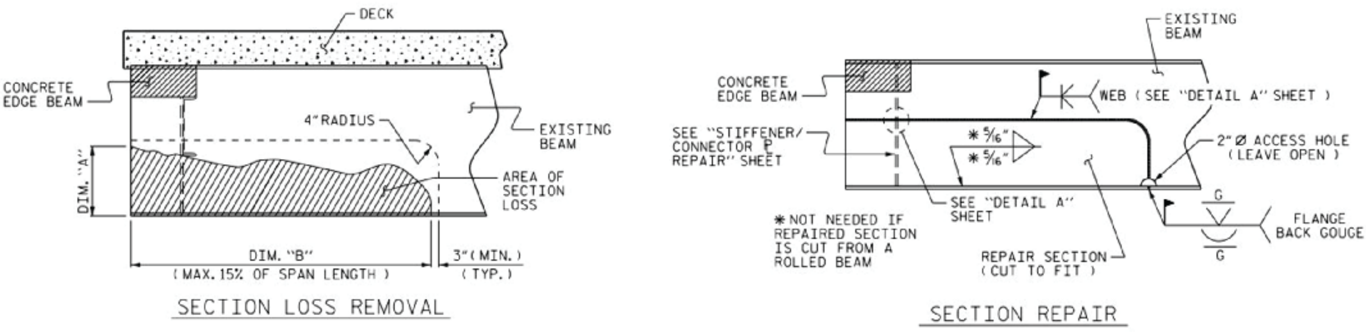


Fig. 4. A typical beam-end corrosion-damage repair detail.

Another relatively common repair performed by owners is girder-end repair. Section loss at girder ends is a challenge faced by every bridge owner and is often caused by leaking joints that allow deicing salts to flow over the steel girder ends. Effective bridge maintenance programs can help mitigate corrosion and can also be key to reducing damage by providing early remediation of compromised coatings. Figure 4 is an example of a common detail used for girder end repair that will be discussed in the proposed G14.2 document.

There are several considerations for making this type of repair. G14.2 will offer guidance for engineers that will help identify important considerations for each repair. For example, flexibility in material selection could be an important consideration for a beam-end repair, as both the fabricator and erector are directly impacted when options are limited—and it can be challenging to find matching historic steel shapes in older bridges. If a specific rolled section is required, then the designer must ensure that it is actively being rolled and is commercially available. If the existing member is a plate girder and time is of the essence for project success, then providing a range of acceptable plate thicknesses will support timely production. Other considerations include defining the extent of shop and field coating, where and by which party the weld edge preparation is to be performed, and assuring accessibility for all field tasks, including nondestructive evaluation (NDE).

G14.3

The third target document, G14.3, will be more graphical in nature than G14.1 and G14.2, effectively becoming an evolving catalog of repair and retrofit details that have been used by engineers throughout the country. The intent is to complement the text and details of G14.2 with supplemental drawings and details, some procedural insight, and commentary on a relative-cost basis, effectiveness, ease of performance, and considerations to be made when selecting the defined repair.

Steel bridge superstructures lend themselves well to repair and retrofit methods. The repairs mentioned are just a small sample of what the G14 documents are built around, a compilation of best practices augmented with commentary on effectiveness and design considerations. The result will be a powerful resource for the various stakeholders charged with extending the service lives of the country's steel bridges. ■

*This article is a preview of the 2021 NASCC: The Steel Conference session "Common Steel Bridge Repairs to Extend Service Life." The conference takes place online April 12-16. For more information and to register, visit **aisc.org/nascc**.*

field notes

RAISING THE BAR

INTERVIEW BY
GEOFF WEISENBERGER

Vicki O'Leary's mission is to make the ironworking profession more equitable and safer, one heart and mind at a time.

Field Notes is *Modern Steel Construction*'s **podcast series**, where we interview people from all corners of the structural steel industry with interesting stories to tell. Listen in at **modernsteel.com/podcasts**.

Geoff Weisenberger (**weisenberger@aisc.org**) is senior editor of *Modern Steel Construction*.

VICKI O'LEARY, a member of Iron Workers Local #1 in Chicago, was born into an ironworking family and got into the profession herself based on a bet with her brother. And while she's raised a lot of steel in her more than thirty years as an ironworker, more recently she has raised the bar for ironworkers everywhere as director of diversity for Ironworkers International. In this month's Field Notes podcast, she discusses how she got into the profession, the Be That One Guy anti-bullying program, and the evolution of paid maternity for ironworkers.

I understand you've been in Chicago for a while. Are you from here?

I was actually born in Paradise, Calif. When I was six weeks old, we moved to Chicago, and from there we ended up moving to Kenosha, Wis., and then back to Chicago. And my parents are from Arkansas, so we moved there for a while—and then, again, back in Chicago.

Sounds like you keep getting drawn back here! I understand you had a triple major in college and also have a master's degree. What did you study?

I knew that I wanted to move forward in my career, and I figured that I had to bring as much to the table as possible to stand out. So I went to National Labor College [in Maryland] and got my degrees in union leadership and administration, labor studies, and labor education. Then I went on to Gonzaga University and got my master's degree in organizational leadership. And then I also graduated from the Harvard Trade Union Program as well as Cornell's National Labor Leadership initiative. I think I've run the gamut of education!

Let's go back a bit further. How did you get into the ironworking trade?

I got into the ironworkers on a bet between me and my brother. The four of us were at the dinner table—my mom, my dad, my brother, and myself—and my brother, an ironworker, bet me that I couldn't do it. So basically, it was game on. My brother and I have always been very competitive, and he's three years older than me. We were raised to believe that occupations don't have gender limitations, so with that, I was going to prove him wrong. And it ended up being my career. I even did better than my brother on the apprenticeship test. I started working as an ironworker when I was 20 and didn't go back to school until I was in my 40s.

Can you tell me a little bit about your first experience up on the iron?

There's usually a long gap between taking your tests to get into a trade and actually starting the trade. After taking my apprenticeship test, I was working at a law firm as a legal secretary and I got a call at work, and they said they wanted me to go to work the next day at McCormick Place in Chicago; this was the expansion in 1985. And during that first experience being up on the iron, I was exhilarated, I was nervous, I was anxious. I was extremely proud of myself, and I remember watching the connectors and it was like watching a well-orchestrated ballet. They seemed to be so in sync with each other. It was also pretty cool that I was in that first group of women that started in Local #1. I'm thankful that on that job, I saw examples of what workers should be like on a site—unfortunately, it's not always like that—but they were actually pretty cool to us as the first group of women coming through.

Another early job was on a 40-story building in the heart of the financial district in Chicago. This is where I learned firsthand about the perception of people who work in construction from people who wear suits—I used to be that person wearing a suit in a law firm on Michigan Avenue—as a construction worker trying to go to a restaurant for lunch or trying to find a restroom. It was funny because I was making more money than I ever had in my life. I had more money in my pocket than when I worked at the law firm, but the majority of the suit people didn't give construction workers any kind of respect.

As an ironworker, do you have to go into the job without a fear of heights, or is that something you can gradually get over?

On that 40-story job, I remember when we got to the 28th floor and we were going to jump to the 29th floor, and I wasn't scared until I got to the 29th floor. It took a few days to get over why that extra floor made a difference for me. But after that, I was okay. And that was in 1985 before fall protection became a thing, so we weren't wearing harnesses.

Switching gears a bit, can you talk about the Be That One Guy program and what sparked it?

The day that Outi Hicks was killed by one of her coworkers is one that no woman working in the construction trades will ever forget. Outi was a carpenter apprentice in Fresno, and she was bludgeoned to death by a guy she was working with on a job on Valentine's Day of 2017. I've asked women ironworkers if they were ever afraid on the job site outside of the inherent dangers of the work they do, and all of them said yes. There are a lot of great women ironworkers that have left the industry, not because they weren't good at it or because the work itself was too difficult but because of the way they were treated. They were fine with working hard up high and in small spaces, but they weren't okay with the disrespect and abuse from others. So we developed the Be That One Guy program because we recognized that harassment, intimidation, and other kinds of bullying on the job can make for a hostile work environment. And we recognize that it's not just a treatment issue but also a safety hazard. Our approach to developing the program included the same methods as our safety program training and empowering everyone to address on-the-job harassment. Not everyone addresses it in the same manner, and we're trying to teach people that that's okay. Even if it's just deflecting from a situation to get the person that's being harassed or bullied out of that situation, that's fine because not everybody is an in-your-face kind of person to say, "Knock it off."

Can you talk a bit about how you've influenced Ironworkers International's maternity policy?

There's a tragic story about a woman ironworker losing her unborn child while working because as a single mom, she had no choice but to go to work if she wanted to provide for her family. So from that story, the question was posed to our general president, Eric Dean, that if we can implement an on-the-job injury program to assist ironworkers, why not also have a maternity program that provides similar assistance to our female members. The end result was our paid maternity leave program. It's funded through currently established contributions with no additional cost for either the contractor or the member, and the program brings relief to our pregnant members by providing financial support that can help families redeem their health insurance. It ensures the safety of both the mother and her baby during pregnancy and allows members to fully recover from delivery prior to returning to work. The program relieves contractors from possible liability by allowing ironworkers to be open about their pregnancies without fear of losing their health-care coverage. Prior to the establishment of the program, members couldn't be honest with their employer about their pregnancy, out of concern for their employment status and continued hours, and then they weren't being honest with their doctors about how grueling and how hard their work is. So we help our partner contractors retain training dollars by creating a safe and healthy alternative for ironworker employees during their pregnancy and encouraging return to work following delivery. IMPACT (the Ironworker Management Progressive Action Cooperative Trust) handles the program claim forms from start to finish, which takes the administrative burden off the contractors and local unions. It's a win-win. This isn't an insurance policy. This is a safety program, and like any other safety program, it's designed to help both contractors and workers. It's just good business sense. ■

To hear more from Vicki, including her favorite things about Chicago, her role as director of diversity for Ironworkers International, and the challenges of getting younger people interested in construction careers, visit ***modernsteel.com/podcasts****.*

business issues

EFFECTIVE NETWORKING FOR INTROVERTED ENGINEERS

BY JENNIFER ANDERSON

Here are four techniques to successfully navigate networking.

Jennifer Anderson (**jen@careercoachjen.com**) is a career strategist for the tech and engineering sector.

FOR SOME PEOPLE, networking can feel awkward, seemingly self-serving, discouraging, and even embarrassing.

Many people consider the term "networking" a dirty word and don't like the potential "icky" feelings that come from attending a networking event. I agree that these events can feel awkward, but if you aren't networking, then it's going to be much harder for you to grow and develop as a professional. I promise you that networking has the power to help you in significant ways in both your professional and personal lives.

Here are four of my favorite techniques to more effectively navigate the world of networking:

Know the difference between the different types of networking. Networking is not isolated to attending a lunch-and-learn to hear a guest speaker share thoughts about an engineering-related topic. Networking can look like many different things, such as volunteering for a cause that you're interested in, participating in an industry conference, taking additional college courses and getting to know your classmates through group projects, joining a running club, etc. Networking should never be just a bunch of people in a room trying to get other people's business cards. Those types of events are definitely awkward!

I think it can be valuable to attend events where you learn from other professionals, but remember to take some time to evaluate how you want to make a difference in the world. For example, I have a colleague who is interested in STEM (science, technology, engineering, and math) initiatives to help adolescents learn about different ways they can engage with the world of science. As those kids come to realize how important STEM is, their eyes are open to more possibilities, and they find themselves more interested in math and science courses. The ripple effect is quite substantial in their education and career choices. In addition to the personal gratification, along the way my colleague has met numerous individuals that have helped her stay connected in her field in interesting ways that did not stem (pardon the pun) from a "typical" networking event.

As you find groups of people that are interested in similar hobbies, community causes, professional development, and so on, you will come to meet some interesting, passionate, and thoughtful people. That is when networking becomes fun and worthwhile.

Make time for networking. This might seem like a very basic technique, but if it's so easy to do, then why don't more people make time for networking? Typically, people tell me that they are "too busy" with work to network. Later, when they are ready to make a job change or ready to hire a new person to the firm, they find themselves with few strong connections—and at that moment, they wish they had made time for networking.

It's imperative to invest in the people within your professional circles so that you have time to get to know them, help them get to know you, and build mutual trust and respect. In the future, you'll be able to comfortably contact them when you're looking to make a job change or add to your team. If you find yourself feeling awkward at networking events, it's probably because you aren't participating in something that is interesting and thought-provoking to you.

Follow up on social media. After meeting new people, I recommend that you follow up and connect through social media. LinkedIn is my favorite place for connecting with other professionals. Sure, Facebook and Instagram are loads of fun, but LinkedIn is where most people think to connect professionally, so that's a better use of your time.

However, just because you're connected on LinkedIn or any other social media platform doesn't mean you're instantly best friends. You'll still need to nurture and cultivate relationships. Look for ways to stay in touch with people. Find articles to share that you think will be interesting to specific people, then copy the URL and share it in a message. Periodically check in with them; even a quick "hello" message goes a long way to keeping in touch.

One major benefit of being active on social media is that you will be exposed to other people who are likely outside your immediate circles. Join groups on LinkedIn to interact with other interesting people who live and work in different industries. Gaining a different perspective from other people is a great way to grow and develop—and in turn, you may offer a fresh perspective to someone else.

"So, what do you do?" Be ready to answer that all-too-common question because everyone asks it in one form or another. In answering that question, you have an opportunity to differentiate yourself from other people.

I will admit that I actually cringe when I hear people ask that question because it can be a conversation killer. After answering the question, people typically respond with, "And what do you do?" And then where do you go with the conversation? It's a dead-end question. Instead, consider asking other thoughtful questions that will help to create better, more in-depth conversations, such as:

"What brings you to this conference?"

"What's the most interesting thing you've learned at this trade show you so far?"

"What does your firm specialize in?"

Conversations get much more interesting and far less awkward when you're discussing meaningful information beyond simply telling each other your job titles.

In the end, networking can lead to some great conversations and professional opportunities. Don't hold yourself back. Plan to attend. Go. Bring your business cards. Have a goal of meeting two to three people at the event (and don't just ask them what they do). Then wash, rinse, and repeat. Practice makes perfect. You'll find that over time, networking is truly a wonderful way to exchange ideas and meet and keep in touch with other professionals. This will, in turn, provide you the opportunity to build your professional network, enhance the probability for future opportunities in your career, and potentially add interesting, qualified people to your firm. ■

This article is a preview of the 2021 NASCC: The Steel Conference session "Even Introverted Engineers Can Network!" The conference takes place online April 12–16. For more information and to register, visit ***aisc.org/nascc****.*

Super Fast, Super Tall

BY STEVEN R. WITKOWSKI, PE, AND DARREN R. HARTMAN, PE

HOW DO YOU CONSTRUCT one of the country's tallest buildings in a dense, bustling area next to one of the world's busiest transit hubs, and on an accelerated schedule? For one thing, start the steel connection design and modeling as early as possible.

One Vanderbilt, located at 42nd Street and Vanderbilt Avenue in Midtown Manhattan—practically at the doorstep of Grand Central Terminal—is the newest, and now second-tallest, office tower in New York City. Soaring to 1,401 ft, it includes 1.7 million sq. ft of space in 77 stories and was completed ahead of schedule and under budget.

Designed by architect Kohn Pedersen Fox Associates, the tower comprises four interlocking and tapering planes that spiral toward the sky. The structure, designed by engineer of record Severud Associates, features structural steel floor framing, sloping columns, transfer structures, and outriggers around a concrete core—with the steel framing being erected first using a temporary steel core that was eventually embedded in the concrete core. This allowed the project to be erected as if there were no concrete core, thus maximizing the impact of steel's quicker erection time on the overall schedule.

With a building occupancy date planned for late 2020, erecting the superstructure, which comprises more than 25,000 tons of steel, began in the summer of 2017. As the building went through several design iterations in the fall of 2015/winter of 2016, Thornton Tomasetti's Construction Engineering practice was brought

Looking south toward Downtown Manhattan from one of the upper floors of One Vanderbilt, which encompasses 1.7 million sq. ft of space in 77 stories.

Max Touhey, courtesy of SL Green

onto the project to reclaim time in the steel schedule and ensure that the project's timely completion would not be jeopardized. The firm implemented its Advanced Project Delivery™ (APD) approach, which, along with the company's structural engineering expertise, provides early steel connection design and Tekla modeling services for mill orders and steel detailing.

Throughout the project, Thornton Tomasetti worked collaboratively with the design and construction team, starting 15 months before steel was to arrive on-site, bridging the gap between design and construction. During this initial phase, the company developed complex connection concepts for review and approval by Severud, identified and resolved any missing geometry information and framing conflicts on the early available documents as the Tekla model was being built, and gathered final force information required for connection design. An internal request-for-information process was used

In a city known for the tallest buildings and fastest pace of life in the country, a supertall skyscraper opens early thanks to an innovative steel connection design and modeling process.

Steven Witkowski is a principal and **Darren R. Hartman** is a senior principal and Construction Engineering practice leader, both with Thornton Tomasetti.

The tower comprises four interlocking and tapering planes that spiral toward the sky.

between Thornton Tomasetti and Severud to track information between the two firms, with the former frequently offering design change suggestions or relief from prescriptive force requirements in specific instances that would help improve the steel connection engineering, detailing, fabrication, and erection.

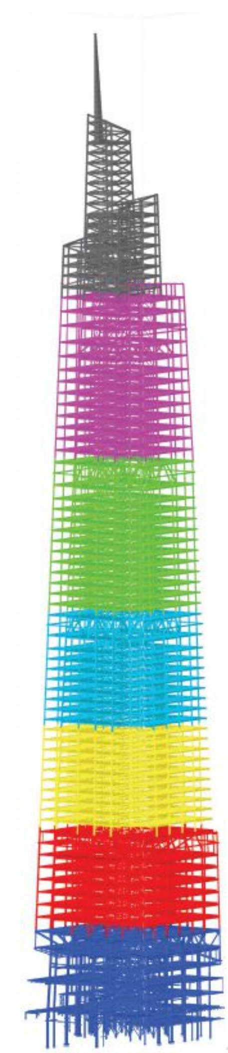
The early connection and geometry information developed was issued to the structural steel bidders in summer 2016. To facilitate a greater understanding of the project requirements, a progress Tekla model and connection detail sketches illustrated some of the complexities and helped to solicit any of the bidders' recommendations for fabrication and erection enhancements. Additional details and progress Tekla models were issued throughout the bid process as the modeling advanced at the building podium.

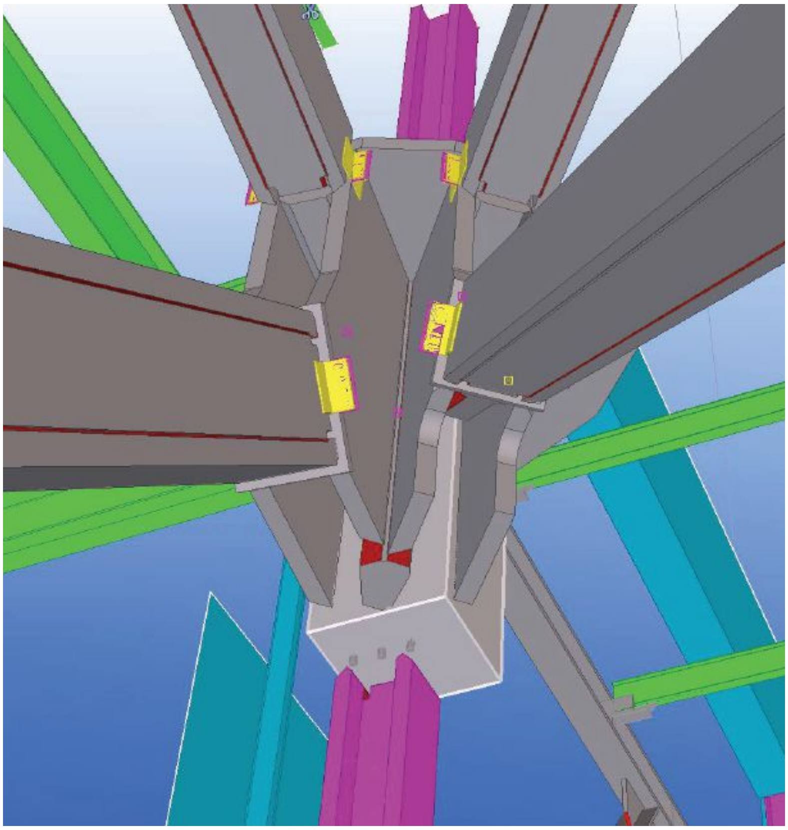
Early connection engineering identified the need for solid steel forgings to accommodate transfer forces in two directions. These elements ranged in weight from three tons to 22 tons, with the largest being approximately 3 ft by 3 ft by 10 ft. These special conditions were detailed at three nodes in the lower part of the building and included in the bid documents to provide the bidders an early and greater understanding of what was required for the project, leading to more accurate and responsible bids. The structural steel fabrication contract was awarded to Banker Steel in October 2016.

The building was broken up into seven sequences for detailing. Each sequence had a scheduled advanced bill of materials (ABM) date and released for detailing (RFD) date. Sequence 1 is the lower part of the podium, from the foundation to Level 6. This sequence contains several 24-ft-deep transfer trusses, typically constructed of built-up box members, and 9-ft-deep plate girders, as well as horizontal bracing on several floors and the structural support of a sloping, hung ceiling over the lobby. Transfer truss connections were typically 26-in.-wide built-up nodes fabricated by laminating plates up to 6 in. thick. Sequence 2, the upper part of the podium, runs from Level 6 to Level 13 and includes a second set of transfer structures. Sequences 3 to 6 comprise 45 floors that are typical office framing floors with three outrigger levels. Finally, Sequence 7 highlights the glass-

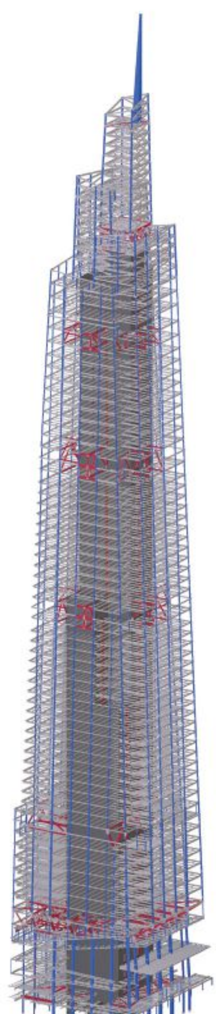
below: The building rises 1,401 ft and is now the second-tallest office tower (and fourth-tallest building overall) in New York.

right: The steel framing package was broken up into seven sequences for detailing.





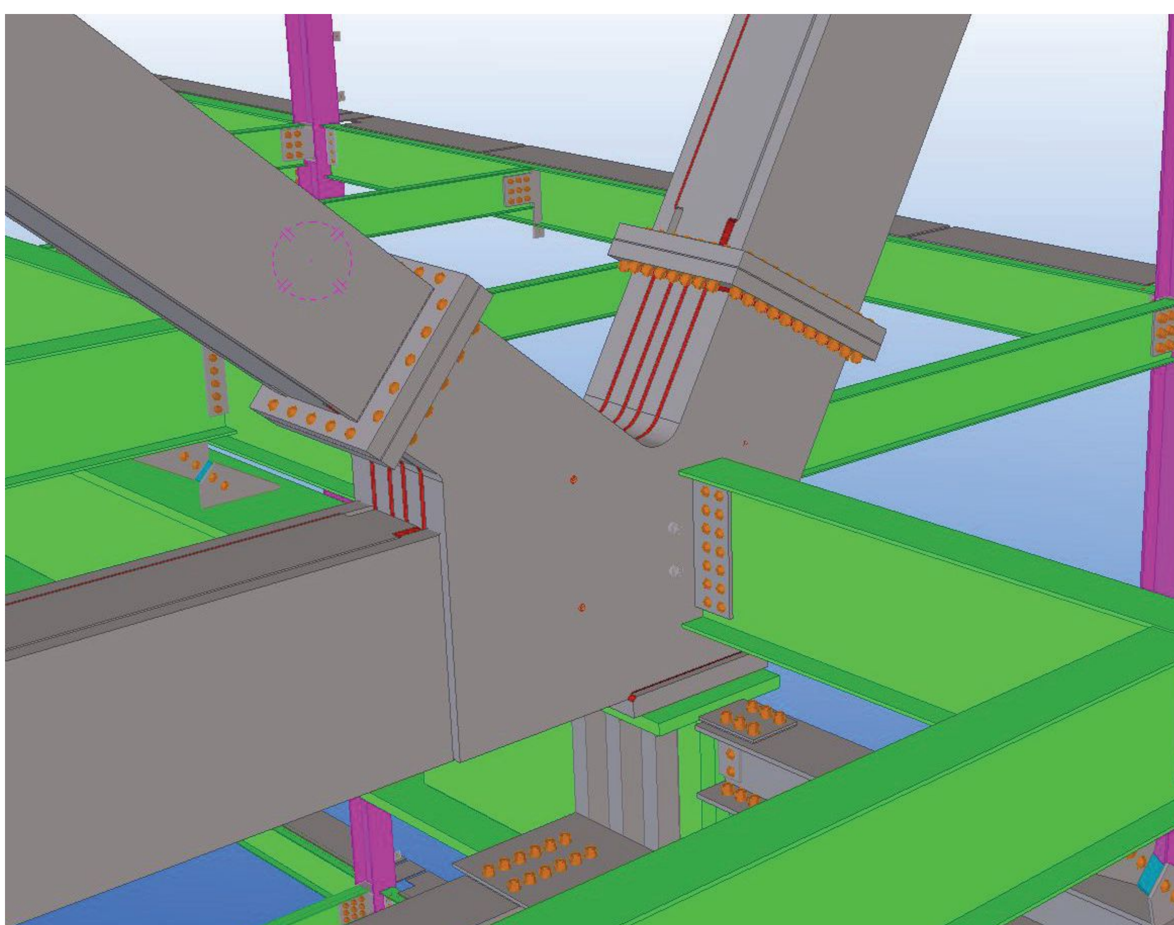
Thornton Tomasetti



left: Steel framing for the entire tower totals 25,000 tons.

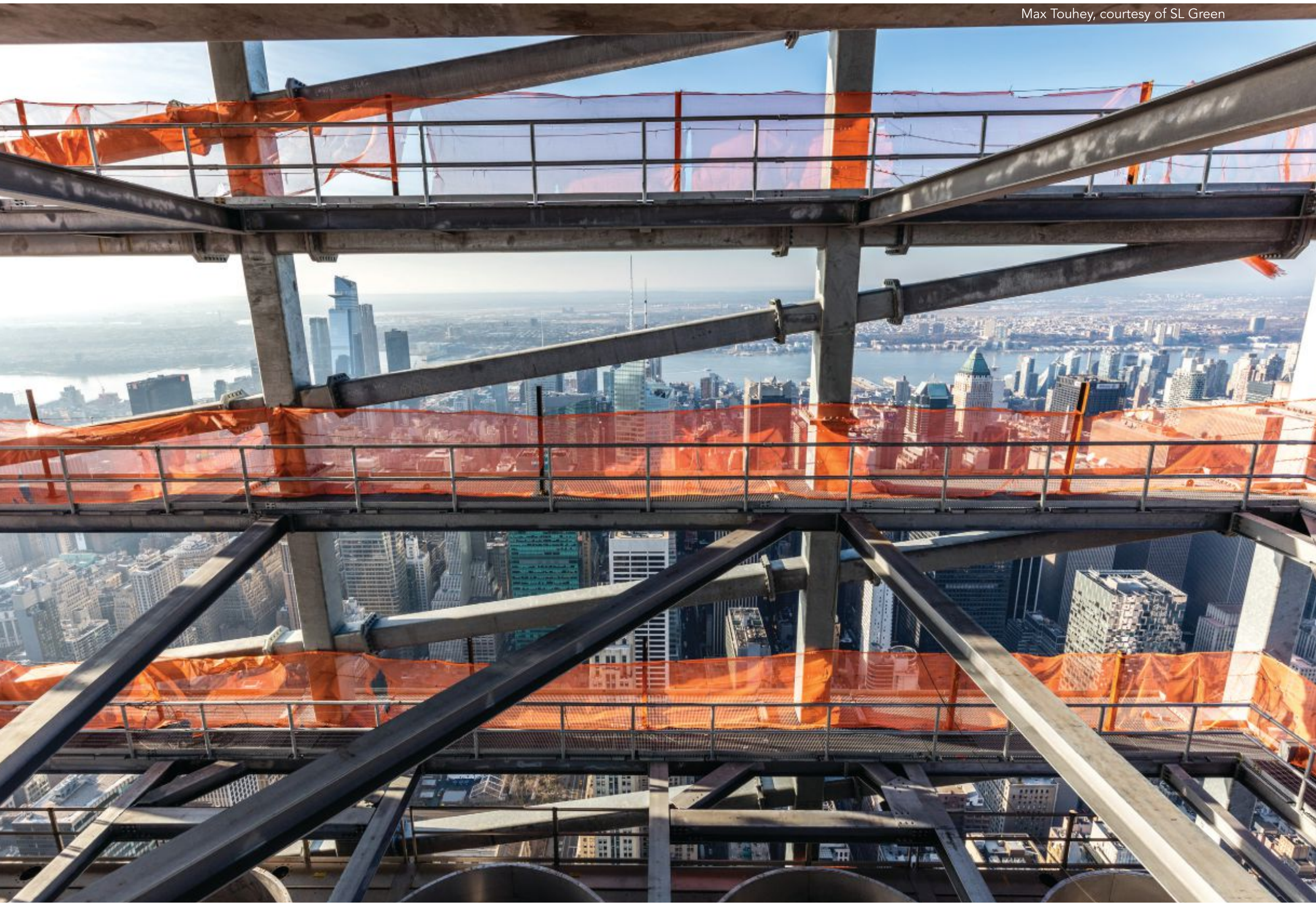
above: Solid steel forgings accommodate transfer forces in two directions and range in weight from three tons to 22 tons, with the largest being approximately 3 ft by 3 ft by 10 ft.

below: A model of a built-up 26-in.-wide transfer truss node.



Thornton Tomasetti implemented its Advanced Project Delivery service, which provides early steel connection design and Tekla modeling for steel mill orders and detailing.

Max Touhey, courtesy of SL Green



enclosed top-of-house structure with exposed hollow structural section (HSS) perimeter columns, horizontals, and diagonals up to HSS22×22 in size.

When the structural steel fabrication contract was awarded, an ABM model totaling approximately 11,500 tons (45% of the total project tonnage) for Sequences 1 and 2 was provided to fabricator Banker Steel, along with anchor rods and steel embedment plates for detailing. Three weeks later, an RFD model for Sequence 1, totaling 7,000 tons, was provided for shop drawing preparation. This was clearly one of the most complex sequences for the project and got the steel detailing and fabrication processes moving early on.

As connection engineering and modeling were developed, any outstanding information required between Thornton Tomasetti and the design team, as well as the connection design and Tekla modeling status, was reported to the entire team during weekly project meetings. The sequenced model delivery schedule that was included in the contract with Banker enabled the project team, both design and ownership, to provide answers and make key decisions in a timely manner. Staggering the model release dates and setting the dates early on supported the overall project schedule. Not only did this approach help streamline the flow of information, but it also allowed for early detection of potential conflicts and helped ensure that the project schedule could be accelerated.

With Sequence 2 released for RFD a month-and-a-half after Sequence 1, several steel pieces and a large amount of tonnage were already being turned into shop drawings for review and approval. Future sequences up the building were issued for RFD approximately every two months thereafter, and the RFD models allowed for the steel to be ordered to actual lengths rather than typical ABM order lengths where connections are not yet known, thus eliminating wasteful drop material. Those members with long lead times were ordered earlier based on the length information available at the time. Finalizing the connection design and modeling before mill order allowed for member sizes to be changed beforehand when beneficial to simplify connections or eliminate the need for costly reinforcing, such as increasing HSS walls that were locally undersized at connections for out-of-plane forces.

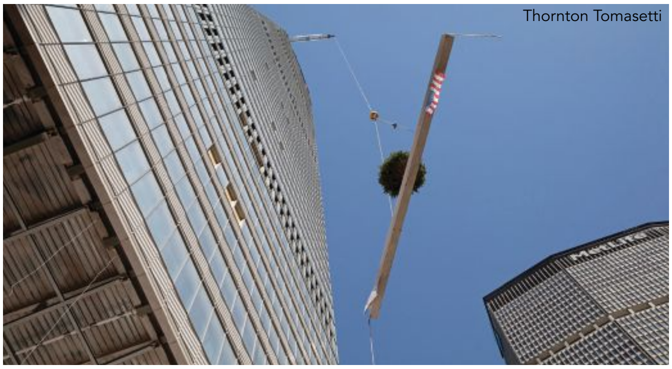
With the steel framing erected before the concrete core, Thornton Tomasetti also coordinated the concrete core rebar with any major steel connections. This included providing rebar couplers welded in the shop and/or holes in connection material for rebar to pass through in the field. This coordination helped reduce field issues between the steel and concrete trades, providing greater flexibility.

Thornton Tomasetti

above: A steel truss node at street level prior to erection.

right: Transfer trusses in Sequence 2, constructed of built-up box members.

below: The steel framing for the tower topped out in September 2019.


Thornton Tomasetti


Bess Adler, Thornton Tomasetti

The structural steel shop drawings were reviewed by Thornton Tomasetti and the design team to confirm that they were prepared according to the details in the model, as well as designed for the proper connection forces. Any comments that could potentially affect the connection design were reviewed and coordinated prior to releasing the shop drawings back to the construction team. The shop drawing submittal process went smoothly, especially for a project of this size and complexity, with most drawings being approved or approved as noted on the first submission. By the time steel erection started in summer 2017, shop drawings had been submitted up to Level 31 and approved up to Level 27.

By preparing the Tekla connected model as the design progressed, the steel fabrication and erection schedule was reduced by at least eight months. Connection engineering and modeling were essentially completed in November 2017; all steel shop drawings were substantially submitted by late spring 2018; the framing topped out, with the last piece of the spire erected, in mid-September 2019; and the ribbon-cutting ceremony took place a year later.

They say the early bird gets the worm, and in the case of One Vanderbilt, getting an early start on connection design and modeling resulted in Manhattan's latest marquee super-tall building opening ahead of schedule, even in the midst of a global pandemic. ■

Owner
SL Green/Hines/National Pension Service of Korea

Construction Manager
AECOM Tishman

Architect
Kohn Pedersen Fox Associates

Structural Engineer
Severud Associates

Connection Design and Modeling
Thornton Tomasetti

Steel Team

Fabricator
Banker Steel, Lynchburg, Va.

Erector
NYC Constructors, LLC, New York

NEED FOR SPEED

AISC's Need for Speed initiative recognizes technologies and practices that make steel projects come together faster. Check out **aisc.org/needforspeed** for more.

Core Value

BY DEVIN HUBER, PE, PHD, AND AMIT VARMA, PHD

The first in a multi-part series on SpeedCore covers what influenced the system, how it was developed, relevant research, design and fabrication considerations, and the reason for its name.

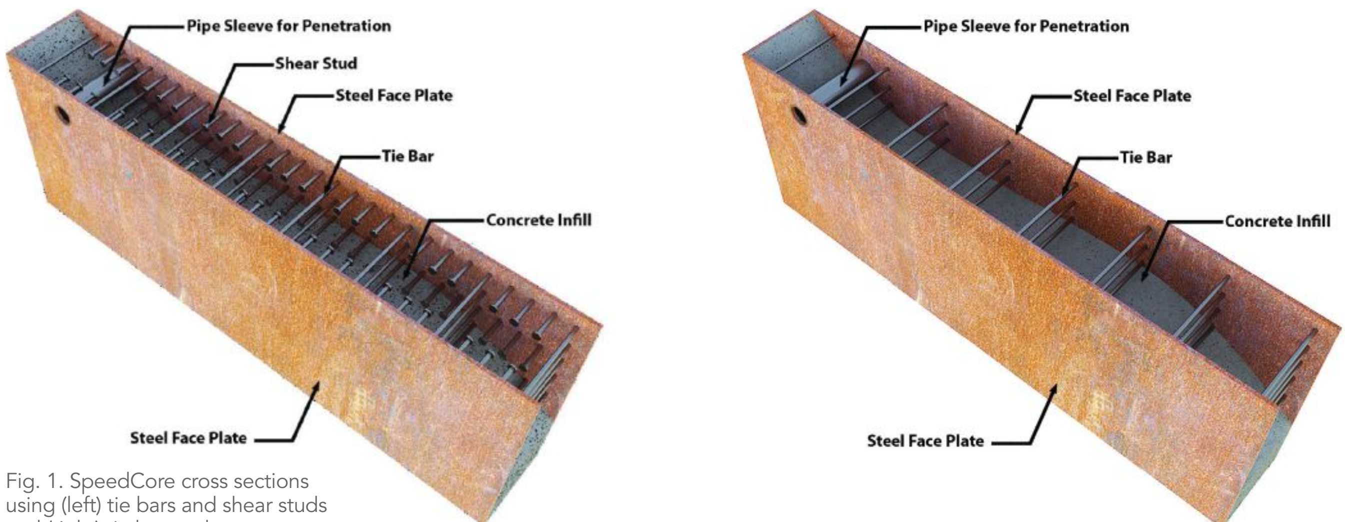


Fig. 1. SpeedCore cross sections using (left) tie bars and shear studs and (right) tie bars only.

Devin Huber (huber@aisc.org) is AISC's director of research.

Amit Varma (ahvarma@purdue.edu) is the Karl H. Kettelhut Professor of Civil Engineering at Purdue University's Lyle School of Civil Engineering and heads up all of Purdue's SpeedCore-related initiatives and research.

BY NOW, YOU MAY HAVE HEARD OF SPEEDCORE.

And if you haven't yet, you will soon—especially if you keep reading.

The system, whose longer, technical name is "composite steel plate shear walls/concrete filled (C-PSW/CF)," is intended for use as a lateral force-resisting system (LFRS) in multi-story steel construction, with Rainier Square Tower in Seattle being the first commercial steel building to use the system (see "Core Solution" in the February 2018 issue, available at **www.modernsteel.com**). SpeedCore is what is known as a "sandwich" structural system, which generally refers to a system composed of stiff outer layers with a softer layer in between. It can be used to replace reinforced concrete (RC) shear walls in building structures—and similar to RC shear walls, its walls may be coupled or uncoupled as required for the LFRS.

Here's how it works: Outer steel plates act as permanent formwork and reinforcing steel to an inner concrete core. The plates are tied together using round tie bars that can either be welded to the steel plate (as is the case at Rainier Square) or secured with a double nut configuration (see Figure 1 for the schematics of a typical SpeedCore panel). The system is optimized such that panels are fabricated in the shop and shipped to the job site, where they are connected into their final "core" configuration (at left in Figure 2). While sandwich construction is not a new concept, SpeedCore takes this methodology, literally, to new heights—to the tune of 850 ft in the case of Rainier Square (at right in Figure 2).

Sandwich-type construction has a fairly extensive history, seeing use in metal structures ranging from bridges to ships to nuclear power plants. Here, we'll provide a brief overview and background to sandwich construction, summarize background research that has helped develop the SpeedCore system, and describe some of the considerations for and benefits of using SpeedCore in a building structure.

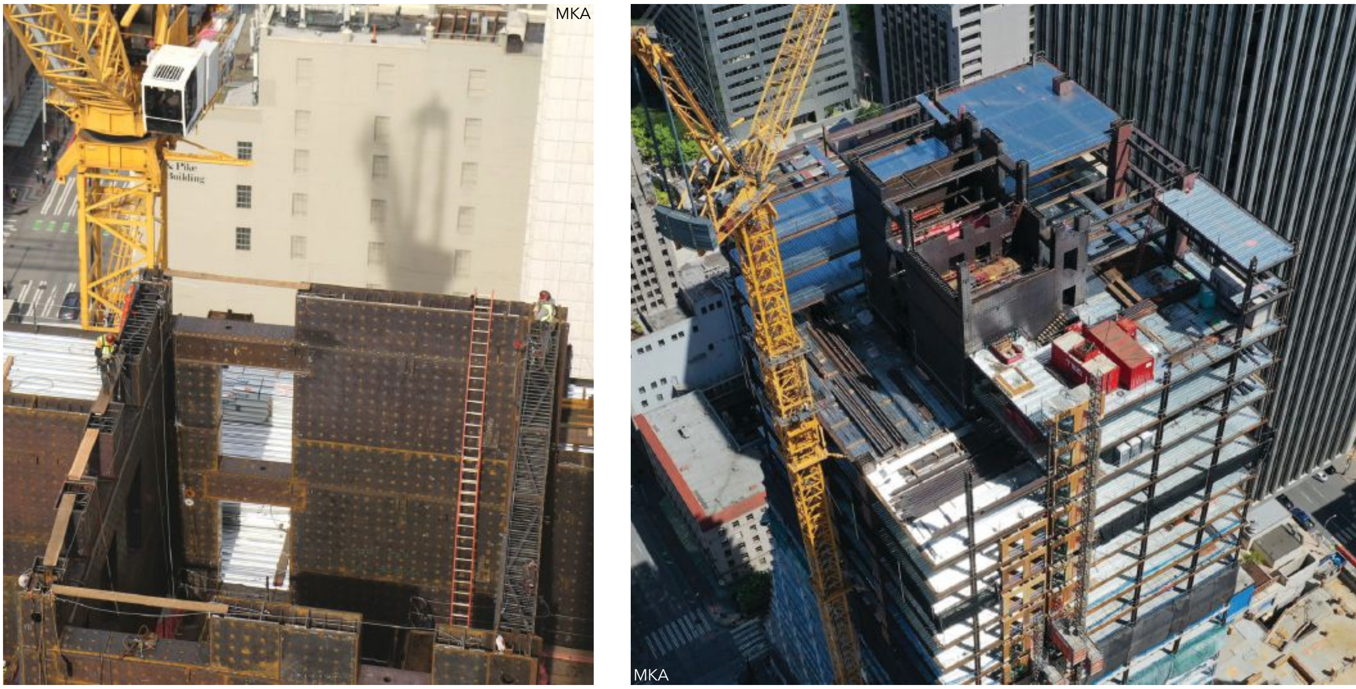


Fig. 2. The Rainier Square project in Seattle, with (left) SpeedCore panels being erected and (right) framing approaching the building's full 850-ft height.

A Brief History of Composite Plate Shear Walls

Historically, there have been various iterations of sandwich systems. In "modern" history, the first large-scale application of sandwich systems in a civil engineering project was the construction of two railway bridges in Great Britain in the mid-1800s. Both bridges, the Brittania and Conwy Suspension bridges, were known as tubular bridges and were made of wrought iron built-up sections and configured with the rail traffic traveling within the structure. (A section and a rendering of the original bridge are shown in Figure 3.) These structures showed how a structure using stiff outer layers with a "softer" inner layer maximizes the efficiency of structural metals for carrying heavy loads.

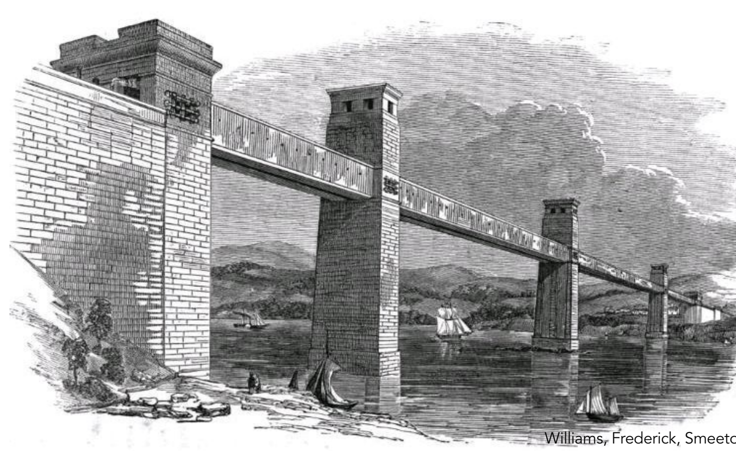


Fig. 3. A section of the original wrought iron tubular Britannia Bridge (left) standing in front of the modern bridge and (right) a rendering of the bridge circa 1852.

NEED FOR SPEED

AISC's Need for Speed initiative recognizes technologies and practices that make steel projects come together faster. Check out **aisc.org/needforspeed** for more.

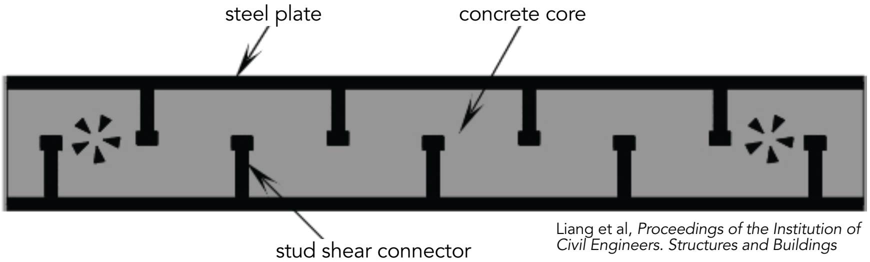


Fig. 4. A cross section of double-skin composite panel.

Fig. 5. A Friction-stir welding tool (left) to fabricate a bi-steel panel and a completed fabricated panel (right).

Fig. 6. A Corefast panel arriving at a site as a prefabricated unit (left) and being erected into a final configuration (right).

Over the years, numerous types of structural sandwich systems of various materials were developed for use in applications like ship hulls, airplane wings, and even some automotive uses. However, the first predecessors of the SpeedCore system were originally developed in Great Britain in the late 1980s and early 1990s for use in tunnel construction. These systems were known as double-skin composites and consisted of outer steel plates with welded shear studs and a concrete core between them (one of the early concepts shown in Figure 4).

A major breakthrough on double-skin composites came in the early 2000s when the British company Corus devised an efficient way to shop fabricate panels using a patented process where tie-bars were connected to the plates using a friction stir welding process. The resultant product from this process was known as a "Bi-Steel" panel and had the tie bars welded to the inside of the plates, creating a smooth outside surface (see Figure 5). These panel types were initially intended for defense applications as blast-resistant walls and eventually became more commonly used as core walls in buildings.

As the application of Bi-Steel panels became more extensive in building applications in Britain as shear walls, Corus rebranded this application as the "Corefast" system. The system gained some popularity in Britain in the early to mid-2000s, where it was used in several steel buildings as the LFRS. Much like SpeedCore, the system was panelized, most of the fabrication occurred in the shop, and final assembly occurred at the job site (as shown in Figure 6). While Corefast closely resembles the SpeedCore system, there are some key differences: SpeedCore does not use Bi-Steel panels, Corefast was never intended for seismic regions (SpeedCore can be used in both seismic and non-seismic areas), and SpeedCore is not patented and can be used by any designer and contractor on their given project.

The use of composite plate shear walls, referred to as steel-plate composite (SC) walls in safety-related nuclear facilities, has been evaluated since the early 1990s. In particular, the AP1000(R) nuclear power plant uses SC walls for almost all the containment internal structures and even for the external shield building. The internal containment structures (steam generator compartments, pressurizer, etc.) are designed for extreme load combinations, including seismic, accident thermal, and pressure loading. The external shield building is designed to resist seismic loads and aircraft impact, which is required by regulatory agencies following the 9/11 terrorist attack.

Fig. 7. Composite plate shear walls being used in the Vogtle Unit 3 Shield Building (a nuclear facility application).

SC walls have two steel plates located on the exterior and interior surfaces, resulting in armored construction, which is excellent for resisting missile/projectile impactive loading or impulsive/blast loading. The AP1000(R) nuclear power plant design, initially implemented in Sanmen and Haiyang, China, is currently nearing completion of its first U.S. installation, in Vogtle, Ga. (see Figure 7). Several other nuclear power plant structures and other safety-related nuclear facilities are also using or considering SC walls due to their inherent advantages of construction speed, seismic performance, and resistance to impactive and impulsive loading. For several decades, there was no industry code or standard governing the design of SC walls in safety-related nuclear facilities. This became a major roadblock for their use, as well as for expedient review and approval by regulatory agencies. Project-specific design criteria, submissions, experimental results, etc., had to be developed by the vendor, and detailed review plans, audits, and expert panels had to be coordinated by the regulatory agencies. The designers had to rely on and build upon ACI 349 (*Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary*) as the basis of design, but it was inapplicable and inappropriate for composite SC walls. Simply put, the technology needed an advocate.

AISC recognized this industry need and constituted an ad-hoc committee for the design of composite SC walls for safety-related nuclear facilities in 2006. Researchers from Purdue University and industry experts on the committee led a decade-long effort to generate and synthesize research results for SC walls, including extensive experimental results and numerical models/analyses. The results were instrumental in the structural design approval of nuclear power plants by regulatory agencies, which eventually led to their licensing and construction. The research was also used to generalize behavior and develop the first consensus code AISC N690 Supp. No. 1 (2015), which included extensive provisions for the design, modeling, analysis, and detailing of SC walls for safety-related nuclear facilities. In order to make the specifications more useful and user-friendly, the AISC Design Guide 32: *Modular Steel-Plate Composite Walls for Safety-Related Nuclear Facilities* (**aisc.org/dg**) was published to guide designers in effectively following the specifications.

SpeedCore Research

Initial research into the use of composite plate shear walls in commercial construction began at Purdue University as part of a Charles Pankow Foundation Project. The industry champion and primary motivator was Ron Klemencic, chairman and CEO of Magnusson Klemencic Associates. A 3:8 scale model of composite plate shear wall was constructed and tested at Purdue's Bowen Laboratory, and the experiments were used to investigate the stability of the empty steel modules, strain compatibility between steel and concrete, shear strength of horizontal splice connections, and behavior of the wall under cyclic loading. The results from the experimental and analytical investigations were used to develop the first design procedure for dual-plate composite shear walls (you can download a PDF of the results from Pankow at **tinyurl.com/pankow-sc**).

Further research, completed between 2014 and 2017, was performed to experimentally and numerically evaluate the in-plane shear behavior of composite plate shear walls. The results showed that these composite walls have significant in-plane shear strength, which includes the contributions of the steel plates and the concrete infill. A subsequent experimental investigation was conducted at the University at Buffalo, led by SUNY Distinguished Professor Michel Bruneau, on the flexural behavior of composite plate shear walls with semicircular or circular concrete-filled tube (CFT) boundary elements. The results showed that these walls can develop their plastic moment capacity and have excellent ductility. The out-of-plane shear behavior of composite plate shear walls was experimentally evaluated further, with the results showing that the out-of-plane behavior is similar to RC walls and depends on the shear strength contribution of the concrete and the tie bars.

Curving the Circuit

2015 IDEAS2 Merit Award Winner:
Circuit of the Americas (COTA)

Landmark 251’ tall observation tower providing a 360 degree panorama view of the circuit with capacity for 10,000 spectators. CMRP provided 35 tons of curved steel that included 73 pieces of curved 8” sch 40 pipe that start out at a tight 96” centerline radius and then get a slightly larger 360” radius before opening up to a large 1,349” radius at the bottom of the tower.

CHICAGO METAL
ROLLED PRODUCTS COMPANY

Call us at 866-940-5739
CHICAGO • KANSAS CITY
cmrp.com

AISC ASSOCIATE
NOMMA
SMA

Standard Mill Shapes - Rolled To Your Specifications

Call 866-940-5739

We bend ALL sizes up to:

No.	Shape	Dimension	We bend ALL sizes up to:
1	Angle Leg Out	INSIDE DIA.	10" x 10" x 1" Angle
2	Angle Leg In	OUTSIDE DIA.	10" x 10" x 1" Angle
3	Flat Bar The Hard Way	INSIDE DIA.	24" x 12" Flat
4	Flat Bar The Easy Way	INSIDE DIA.	36" x 12" Flat
5	Square Bar	INSIDE DIA.	18" Square
6	Beam The Easy Way (Y-Y Axis)	MEAN DIA.	44" x 335#, 36" x 925#
7	Beam The Hard Way (X-X Axis)	INSIDE DIA.	44" x 285#
8	Channel Flanges In	OUTSIDE DIA.	All Sizes
9	Channel Flanges Out	INSIDE DIA.	All Sizes
10	Channel The Hard Way (X-X Axis)	INSIDE DIA.	All Sizes
11	Tee Stem In	OUTSIDE DIA.	22" x $142\frac{1}{2}$# Tee
12	Tee Stem Out	INSIDE DIA.	22" x $142\frac{1}{2}$# Tee
13	Tee Stem Up	MEAN DIA.	22" x $142\frac{1}{2}$# Tee
14	Angle Heel In	INSIDE DIA.	8" x 8" x 1" Angle
15	Angle Heel Out	OUTSIDE DIA.	8" x 8" x 1" Angle
16	Angle Heel Up	MEAN DIA.	8" x 8"x1" Angle
17	Square Tube	INSIDE DIA.	24" x $\frac{1}{2}$" Tube
18	Rectangular Tube The Easy Way (Y-Y Axis)	INSIDE DIA.	20" x 12" x $\frac{5}{8}$" Tube
19	Rectangular Tube The Hard Way (X-X Axis)	INSIDE DIA.	20" x 12" x $\frac{5}{8}$" Tube
20	Square Tube Diagonally	MEAN DIA.	12" x $\frac{5}{8}$" Square Tube
21	Round Tube & Pipe	MEAN DIA.	24" Sched. 80 Pipe
22	Round Bar	MEAN DIA.	All Mill Produced Sizes

We also roll stair stringers, helical hand rails, off-axis bends, formed shapes and extrusions.

Visit cmrp.com for more information.

CHICAGO METAL
ROLLED PRODUCTS COMPANY
CHICAGO • KANSAS CITY

AISC ASSOCIATE · NOMMA · SMA MEMBER

Investigations were also performed on the stability of the empty steel modules before concrete casting between 2014 and 2019. The testing used experimental and analytical results to propose tie bar spacing requirements for composite plate shear walls. Additional investigation was performed on the local buckling of steel plates after concrete casting, as well as on the compressive strength of composite plate shear walls. They developed shear stud or tie spacing requirements (in the composite phase) to achieve non-slender steel plates that undergo yielding before local buckling. (Figure 8 shows a test specimen that was used to help develop tie bar spacing requirements.)

The missile impact behavior of composite plate shear walls was investigated using experimental results and numerical models to develop design methods for composite plate shear walls subjected to impactive loading. Also evaluated was the behavior of composite plate shear walls subjected to impulsive (blast) loading using experimental results and numerical simulations to develop design methods for walls subjected to impulsive loading. The work has helped demonstrate that composite plate shear walls perform well under extreme impulsive loads.

In addition to this research, Charles Pankow Foundation has partnered with AISC on multiple projects related to composite plate shear walls for use in commercial construction since 2016, all conducted at Purdue University and the University at Buffalo under the leadership of Amit Varma and Michel Bruneau. This research is far-reaching and includes work on seismic design, coupling beam connections, and fire engineering. With respect to fire engineering and designing composite plate shear walls, one of these endeavors included funding by the Steel Institute of New York with the work conducted at Purdue University. For this project, experimental and numerical research was conducted to evaluate the effects of standard fire loading on the thermal and structural behavior of composite plate shear walls. Different heating configurations, duration, and structural loading were considered. The results were used to develop standard fire-resistance rating (FRR) for prescriptive design and design equations for calculating the strength of walls subjected to elevated temperatures for performance-based design. Furthermore, the research showed a typical SpeedCore system using 18-in.-wide panels can readily

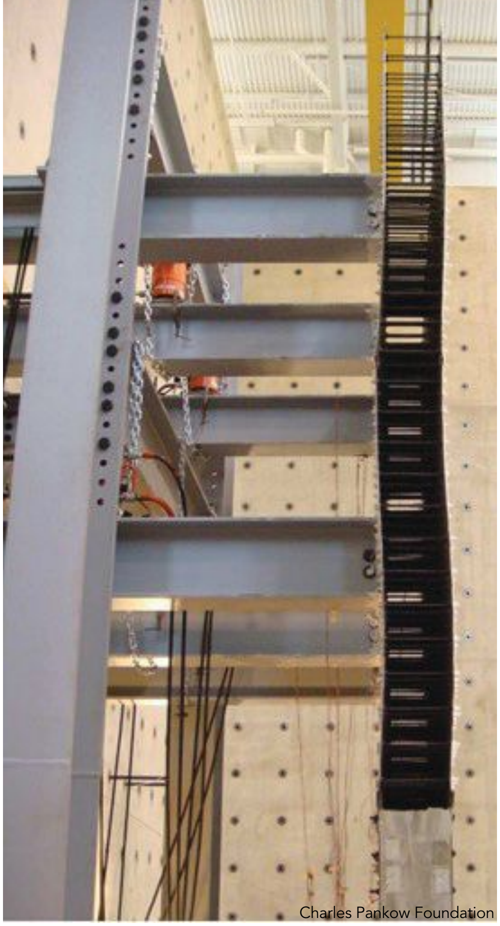


Fig. 8. A test specimen to calibrate tie bar spacing requirements for SpeedCore modules.

Fig. 9. A SpeedCore specimen being tested under combined elevated temperature and axial loading at Purdue University.

achieve a two-hour fire rating without any additional fire protection applied (bare steel). This also assumes an axial load ratio of less than 17% and a slenderness ratio of the wall less than 20. (A photo of one of the test specimens from this research is shown in Figure 9.) Note that the online version of this article will provide additional information on the other related Pankow-AISC projects.

Standardization

The research results have been used to develop design provisions for SpeedCore. For example, design specifications for composite-plate shear walls in non-seismic applications are included in the forthcoming 2022 *Specification for Structural Steel Buildings* (ANSI/AISC 360; the current version is available at **aisc.org/specifications**). The public review ballot issued in 2020 included structural design specifications in Chapter I and fire-resistant design provisions in Appendix 4. In addition, seismic design provisions for SpeedCore will be included in the 2022 *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341), also forthcoming. The public review ballot issued in 2020 included seismic design provisions for uncoupled SpeedCore in Section H7 and for coupled SpeedCore in H8. These provisions are also published as part of the National Earthquake Hazards Reduction Program (NEHRP) *Recommended Seismic Provisions for New Buildings and Other Structures* and are also in line for publication as part of ASCE 7-21, which includes the seismic design coefficients (R-factor, etc.) for coupled SpeedCore.

With all this work being done to get SpeedCore written into standards, you may be wondering if you can actually use SpeedCore for your next project? The short answer is yes. Beyond the Rainier Square Project, a recent project is underway in San Jose, and others are in the planning phases for construction on the east coast of America. In fact, SpeedCore has been approved by the New York City Department of Buildings for use in all boroughs of the city. Using the system will only get easier as the standards being updated continue to be published.

Design, Fabrication, and Erection Considerations

The benefits of using SpeedCore in commercial construction applications center around its speed of installation, which is rooted in its modular construction techniques. The ultimate goals with the aforementioned ongoing SpeedCore research and development work are to 1) develop clear specification language and design tools for engineers to efficiently design the system and 2) conduct further research that results in optimized fabrication techniques and details, efficient and constructable panel-to-panel splice details, and wall-to-foundation details that are simple to erect.

When it comes to specification language, there is some limited existing language in the current AISC *Seismic Provisions* for composite plate shear walls, but there is no language in the current AISC *Specification*. The intent of the proposed specification and provisions language is to provide the engineer with a systematic process for designing composite plate shear walls in both seismic and non-seismic applications.

In addition to these updates, an AISC Design Guide on SpeedCore is expected to be published this year. The guide will include specific design examples for composite plate shear walls—both seismic and non-seismic cases—and will also show scenarios using uncoupled walls and those using coupling beams in their design. The guide will also use the proposed specification provisions currently being balloted within the AISC *Specification* and *Seismic Provisions*.

From a fabrication and erection standpoint, SpeedCore does involve a learning curve. However, early involvement with a project's steel fabricator and erector will allow for most encountered concerns to be alleviated early on in a project. Items that should be considered and agreed upon early in a SpeedCore project include:

1. Layouts and placements of tie-bars either by welding, double-nuts, or other means and methods
2. Locations and methodology of completing splice connections in the field (welding versus bolted)
3. Modularization of panels—i.e., what can be reasonably be shipped to the site and handled in the field for erection (preferred module geometries)

4. If using a coupled wall system, an agreement on coupling beam layouts, geometry, and field installation requirements
5. Alignment with the authority having jurisdiction (AHJ) on any fire protection requirements
6. Wall-base-to-foundation connection. The interface between the base of a SpeedCore wall system to the building foundation can be complex and should be considered early in the design process with fabricator involvement when possible

Once some of these key items can be investigated and agreed upon by all relevant parties on a given project, a significant amount of optimization and speed can be realized for the project using the system. The core can then be detailed much like any other steel structure and the panels laid out and modeled so the fabricator can plan their fabrication sequencing.

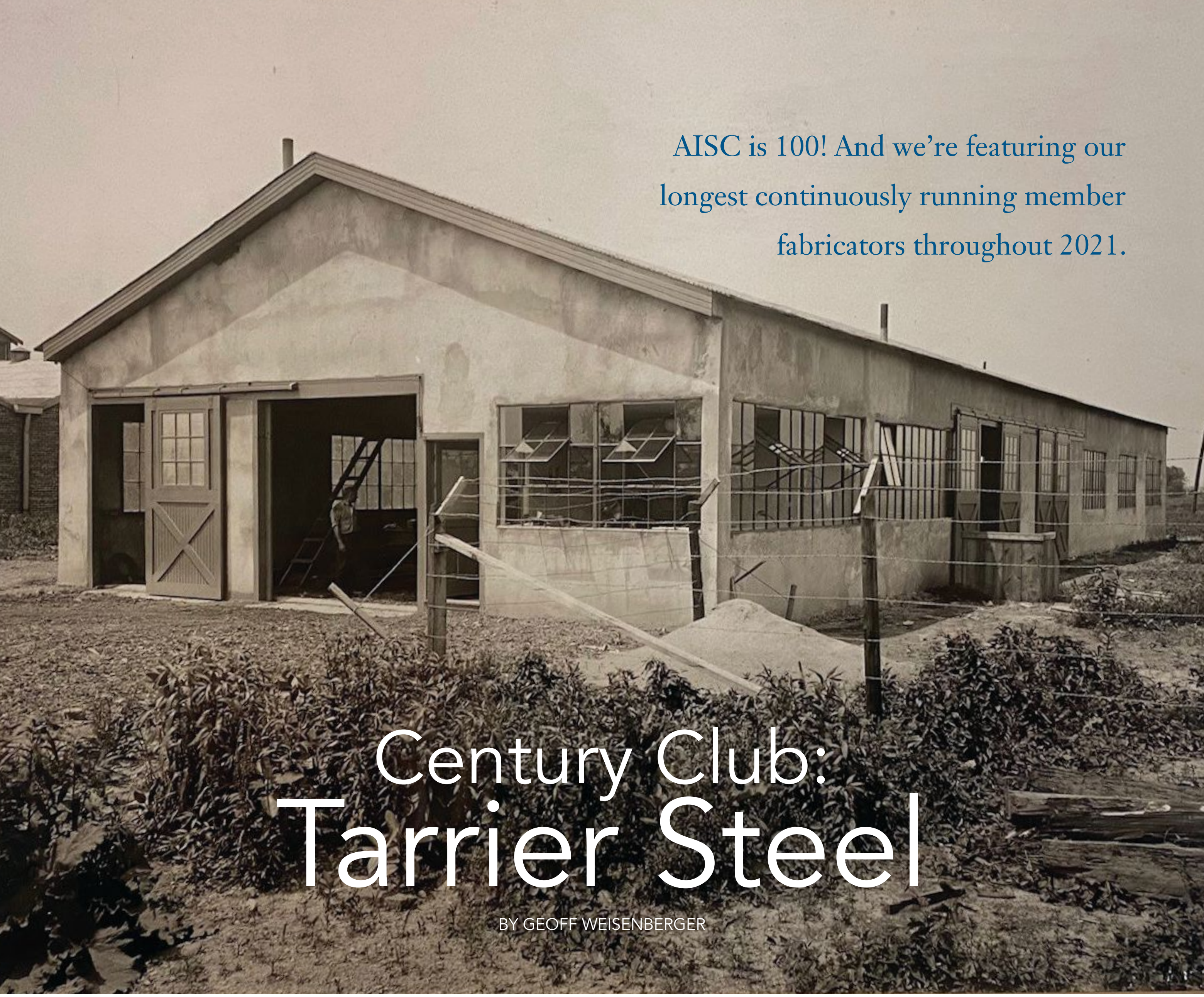
The Speed in SpeedCore

The most pronounced benefit to using SpeedCore is, of course, the potential construction schedule improvement it can bring when properly specified, fabricated, and erected. The Rainier Square project realized a 43% schedule improvement by going to the SpeedCore system compared to a traditional reinforced concrete core. This quantified to an overall multi-million dollar savings to the building owner.

To best gain schedule improvements using SpeedCore, as has been mentioned previously, early fabricator and erector involvement is critical. This involvement includes collaboration with the engineer of record (EOR) to align on key elements such as module arrangements, wall thicknesses, tie bar size and spacing, splice details, and erection aids that may be required.

When considering implementing the system on a given project, the potential schedule improvements should be communicated as the primary driver for using the system. This is important when comparing the system to a traditional cast-in-place reinforced concrete wall, which may come with a lower up-front cost but a much longer construction schedule. These increased schedule times with a traditional reinforced concrete wall system will impact other trades on-site, increase general conditions cost, and impact overall construction efficiency.

Future articles in this series will go into further detail on specific topics of interest related to SpeedCore, including seismic design, wind design, fire considerations, and fabrication and erection considerations. ■



AISC is 100! And we're featuring our longest continuously running member fabricators throughout 2021.

Century Club: Tarrier Steel

BY GEOFF WEISENBERGER

Geoff Weisenberger (**weisenberger@aisc.org**) is senior editor of *Modern Steel Construction*.

CELEBRATING 100 YEARS 1921–2021

IN CELEBRATION OF AISC turning 100, throughout the year we are highlighting member fabricators that are even older than we are.

This month's century clubber is **The Tarrier Steel Company**, a family-owned fabricator that was founded just after World War I.

Answers provided by Ben Tarrier, president of The Tarrier Steel Company:

How and when did your company start?

The Tarrier Steel Company was founded in Columbus, Ohio, by Fred Tarrier in 1919 after his return from World War I. The early years are not well recorded, but we have documents showing that Fred designed and fabricated some of the first steel joists. Four generations later, we have been able to maintain our status as a leading fabricator of structural steel in the central Ohio area, and we are still located on the same property.

Fred Tarrier, the company's founder.

above: Tarrier fabricated the steel for Marietta High School in Marietta, Ohio, seen here in 1965.

opposite page: The original Tarrier shop in 1921.

right: Ford Motor Company – Columbus Assembly Plant, also fabricated by Tarrier.

Your company has been able to weather challenges for over a century. How has this helped you weather the current pandemic?

Construction companies have to be flexible regardless of the situation. Our margins are so small and the risks so great that if you can't figure out a way to bend, then you will absolutely break. We like to react quickly but not so fast that we can't apply critical thinking and backward planning. The pandemic had a silver lining for us in that we were not set up for every office employee to work from home, and now we are. Instead of an employee having to use PTO because they have the sniffles, we have them work from home so they don't lose any time or come to work and get everyone else sick, and we don't lose any productivity. We strive to see how we can improve our processes when we're faced with a challenge.

What's the best advice you've received from past leadership at the company?

The biggest lesson that's been passed down is: Take care of our people and our people will take care of us. This applies to employees, customers, and vendors. We make every effort to do what's right, and we want companies and people we work with to do the same thing. There's no substitute for doing the right thing.

AISC turns 100 this year. How long has your company been involved with AISC?

We have been an AISC member since 2002 and became certified in 2009, and since then our production quality and output have gained tremendous ground because we have a quality manual we can refer to instead of simply "doing it the old way." It's not just a certification in order to gain access to bid on projects, it's an entire business transformation that gives everyone in the company a better understanding of quality standards and how the work is supposed to be performed. When we have a project or part of a project that we need to sub out to another fabricator, the first thing we do is look at the AISC list of certified members, even if the project doesn't call for an AISC fabricator. We want to know that the fabricator can maintain the level of quality that we are expected to adhere to. ■

above: The National Veterans Memorial Museum in Columbus, which opened in 1918. Tarrier fabricated the project's 400 tons of steel.

left: The 500 Neil Avenue office building in Columbus, for which Tarrier completed steel fabrication in 2020.

conference preview

THINKING INSIDE THE (BIG) BOX

BY SHELLEY R. CLARK, SE, PE, AND TRAVIS P. CORIGLIANO, SE, PE

Four insights for successfully repurposing anchor big box stores.

Shelley Clark (sclark@mka.com) is a senior principal and **Travis Corigliano** (tcorigliano@mka.com) is an associate, both with Magnusson Klemencic Associates.

LET'S FACE IT: America's retail sector is experiencing a host of profound challenges—from the ongoing and increasing shift from in-person to online shopping to the simple fact that the country is "over-retailed."

While the COVID-19 pandemic's economic impact is certainly another challenge, malls were already struggling prior to its onset; the pandemic just forced property owners to consider new development strategies sooner.

Hundreds of department stores—once anchor tenants at shopping malls across the country—have closed their doors forever. Typically, large anchor stores account for as much as 30% of a mall's square footage, and more than half of all mall-based department stores are estimated to close by the end of 2021. Across the country, this demise of the anchor store is having a large impact on the health of mall properties. A quarter of the 1,000-odd remaining U.S. malls now look likely to close in the next three to five years, according to Coresight Research.

Repurposing anchor stores that have gone dark offers a promising solution for the new retail landscape—but it's no simple task. While most anchor box stores may look the same from the street, the structural systems supporting those unadorned exteriors can vary drastically.

An understanding of the underlying structure is vital to informing the costs and design approaches for revitalizing these structures. Here are four key insights to consider when determining if a structure should be repurposed or torn down and rebuilt.

Assess the Existing Structural System

Answering the following questions can help property owners, developers, and design teams determine if a vacant big box store is a good candidate to be repurposed and redeveloped:

- Is the existing column grid spacing generally compatible with the planned use for redevelopment?
- Does the existing floor have the live-load capacity required for the planned future use? If not, can a simple strengthening method be applied to achieve the higher load required?
- Is the existing exterior wall a nonstructural façade element that can easily be removed and replaced (as opposed to a structural, load-bearing shear wall, which is part of the primary structure)?

In general, if two or more of these questions can be answered "yes," the structure should at least be considered for repurposing and redevelopment.

Understand the Advantages of Steel-Framed Buildings

Anchor boxes with beams and columns made of wide-flange steel often provide the easiest and most economical redevelopment opportunities. These buildings typically include steel lateral systems of braced frames or moment frames, which allow the exterior skin to be removed and replaced with no impact to the primary structure.

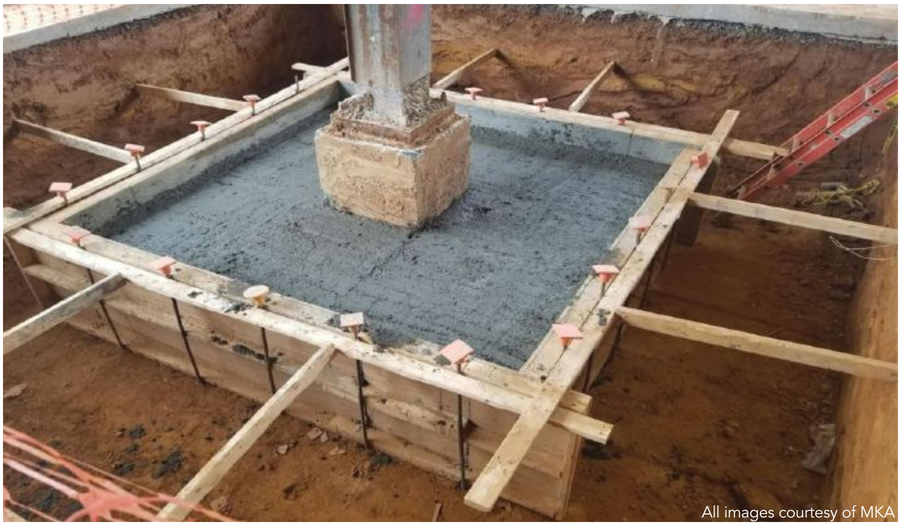
When wide-flange strengthening is required, increased capacity for individual members can often be provided by welding new steel elements to the existing framing. For projects looking to increase floor-loading capacity, consider the following:

- For composite wide-flange floors, welding steel plates or WT sections to the underside of the existing framing is often the most efficient way to provide increased bending strength.
- For non-composite sections, welding steel plates to the underside of the top and bottom flanges of the existing steel beams will typically provide the most efficient increase in bending strength.
- For column strengthening, attaching side plates to "box out" a column will provide a larger radius of gyration to allow for increased axial load or longer unbraced lengths.

When adding new floor openings in steel-framed buildings, it is important to evaluate whether there is sufficient ceiling space for an "underslung" beam. An underslung beam can be connected into existing framing (likely strengthened) before any existing structure is cut. With the underslung beam in place, the existing floor can be removed without any temporary shoring or impact to the floors below.

Recognize the Opportunity to Improve Concrete Buildings with Steel

It is common for anchor box stores built in the 1950s and 1960s to have exterior load-bearing walls supporting floors—whether mild flat slab, mild slab with beams, or hollow-core planks with concrete topping—made of concrete. While these buildings tend to have reserve capacities in their floors and walls, *understanding* those reserve capacities can be difficult without full and legible existing drawings that provide concrete design strengths along with reinforcing quantities and locations. Field tests can provide this information, but such tests can be time-consuming and costly.

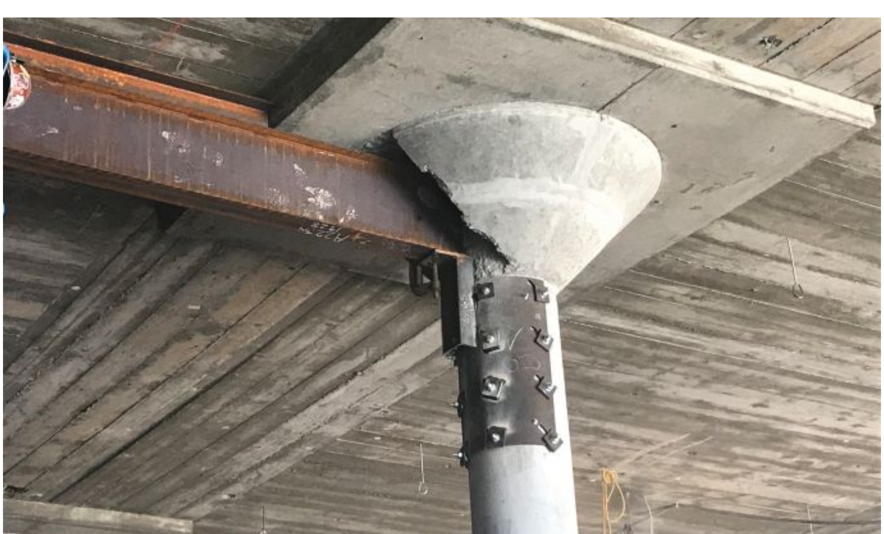


All images courtesy of MKA

Three examples of steel-framed buildings that have been structurally retrofitted.

A new underslung beam positioned beneath existing wide-flange steel framing.

above and below: A floor extension using new steel framing.



Once enough information is collected to determine the baseline strength of the concrete building, several techniques can be used to redevelop and repurpose these box building types—and rarely does the list include adding new concrete to the concrete box.

Fiber-reinforced polymer (FRP) added in the tension regions of the slab—typically underside of the middle of the bays and over the top of support locations—can enhance the distributed floor-load capacity. Alternatively, if there is enough head clearance, steel beams can be added underneath the existing slab to reduce the slab span lengths.

If redevelopment conditions require new and concentrated loads, floor openings, or floor extensions, FRP is not likely to be helpful. Instead, steel beams can be added below the slab to directly support the new conditions. With some creative detailing, the new steel beams can frame directly into the existing vertical concrete structure, eliminating the need for new columns and foundations.

Understand the Challenges of Open-Web Steel-Joist Buildings

When looking to retrofit big box stores built between the late 1960s and early 1980s, open-web steel joist (OWJ) floors are almost certain to be encountered, especially in the Southeast. In general, OWJ floors are structurally efficient but lack reserve capacity. Redevelopment and retrofitting challenges inherent in OWJ floors include:

- The actual OWJ elements are manufacturer-provided items, and their final designs are not often kept with other structural base building drawings.
- There are no guarantees OWJ-framed buildings have steel lateral systems. Rather, these structures are often supported by load-bearing exterior concrete masonry unit (CMU) walls.
- It is difficult to efficiently strengthen, cut, and reconfigure OWJs for new floor openings. New floor openings likely require peeling back all slab and OWJ framing to their nearest unaffected beam or girder and reframing full, new bays with wide-flange steel.

Speedier and Sustainable

While redeveloping and repurposing anchor big box stores can be complex and somewhat costly, many of these projects are generally faster to complete and more sustainable than tearing down an existing structure and building a new one. Early due diligence is required on the part of the structural engineer to help the project team decide up front whether the anchor box can be economically repurposed.

Will the future of mall properties be driven by designers thinking *outside* the box, tearing down existing structures and bringing whole new visions to life—or rather those who think *inside* the box, working to redevelop and repurpose existing big box stores that, while vacant today, can be reshaped with new purpose and potential tomorrow? ■

This article is a preview of the 2021 NASCC: The Steel Conference session "Rebuilding the Big Box." The conference takes place online April 12-16. For more information and to register, visit ***aisc.org/nascc****.*

Using structural steel to enhance OWJ framing for added load.

April 12–16, 2021

NASCC: THE *VIRTUAL* STEEL CONFERENCE

incorporating:

World Steel Bridge Symposium | QualityCon | Architecture in Steel
SSRC Annual Stability Conference | NISD Conference on Steel Detailing

2021 exhibitor list

Abrafast.com/ The Blind Bolt Co.
www.abrafast.com

Acrow Bridge
www.acrow.com

Advance Tools, LLC
Glenview, Ill.
ph: 630.337.5904
toll free: 630.634.5168
www.advance-tools.com
Advance Tools LLC is engaged into the distribution of "TORQMAN" professional power tools. Our production line covers extensively electric shear wrenches, torque wrenches, and special tools for heavy duty bolting in bridge construction, commercial steel structured buildings, and public infrastrure projects. A new product of battery powered shear wrench in on the way to the market in spring of 2021. We stay proudly on high product quality and commitment to 100% customer satisfaction.

AFF Design Services, Inc.
Dallas, Texas
ph: 214.712.8223
www.affsteel.com
AFF came into existence in 2008 with the goal of becoming a premier detailing and connection design company in Dallas, Texas. Connoisseurs in detailing and connection design, we work tenaciously to deliver efficient results. With an ideology to succeed, our team of project managers, detailers and connection design engineers circles their guidelines around the requirements of our customers. Our innovative and comprehensive detailing procedures help us identify issues; this enables us to maintain the project schedule. Our methods have been tested and are proven to give effective outcomes.

Agen – Robotic Structural Steel Assembler
Atakum, Samsun
Turkey
ph: 90.362.502.1416
www.abkaotomasyon.com
With the increased use of technology, using automation is becoming a must to meet the capacity/market needs. That's where we come in. We are your solution partner in making a permanent mark in your business. As Abka Automation Ltd., we design, manufacture, and integrate fully automated Industrial 4.0 robotic structural steel assembly lines. With the aid of industrial robots, your products are becoming error free and have high quality.

AGT Robotics
Trois-Rivieres, Quebec
Canada
ph: 819.693.9682
www.agtrobotics.com
AGT Robotics is an automation and robotics expert specialized in the metal industry. They also manufacture the BeamMaster Weld, a robotic welding line specially engineered to answer all the welding needs of structural steel fabricators. BeamMaster features a small footprint, complete robotic automation and integration with dedicated software. With its attractive prices, all sizes of fabrication shops can now consider solving their welding production issues with robotic welding.

AKYAPAK USA
Tampa, Fla.
ph: 813.351.7100
www.akyapakusa.com
One of the longest-established producer in Bursa, Akyapak celebrates its 59th foundation anniversary. Akyapak proudly exports metal-bending, drilling, cutting machines and welding solutions to 110 countries in six continents and delivers high quality from Turkey to the world. Akyapak is a source of pride to Bursa and Turkey with its total 350,000 sq. ft covered technological manufacturing facilities. Akyapak, established in 1962 in Bursa, is continuing to shape technology in Turkey and the world with its 370 qualified and experienced staff. Akyapak has taken new steps to reinforce its strong image all over the world.

Allegheny Coatings
Ridgway, Pa.
ph: 814.772.3850
www.alleghenycoatings.com
Allegheny Coatings is a premier metal protection applicator, providing zinc flake, zinc plating, zinc nickel plating, and related finishes. The company has locations in Pennsylvania and Indiana, stretching across the Eastern and Midwest U.S. Allegheny Coatings uses rack spray, dip spin, and electroplating processes to apply its coatings.

Allied Machine & Engineering
Dover, Ohio
ph: 330.343.4282
toll free: 800.321.5536
www.alliedmachine.com
Allied Machine & Engineering is a leading manufacturer of holemaking and finishing tooling systems. Allied devotes its advanced engineering and manufacturing capabilities to creating the widest selection of value-added tooling available to metal-cutting industries around the world. Our tooling solutions deliver the lowest cost-per-hole in a wide range of drilling, reaming, threading, boring and burnishing applications. Precision engineering and expert application support make Allied the first and best choice for solving complex metal-cutting challenges.

American Galvanizers Association
Centennial, Colo.
ph: 720.554.0900
www.galvanizeit.org
The American Galvanizers Association (AGA), headquartered in Centennial, Colo., is a not-for-profit trade association dedicated to serving the needs of specifiers, architects, engineers, contractors, fabricators, and after-fabrication hot-dip galvanizers throughout North America. Since 1933, the AGA has provided information on the most innovative applications and state-of-the-art technological developments in hot-dip galvanizing for corrosion protection.

American Institute of Steel Construction (AISC)

Chicago, Ill.
ph: 312.670.2400
www.aisc.org

The American Institute of Steel Construction (AISC) is a non-partisan, not-for-profit technical institute and trade association whose mission is to make structural steel the material of choice by being the leader in structural-steel-related technical and market-building activities, including specification and code development, research, education, technical assistance, quality certification, standardization, market development, and advocacy. AISC represents the total experience, judgment, and strength of the entire domestic industry of steel fabricators, distributors, and producers.

American Punch Company

Euclid, Ohio
ph: 216.731.4501
toll free: 800.243.1492
www.americanpunchco.com

The American Punch Company is the leading manufacturer of high-quality punches, dies, and shear blades for metalworking and structural steel fabrication. In addition, the company supplies precision tooling and custom die components to the stamping, roll forming and metalforming industries. American Punch is proud to be ISO-certified, demonstrating a high level of commitment to quality in manufacturing and customer service. Quality tooling combined with superior customer service make American Punch the right choice for your tooling needs.

AMPP

ph: 281.228.6200
www.ampp.org

The Association for Materials Protection and Performance, AMPP, is the world's leading organization focused on the protection of assets and performance of materials. AMPP was created when NACE International and SSPC united after more than 145 combined years of corrosion control and protective coatings expertise, and service to members worldwide. AMPP is active in more than 130 countries and has more than 40,000 members.

Anatomic Iron Steel Detailing

North Vancouver,
British Columbia
Canada
ph: 604.841.0555
www.anatomiciron.com

Anatomic Iron Steel Detailing specializes in complex structural steel detailing, design-detailing, connection design, design consulting and 3D modeling. We operate both Tekla and SDS2. We also complete steel erection animations and 3D rendering. Our team oriented approach with our staff and clients has resulted in an outstanding track record of completing high profile complex projects accurately and on time. With over 150 staff, we can detail over 10,000 tons of structural steel per month. Please review our website at www.anatomiciron.com or call 604.779.3800 to discuss our project history.

Applied Bolting Technology, Inc.

Bellows Falls, Vt.
toll free: 802.460.3100
www.appliedbolting.com

We make Direct Tension Indicators, i.e., load cells, that assure compliance with bolting standards and specs. Torque, Turn of Nut, and TCs can all produce false positive tension, and regularly do: Torque scatter is ±40%, for new bolts, and worse for weathered. Relying on torque is optimism, at best. TCs are torque bolts that are adversely affected by cold or wet weather. Turn of Nut can be defeated by mispresenting turn angle, regardless of turn applied. DTIs read load. If a bolt is tight, a DTI will show it, independent of weather, torque, angle, tool, or skill.

ArcelorMittal International

Chicago, Ill.
ph: 312.899.3051
www.arcelormittal.com

ArcelorMittal is the leading supplier of quality steel products in all major steel markets, including construction. Signature products, like our HISTAR® (ASTM A913) steel, have been integral to numerous iconic structures, including One World Trade Center, 150 North Riverside, Mercedes-Benz Stadium, and SoFi Stadium. Through our world-class R&D team and outstanding distribution network, we offer innovative, competitive, and sustainable solutions that have led to several industry firsts, such as the 80-ksi rolled-steel shapes supplied in Chicago's Union Station Tower.

Atema, Inc.

www.atema.com

Atlas Tube, a division of Zekelman Industries

Chicago, Ill.
toll free: 800.733.5682
www.atlastube.com

Depend on Atlas Tube for steel hollow structural sections (HSS) and answers to all your design and shipment questions. We manufacture the largest size range with the best availability in the industry for all products: ASTM A500, A1085, A513 and A252; CSA G40.21 Class C and Class H; jumbo sizes; and Epox Z Kote® powder-primed tubing. As a division of Zekelman Industries, we're doing our part to MAKE IT eZ. Ask us about the world's largest ERW Continuous Mill coming to Blytheville, Arkansas in 2021.

Automated Layout Technology, LLC
Hudson, N.H.
ph: 603.402.3055
www.automatedlayout.com
Automated Layout Technology is the maker of the Lightning Rail, the first automated marking machine created specifically for the layout of stairs and hand rails. The Lightning Rail works with DXF files to quickly and accurately print an entire stair stringer or rail in minutes saving hours of labor. The fully automated CNC machine takes your design and prints the entire work piece on a rigid steel frame table in any configuration including rails, pickets, hangers and more. Easily place channels on the table for the automatic layout of stair stringers.

Axis Virtual Construction
Lehi, Utah
ph: 801.734.6410
www.axissteel.com
Axis Steel Detailing is now Axis Virtual Construction. Axis Virtual Construction applies cutting edge BIM solutions to build complex steel structures. They specialize in structural steel detailing, 3D laser point scanning, full BIM solutions, engineering, connection design, and expert consulting. Their past projects have won six North American Modeling Awards, four Tekla Model Awards, three AISC IDEAS^2 Merit Awards, and 20-plus features in industry publications and magazines.

AZZ Metal Coatings
Fort Worth, Texas
ph: 817.810.0095
www.azz.com
AZZ Metal Coatings, a division of AZZ Incorporated, headquartered in Fort Worth, Texas, owns and operates 40 hot dip galvanizing plants strategically located across the U.S. and Canada. With kettles ranging from 16 ft. to 62 ft. in length, we can easily handle a wide variety of material sizes. With our network of plants we are able to accommodate the largest projects with customized turnaround time at a competitive price.

Baco Enterprises, Inc.
www.bacoent.com

Beamcut Systems/ Machitech Automation
St. Louis, Mo.
toll free: 833.232.6288
www.beamcut.com
Automate your structural steel fabrication and eliminate costly mistakes with BeamCut, an industry-leading robotic plasma cutting system that integrates advanced FANUC robotics and easy-to-use 3D simulation software with Hypertherm's XPR300 plasma systems. We're masters of automation and we've designed this remarkable machine to help structural steel fabrication companies across the world substantially improve productivity, profits, safety and on-time deliveries. Beamcut is a member of the Machitech Automation group with 20 years of dedicated experience, 1,500+ machines in service worldwide and 98% customer referral.

BEAMCUT SYSTEMS™

Bend-Tech Dragon
Osceola, Wis.
ph: 651.257.8715
www.bend-tech.com
Bend-Tech products are at the forefront of designing and fabricating tube and pipe. The Bend-Tech Dragon is the essential production machine for any company that produces handrail or other miscellaneous metals. The Dragon accurately and efficiently plasma cuts round, square, rectangle, angle, and channel tubing. The Bend-Tech Dragon also accurately marks bend locations/rotations and part numbers. With over 27,000 customers Bend-Tech Software has reduced production time and material waste for companies since 2001.

Bentley Systems, Inc.
www.bentley.com

Birmingham Fastener
www.bhamfast.com

Birmingham Rail & Locomotive
www.birminghamrail.com

Blair Corporation
www.blairwirerope.com

Bluebeam Inc.
www.bluebeam.com

Brown Consulting Services, Inc.
Houston, Texas
ph: 281.260.9749
www.steelconnectiondesign.com
Professional structural engineering firm specializing in connection design calculations and shop drawing supervision for structural steel, steel stairs and miscellaneous steel projects. Licensed in 46 states and the U.S. Virgin Islands, Brown offers additional services including: structural design, forensic engineering, expert witness testimony, light-gauge steel calculations, project pricing and quick turnaround. Contact: sales@brownfirst.com. Make Brown Your Engineering Connection.

Brown Strauss Steel
www.brownstrauss.com

Bull Moose Tube Company
Chesterfield, Mo.
ph: 636.537.2600
toll free: 800.325.4467
www.bullmoosetube.com
Creating value for customers across a variety of fields, through manufacturing, engineering, and support services of exceptional strength. Bull Moose produces Hollow Structural Sections (HSS) from 2 in. square to 12 in. square and corresponding rectangles. Charpy V-Notch HSS available in wall thickness up to 0.625 in. Largest Metric HSS producer in North America. HSS available in additional yield strengths of 70, 80, 100, and 110 KSI. HSS available in ASTM A500, A847 (weathering grade), A1085, and EN 10219.

BULL MOOSE®

CADeploy, Inc.
San Ramon, Calif.
ph: 408.375.9200
toll free: 855.444.9497
www.cadeploy.com
CADeploy, Inc. (ISO 9001:2015) is a California corporation and member of AISC, NISD, MBMA, and ACI. We offer steel engineering, steel detailing, estimation services (Structural Steel/PEMB/Rebar), and as-built services and HSE studies (oil and gas) to 400+ clients spread across the globe. Our team of 1,000+ engineers specializes in structural and miscellaneous projects across industrial, commercial, residential, and other industries. We work on TEKLA, SDS2, Advance Steel, AutoCAD, RebarCAD, Revit, PDS, PDMS, and other widely used platforms. We have completed more than 3,200+ projects on time with 100% quality.

cadeploy
because quality matters

CAMBCO, Inc.
www.cambcoinc.com

Carhartt, Inc.
www.carhartt.com

Cast Connex Corporation
New York, N.Y.
ph: 647.725.1446
www.castconnex.com
Cast Connex is the supplier of connection solutions for structural steel, including brace end connectors for use in SCBF (High Strength Connectors), sculpted clevis-type connectors and tapers for AESS (Universal Pin Connectors and Architectural Tapers), high-ductility yielding connectors for use in the retrofit of seismically deficient structures (Scorpion Yielding Connectors), and cast steel fittings that enable unobtrusive field bolted splices (Diablo Bolted Splice). Cast Connex also designs and supplies custom cast steel structural nodes for use in building and bridge structures.

Cerbaco, Ltd.
Warrington, Pa.
ph: 908.996.1333 ×1
www.cerbaco.com
Cerbaco's line of 500+ configurations of nonmetallic weld backings permit finished-quality, full-penetration welds from one side. For use with structural steel, shipbuilding, pipeline, pressure vessel, and tank manufacturing. Backings work with MIG, TIG, Stick Electrode, Sub Arc, and Flux Core welding processes to weld carbon and alloy steel, stainless, and aluminum. Where one-sided welding is not desirable, backings eliminate arc gouging or heavy grinding prior to second-side welding.

CERBACO LTD.

Charlie Irwin Painting, LLC (CIP)

Franklin, Tenn.
ph: 615.790.8822
www.cipaint.com
CIP-Charlie Irwin Painting, LLC, is dedicated to providing the best commercial painting, industrial sandblasting and painting and fireproofing the Nashville area has to offer. In business since 1984 and located just south of Nashville, we are a locally owned and operated business. We specialize in commercial painting, sandblasting, industrial painting services and fireproofing. Mission statement: coating the construction industry with quality, excellence and integrity while empowering our employees and honoring Christ the Lord. Core values: quality, excellence, integrity, relationships, dependability.

Chicago Clamp Company

Broadview, Ill.
ph: 708.343.8311
www.chicagoclampcompany.com
Chicago Clamp Company provides an innovative method for framing roof openings and supporting rooftop loads with no welding or drilling. This standardized method for connecting joists and beams allows structural engineers to focus on load distribution rather than attachment apparatus or welding concerns. With up to 4,000-lb capacity per system, it is ideal for the safe and economical framing and installation of rooftop units, sky lights, exhaust fans, and vents.

Chicago Metal Rolled Products

Chicago, Ill.
ph: 773.523.5757
toll free: 800.798.4504
www.cmrp.com
Curving every size of angle, bar, channel, tee, and beam up to W44335# the hard way (x-x axis) on the world's largest beam bender. Tube and pipe bending up to 30 in. OD. Rectangular tubing up to 20×20 in. Low-deformation, thin-wall bending. Single radius bending in one plane, as well as off-axis and multi-axis bends; multi-radius bends; true, helical coils; and plumb, circular stair stringers. Hard way, easy way, and every way in between. Plate rolling up to 2 in. × 12 ft and 1 in. plate × 20 ft wide. High-accuracy straightening of beams and tees. Induction Bending of pipes up to 12 in. OD.

Cleveland City Forge

www.clevelandcityforge.com

Cleveland Punch & Die Co.

Ravenna, Ohio
ph: 330.296.4342
toll free: 800.451.4342
www.clevelandpunch.com
Cleveland Punch & Die Company is the World Leader in manufacturing punches, dies and shear blades in the steel industry. All of our products are proudly manufactured in the U.S. Original Equipment Manufacturers continue to trust and recommend our products to meet and surpass our customers expectations for all steel applications. Our customers continue to trust and rely on the most experienced and friendly engineering and customer service support team in the industry. We are proud of our 141 Years of Quality, Experience and Tradition. Customer Service Hours: 7:00 a.m.–6:00 p.m. EST, sales@clevelandpunch.com.

Color Works Painting, Inc.

New Castle, Del.
ph: 302.324.8411
www.colorworkspainting.com
Color Works Painting, Inc. is an enclosed SSPC-QP3 certified shop. Celebrating over 28 years of experience and knowledge in blasting and high-performance coatings! CWP offers capabilities to handle massive structures, Duplex Systems, AESS-4, DOT, and bridge projects. What's more, they staff NACE Level 3 QC inspectors, guaranteeing your project meets specifications. Their safety record is impeccable—receiving nine consecutive National Pinnacle Awards! No downtime keeps projects progressing with ease. Moreover, CWP offers their own fleet delivery services and access to nearby Port and Rail services.

ColorWorks PAINTING, INC.
The Blasting & Coatings Experts

Columbia Safety and Supply

Atlanta, Ga.
ph: 800.969.5035
www.colsafety.com
Columbia Safety and Supply is North America's Premier Outfitter of safety gear, contractor equipment, and industrial supplies. We are fall protection experts and we're here to help you find exactly what you need to be safe and productive. Our Gear Experts combine industry knowledge with professional experience. We service a variety of industries, including steel construction, road and bridge construction, manufacturing, oil, gas, wind energy, and more. We carry thousands of products from the world's best manufacturers. Be Safe, Do More, with Columbia Safety and Supply!

ComSlab

www.comslab-usa.com

Consolidated Pipe & Supply Company

Birmingham, Ala.
ph: 205.323.7261
toll free: 800.467.7261
www.consolidatedpipe.com
Our Piling and Structural Division offers a complete inventory of carbon steel structural pipe, H-Pile, sheet pile, and piling accessories. We also offer piling fabrication at our yards and a full line of coating services from our in house coating plant. We pride ourselves on understanding and servicing our customer's needs on time and at competitive prices. Consolidated Pipe & Supply has several divisions including: structural/piling, line pipe, utilities, industrial, and nuclear. Please visit our website or contact us for more information on our products and services.

Controlled Automation, Inc.

Bryant, Ark.
ph: 557.557.5109
www.controlledautomation.com
Controlled Automation is a customer-driven company specializing in the design and manufacture of superior fabricating equipment. Our mission, as a team, is to strengthen and grow through the success of our customers while offering them constant respect, gratitude, and a quality product. Along with new machinery, we offer material handling systems to compliment each of our machines. All machines, software, and controls are designed, manufactured, and supported entirely in the United States.

Controlled Automation

CoreBrace, LLC

West Jordan, Utah
ph: 801.280.0701
www.corebrace.com
CoreBrace buckling-restrained braces (BRBs) are a cost effective solution to improve the seismic performance of structures. This highly ductile system has been used in hundreds of projects for earthquake risk mitigation. CoreBrace's expert staff works closely with owners, architects, engineers, fabricators, and erectors to meet their design and construction requirements and is committed to providing braces to the highest level of quality. Our latest research has focused on sustainable and resilient designs of structures in high seismic zones.

COREBRACE®
SUPERIOR SEISMIC PERFORMANCE

CSC – Canam Steel Corp.

Point of Rocks, Md.
ph: 301.874.5141
toll free: 800.638.4293
www.cscsteelusa.com
Canam Steel Corporation (CSC) is a service oriented manufacturer of open web steel joists and steel deck that services the entire U.S. via our six manufacturing facilities. We are a company that prioritizes safety and efficiency of the entire process for both our employees and our customers. We believe in the power of partnerships and the need for flexibility throughout the process for all of our partners. Our projects range from the small retail store at a local strip mall to some of the largest distribution centers, high-rises, schools and stadiums. We are a participating member of both the SJI and SDI.

CSC
CANAM STEEL CORPORATION

Cutting Edge Steel & Stair
Dacono, Colo.
ph: 303.651.3180
www.cesteel.com
At Cutting Edge Steel, we have the knowledge and expertise to provide an affordable solution to all of your project stair and rail needs. We are your one-stop solution. Our specialty includes work across North America of architectural, commercial and service class stair and rail products. CES offers "Pre-Engineered" systems when applicable or can work with clients who envision a one off product for true uniqueness. Depending on scope and location CES can also provide a complete miscellaneous steel package. Please call to discuss the needs of your next project.

CWB Group
www.cwbgroup.org

DACS, Inc.
www.dacsinc.com

Daito Seiki Co., Ltd.
Elk Grove Village, Ill.
ph: 847.437.6788
www.daitousa.com
DAITO is focused on metal cutting, drilling, and plasma cutting machines and has become the most technologically advanced machine producer in its field. Along with being the world's top manufacturer in its field, DAITO is geared toward customer satisfaction by supporting our customers with our knowledgeable and responsive sales, applications, and our sales personnel.

Dale Fastener Supply
www.dalecompany.com

Damptech USA
www.damptech.com

Danny's Construction Company, LLC
Shakopee, Minn.
ph: 952.445.4143
toll free: 877.451.9627
www.dannysconstruction.com
Danny's Construction Company is a leader in the steel erection industry because we recognize and embrace the uniqueness of each project and strive to provide innovative and creative methods for erecting structures of varied sizes, functions, locations and difficulty. The successful construction of any building, bridge or arena is only as strong as the erection plan and its execution, and we work tirelessly to offer solutions to the structural challenges presented on each job site (WBE).

DBM VirCon
Tempe, Ariz.
ph: 480.615.1700
www.dbmvircon.com
We make design constructable. DBM Vircon is a premier construction modeling, detailing and digital engineering company. With our vast experience, we help our market leader customers including owners, engineers, EPCM firms, general contractors and fabricators build with confidence across the globe. Our proven methods and preconstruction collaboration platforms help our clients compress schedules and mitigate cost overruns by proving design constructable and complete.

Delta Steel, Inc.
Houston, Texas
ph: 713.635.1200
toll free: 800.324.0220
www.deltasteel.com/
Delta Steel, Inc. is a customer oriented company, striving to build long lasting and mutually profitable customer relationships. We are committed to continuous improvement in our service, in our products, in safety and in our personnel. We emphasize professional and ethical business dealings with customers, suppliers and employees. Formed in 1963, Delta Steel is a subsidiary of Reliance Steel & Aluminum Co. Delta Steel is one of the largest steel service centers in the southwest United States serving industrial, commercial as well as OEM markets.

DGS Technical Services, Inc.
Elgin, Ill.
ph: 630.539.8200 ×5204
toll free: 630.539.8200 ×5202
www.dgsts.com
DGSTS is a Quality-Focused Engineering services enterprise, providing end-to-end solutions in engineering design and structural domains, based out of Elgin, IL (U.S.). We are an AISC, NISD, QPP & ISO 9001:2015 Certified company with over 800+ engineers. We have presence with offices in North America, Canada, United Kingdom, Bangladesh, and India. We have Certified American P.E. and technical PMs with over 35+ years of experience located in the U.S. We use smart software like Tekla, SDS2. All our teams are specialized in detailing steel structures, bridge detailing, connection design, and estimation.

Dlubal Software, Inc.
Philadelphia, Pa.
ph: 267.702.2815
www.dlubal.com
Dlubal offers powerful programs for structural and dynamic analysis of multiple materials including steel, concrete, aluminum, timber, CLT, glass, cables, and fabric form-finding per the USA/International standards. The 3D FEA program RFEM efficiently and accurately performs non-linear analyses of member, plate and solid elements. RFEM is one of the most highly sophisticated yet user-friendly programs especially suitable for new users with its intuitive modeling work flow. Experience why more than 5,000 companies and universities worldwide trust in Dlubal Software.

DOT Quality Services
www.dotqs.com

DuraFuse Frames
West Jordan, Utah
ph: 801.727.4060
www.durafuseframes.com
DuraFuse Frames are the ideal moment-frame and dual-frame solution for all building types in all seismic design categories, making them the most versatile SMF/IMF system on the market. DuraFuse Frames are fully compliant with the performance requirements in the AISC *Seismic Precisions for Structural Steel Buildings* (ANSI/AISC 341) with code approval from IAPMO UES ER 610, including 2018 IBC, 2019 CBC, and LA Supplement. Instant benefits include overall costs savings, elimination of seismic bracing, smaller protected zones, larger open spaces, and outstanding resilience.

EDSCO Fasteners
www.edsco.com

Ercolina – CML USA, Inc.
Davenport, Iowa
ph: 563.391.7700
www.ercolina-usa.com
CML USA, Inc. is the North American supplier of Ercolina tube, pipe and profile bending and metalworking machinery. CML has experienced sales, service and support staff ready to offer positive application solutions for today's fabricator. Ercolina's affordable tubing benders and fabricating machinery reliably and accurately produce your applications increasing profit and improving product quality and finish.

Exact Detailing
www.exactdetailing.com

Fabreeka International, Inc.
www.fabreeka.com

FACCIN U.S.A., Inc.
Fairhope, Ala.
ph: 833.611.3676
www.faccin.com
FACCIN Group is a leading global metal forming machine manufacturer that provides a wide range of plate rolls, angle rolls, dished heads line and special machines. FACCIN Group is the sole proprietor of FACCIN – ROUNDO and BOLDRINI brands. The FACCIN & ROUNDO solutions are suitable for bending different type of profiles (standard and non-standard) at very tight diameters and strict tolerances. Wide range of accessories and CNC controls are available with the aim to increase precision and productivity. FACCIN & ROUNDO angle rolls are the best solution for your next future challenges!

FICEP Corporation

Forest Hill, Md.
ph: 410.588.5800
www.ficepcorp.com

Ficep Corporation is currently the largest manufacturer of structural steel and plate fabrication systems and software. Ficep offers over 100 different CNC systems to achieve the optimum solution to any specific fabricators application. In addition to the different CNC work centers, Ficep totally integrates custom designed material handling systems for Intelligent Steel Fabrication without the requirement for multiple operator involvement.

Fontana Fasteners, Inc.

Frankfort, Ind.
www.acument.com/brands/le-usa

Fontana Fasteners, Inc., a Fontana Gruppo company, produces LE USA® fasteners and provides customers with high-quality cold-formed fasteners produced from steel melted and rolled exclusively in the U.S. In fact, Fontana Fasteners Inc. is the only North American full-service manufacturer and provider of structural bolts, nuts, washers, and TC assemblies.

Freedom Tools, LLC

www.freedomtoolsllc.net

GERB Vibration Control Systems

Lisle, Ill.
ph: 630.724.1660
toll free: 888.454.GERB
www.gerb.com

With a company history of over 100 years, GERB is dedicated to vibration and seismic control of buildings, tall structures, rail trackbeds and large machinery (e.g. emergency generators etc.). GERB Tuned Mass Dampers (TMDs) in particular are used worldwide for the vibration control of pedestrian and wind induced vibration of long-span and slender structures (e.g. floors, bridges, skyscrapers, etc.). GERB systems are based on well-established physical principals using elastic elements and the VISCODAMPER, a viscous fluid dashpot/damper that is frictionless and can work at very low amplitudes.

Gerdau

Tampa, Fla.
ph: 800.367.8144
toll free: 800.237.0230
www.gerdau.com

Gerdau Long Steel North America (GLN) manufactures structural steel, piling, rebar, merchant bar, and special bar quality products for the agricultural, automotive, civil construction, distribution, energy, industrial, and mining markets. GLN operates seven mills in the United States and three in Canada, and is a wholly owned subsidiary of Gerdau S.A.

Girder-Slab Technologies, LLC

www.girder-slab.com

GIZA

St. Louis, Mo.
ph: 314.656.4615
www.gizasteel.com

GIZA is a connection design software that covers more than 400 different connection types in the shear, moment, vertical brace, horizontal brace and splice categories. Compliant to AISC 14th, 15th editions—ASD and LRFD methods, GIZA provides a comprehensive set of calculations with references to all applied codes. We offer integration with Tekla Structures and Tekla Structural Designer but can also be used as a standalone option. GIZA has been in use for over nine years and has successfully designed thousands of connections on thousands of projects over that time. Try it yourself free for 15 days!

Graitec
Houston, Texas;
Montreal, Quebec
Canada
toll free: 800.724.5678
www.graitec.com

GRAITEC (1986), Autodesk Partner and Authorized Training Center, is a long-standing software developer of design, simulation, fabrication and management solutions for the steel industry. Our extensive range of CAD and BIM software combined with the Autodesk portfolio (Revit, Advance Steel) are used by structural engineers and detailers worldwide. With 48 offices in 13 countries, North American customers can count us for all their needs: implementation, customization, training, workflow optimization and technical support. Ask about Advance Workshop, Advance Design Connection & Opentree.

Grating Fasteners
Harvey, La.
ph: 504.361.3471
toll free: 800.227.9013
www.gclips.com

Grating Fasteners specializes in producing the G-Clip line of grating fasteners. G-Clips are used to attach grating to structural members using simple hand tools. The entire G-Clip line of fasteners are noted industry-wide as being a cost-effective, fast, and dependable way to fasten grating.

Greenbrook Engineering Services
www.greenbrookengineering.com

GRM Custom Products
Conroe, Texas
ph: 936.441.5910
www.grmcp.com

For over 60 years, GRM Custom Products has worked with engineers, steel fabricators, and contractors to provide customized high-quality industry and project-specific solutions on a wide variety of construction projects. As the exclusive fabricator of Fluorogold Slide Plates in North America, we manufacture our products to meet your project's specifications and schedule. FRP Wear Pads and structural components are an alternate solution to steel in corrosive environments. With our experience in manufacturing structural components, we can help your project using a variety of materials.

Grupo Cano
www.grupocano.com.mx/home

Haydon Bolts, Inc.
www.haydonbolts.com

Hercules Bolt Company
www.herculesbolt.com

Hexagon
Houston, Texas
ph: 281.890.4566
www.hexagonppm.com

Hexagon is a global leader in software, design, project performance, and autonomous solutions that boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications. We empower our clients to transform unstructured information into a smart digital asset to visualize, build, and manage structures and facilities of all complexities, ensuring safe and efficient operation throughout the entire lifecycle.

Holloway Steel Services
Saginaw, Texas
ph: 817.232.8663
toll free: 800.869.8663
www.hollowaysteelservices.com

Holloway Steel Services—we specialize in structural steel rolling, plate rolling, ASME code vessels, shop fabricated tanks and custom plate cutting Holloway Company provides tube bending, bending of pipes, bar bending, beam bending, structural steel bending and plate rolling for OEMs and construction projects. We feature fabrication of structurally formed alloys, including tank manufacturing, plate rolling, angles, bars, bricklintel, pipe and tubes.

HRV Conformance Verification Associates, Inc.
Moon Township, Pa.
ph: 412.299.2000
www.hrvinc.com

Leading experts in materials QA/QC inspection, coatings inspection, NDT, and CM/CI focused on transportation, rail and transit, oil and gas, power, commercial, and water/wastewater markets, with the capacity to provide AWS CWI, NACE, SSPC, ACI, PCI, and API inspections in materials fabrication plants and on project sites. We excel by maintaining high standards of technical training, leveraging deep industry knowledge and experience, practicing ethical conduct, applying innovative technologies, and communicating openly with our clients. We are Quality. Assured.

Hypertherm Inc.
Hanover, N.H.
ph: 603.643.3441
toll free: 800.643.0030
www.hypertherm.com

Hypertherm designs and manufactures industrial cutting products for use in a variety of industries such as shipbuilding, manufacturing, and structural steel. Its product line includes cutting systems, in addition to CNC motion and height controls, CAM nesting software, robotic software and consumables. Hypertherm systems are trusted for performance and reliability that result in increased productivity and profitability for hundreds of thousands of businesses worldwide.

HYTORC
Mahwah, N.J.
ph: 201.512.9500
www.hytorc.com

HYTORC makes industrial bolting safer and simpler. With over 50 years of experience focused entirely on developing the highest quality industrial bolting systems, HYTORC is the most trusted name in the industry. From steel mills and mining equipment to refineries, power plants, and wind turbines; we have developed solutions for every bolting application imaginable. For custom projects, our highly experienced engineering team is at your service to design the most efficient solution for your job with simple operation and economical pricing in mind.

IAPMO Uniform Evaluation Service
www.uniform-es.org

IDEA StatiCa
Brno
Czech Republic
ph: 420.725.078.287
www.ideastatica.com

IDEA StatiCa Connection is a revolutionary software for structural design of steel connections/joints. It is based on a new CBFEM method and allows structural engineers to design and check connections of all topologies in minutes. IDEA StatiCa is improving workflow of engineers all around the world by linking to FEA and CAD software they use.

IKG
www.ikg.com

Infasco / Ifastgroupe
www.infasco.com

Informed Infrastructure
www.informedinfrastructure.com

InfoSight Corporation
Chillicothe, Ohio
ph: 740.642.3600
toll free: 800.642.3600
www.infosight.com

"We Barcode Difficult Stuff" is InfoSight's promise to our customers to provide unique, value-added products and services that reduce risk and cost and increase efficiency and safety. Our metal tags and LabeLase® laser printers are the best and most durable identification and traceability solutions on the market. KettleTag®PLUS, ShotTag™, and PaintTag™ are the go-to laser printed metal barcoded tags used by galvanizers and fabricators. Our ever-growing selection of metal tags and laser printers is driven by our dedication to satisfy the unique needs of our customers.

Infra-Metals Co.

Langhorne, Pa.
ph: 215.741.1000
toll free: 800.899.3432
www.infra-metals.com

Infra-Metals Co. is one of the largest structural steel service centers in the United States. We are well-positioned to satisfy your needs in New England, Mid-Atlantic, Midwest, Southwest and Florida. As a subsidiary of a leading international company, Infra-Metals is provided with secure financing and has a strong commitment to steel distribution and processing. Infra-Metals offers unparalleled service with on-time delivery and a substantial lineup of processing equipment. Anyone can quote a price, Infra-Metals can quote it from stock.

INFRA-METALS

International Design Services, Inc.

St. Louis, Mo.
ph: 314.872.1791
www.ids-inc.net

IDS is committed to delivering the highest quality of detailing and connection design services. Our over 600 team members, including connection design engineers, detailers, and supporting staff provide ample manpower to support any project type and schedule. Our shop drawings and calculations are produced under the direct supervision of licensed professional engineers. In addition to 3D and BIM Models in SDS2 or Tekla, IDS provides NC1, CNC, DXF, DSTV, and other production file formats.

Interstate Gratings

www.interstategratings.com

Ironworkers/IMPACT

www.impact-net.org

IRyS Global, Inc.

Rodney, Ontario
Canada
ph: 519.652.6625
toll free: 800.711.IRYS
www.irysglobal.com

We are a company that offers customers immediate access to a professional virtual desktop solution. If you always wanted to continue your work when you go home but found it hard to do that due to technical limitations, look no further. There are many benefits that come from using our virtual desktops. For example, we provide sequential user logins, which means each desktop has two login accounts that can be accessed one at a time. This way you can cut the licensing costs in half while also extending your productivity and taking it to the next level. It's the ultimate remote office solution.

J. B. Long, Inc.

Fleetwood, Pa.
ph: 610.944.8840
www.jblong.com

Cheap Detailing Ain't Cheap! J.B. Long, Inc. has supplied structural steel and miscellaneous iron detailing to the fabrication industry for 35 years.

JH Botts, LLC

Joliet, Ill.
ph: 815.726.5885
toll free: 800.888.5885
www.jhbotts.com

As specialists in manufacturing anchor bolts from raw material emphasizing ASTM F1554 and ASTM A449 material, we stock many ½ in. to 3½ in. diameter round bars in 20 ft–0 in. to 40 ft–0 in. lengths. Additionally, we can manufacture using many different grades of material including ASTM A615 rebar, Stainless Steel rods and other assorted carbon steel grades. Our ability to produce within the tolerances prescribed by the American National Standards Institute (A.N.S.I.) make us a valuable asset to our customers.

Kinetic Cutting Systems, Inc.

www.kineticusa.com

Kobelco Welding of America, Inc.

Stafford, Texas
ph: 281.240.5600
www.kobelcowelding.com

Kobelco, your best partner for structural steel fabrication, including seismic application is proud to be one of the few companies that develops all of its own original welding materials, welding robots, and welding power sources.

Kottler Metal Products, Inc.

Willoughby, Ohio
ph: 440.946.7473
toll free: 800.678.0808
www.kottlermetal.com

Structural steel bending and fabricating specialists. Kottler Metal Products is proud to have one of the largest pipe, tube, and structural steel bending capacities in the Midwest, bending up to 10 in. angle, 20 in. pipe and tube, and 40 in. channel and I-beam, both easy-way and hard-way. Family owned and built on a 100+ year legacy, our business philosophy is based on a dual commitment to quality and service. For five generations we have maintained the tradition of producing the highest caliber of metal fabrications throughout the world.

KTA-Tator

Pittsburgh, Pa.
ph: 412.788.1300
toll free: 800.245.6379
www.kta.com

KTA provides government, facility owners, engineers, and contractors peace of mind that the integrity of steel and concrete structures are properly assessed and protected. KTA provides professional consultation and support during any phase of a project—design, construction, post-construction, and maintenance. KTA's specialties include steel and concrete fabrication inspection; NDT; coatings and corrosion engineering and inspection; field and lab coatings failure analysis; and coatings training. KTA also distributes a complete line of field inspection instrumentation.

LAP Laser, LLC

www.lap-laser.com

Lapeyre Stair

New Orleans, La.
ph: 504.733.6009
toll free: 800.535.7631
www.lapeyrestair.com

Lapeyre Stair is a complete outsource solution with in-house design, engineering, and detailing. Steel welded egress stairs with pre-engineered components meet applicable codes and allow for customization. Steel bolted egress stairs are a cost-effective solution that does not require welding. Alternating tread stairs are a safe alternative to steep stairways and ladders. Platforms, legs, and crossovers integrate to create custom stair systems. The lead time guarantee ensures orders arrive on site, on time, every time.

LAPEYRE STAIR

LECGI Inc.

Louisville, Ky.
ph: 502.425.1647
www.lecgi.us

LECGI, Inc. is an engineering firm specializing in structural design and steel detailing. We use state-of-the art computer technology and a group of talented and ambitious employees with great experience and high education. Our 3D modeling software, Tekla Structures, enables us to design projects very efficiently. Our models reduce design errors and allow us to design the best possible structures. Our detailing experience enables us to recognize the importance of detailed structural design and permits us to decrease cost by using the most practical designs and connections.

LeJeune Bolt Company

Burnsville, Minn.
ph: 952.890.7700
toll free: 800.872.2658
www.lejeunebolt.com

LeJeune Bolt is the leading international supplier of structural fasteners and tools as well as your source for the ASTM F3148 TNA Fastening System. With the recent approval of the Combined Method of installation in the 2020 edition of RCSC *Specification for Structural Joints Using High-Strength Bolts* F3148 TNA Bolt Assemblies and Torque & Angle installation can be specified with confidence knowing the necessary industry approvals are complete. Contact LeJeune Bolt Company to learn more about how our TNA Fastening System can provide improved efficiency, quality control, and cost savings for your next project.

Lincoln Electric Company

Cleveland, Ohio
ph: 216.481.8100
www.lincolnelectric.com

Lincoln Electric is the world leader in arc welding, robotic welding systems, plasma and oxyfuel cutting equipment and brazing and soldering alloys. Headquartered in Cleveland, Ohio, Lincoln has a worldwide network of manufacturing, distribution, sales and technical support covering more than 160 countries. For more information about Lincoln Electric and its products and services, visit the Company's website.

Lincoln Electric Cutting Solutions
Hamilton, Ontario
Canada
ph: 905.689.7771
toll free: 833.798.4669
www.lincolnelectriccutting.com
At every step in our evolution, we've focused on building a portfolio of expertise that encompasses every cutting application within the fabrication and industrial manufacturing universe: plasma cutting and motion control, tube and automated pipe cutting, structural steel cutting, and more. Every segment of our overall business is aimed at providing solutions to the challenges you face every day. Cutting with plasma is about more than just cutting metal. It's about the complete solution.

Lindapter
Leander, Texas
ph: 866.566.2658
www.lindapterusa.com
Over 85 years, Lindapter has pioneered the design and manufacture of structural steel clamping systems and HSS blind fasteners, enabling faster steel construction. Products include the Hollo-Bolt, the HSS expansion bolt approved by ICC-ES for all seismic design categories (A through F); while the girder clamp is approved for quickly connecting W&S beams. Lindapter connections eliminate the need for time-consuming drilling or welding in the field and reduce time and labor costs.

Linders Specialty Company, Inc.
www.lscmetalfab.com

Lion Lumber
www.lionlumber.com

LNA Solutions
Buffalo, N.Y.
ph: 734.677.2305
toll free: 888.724.2323
www.lnasolutions.com
LNA Solutions is the premier supplier of steel-to-steel connection products including seismic-approved BoxBolt® Blind Fasteners and Beam-Clamp® Structural Steel Connectors. Our wide range of pre-engineered connectors deliver safe, cost-effective solutions that never need field drilling or welding, installing easily with basic hand tools, saving you time on the job. High-quality LNA products, services, and warehouses are based in North America. Trust LNA Solutions for every structural application wherever steel connects to steel.

LS Industries
Wichita, Kan.
ph: 316.265.7997 ×328
toll free: 800.835.0218 ×328
www.lsindustries.com
From design and manufacturing, to parts and service LS Industries is committed to providing the highest levels of performance in addressing your metal cleaning needs. LS Industries engineers, designs and manufactures metal cleaning equipment. We are a fully integrated manufacture of airless shot blast cabinets using conveyor and monorail systems. LS also has complete product lines of cleaning systems for rebar, pipe and tubing; dust collectors; parts washers and vibratory tubs.

LTC, Inc.
Onalaska, Wis.
ph: 608.786.0893
www.ltcsteeldetailers.com
LTC is an innovative structural steel detailing company that has been producing quality shop drawings since 1985. We have production teams at both of our office locations in the U.S. and the Philippines, allowing us to provide exemplary service at a competitive price. All management and communication is U.S. based. We exclusively use Tekla and have worked on some of the largest projects in the industry, including professional stadiums and high-rise towers. We have in-house software teams that provide custom business software applications for clients, including customized scripts in Tekla.

LUSAS
www.lusas.com

Mac-Tech
www.mac-tech.com

Magni Telescopic Handlers
Roselle, N.J.
ph: 908.280.8899 x110
toll free: 833.624.6487
www.MagniTH.com
Magni Telescopic Handlers is the world leader and rotating and heavy lift telehandlers. ELIMINATE THE NEED TO RENT A CRANE! Magni offers 16 rotating models with lift heights from 57–167 ft and lifting capacities from 8,800–28,600 lbs. There are 100 attachments which allow the machine to serve as a telescopic forklift, RT crane, aerial work platform, and more. Magni's are the safest, most productive and efficient machines in their class. Magni also offers eight heavy lift models with lifting capacities from 22,000–110,000 lbs.

Manni Green Tech USA, Inc.
www.mannisipre.com/products/introduction
Manni Sipre is one of the largest steel service centers in southern Europe. The company's history in engineering steel structures includes key projects worldwide. Manni Sipre has engineered steel structures for multiple sectors including buildings, bridges, petrochemical, processing, sports venue and pressure vessel projects.

Max Weiss Co., LLC
www.maxweiss.com

MCL Hangers, LLC
www.mclhangers.com

McLaren Engineering Group
www.mgmclaren.com

MDX Software
Columbia, Mo.
ph: 573.446.3221
www.mdxsoftware.com
MDX Software Curved and Straight Steel Bridge Design & Rating is in use by many top design firms and DOTs to design and rate steel girder bridges for compliance with LRFD, LFD, and ASD AASHTO Specifications.

Metals USA
Langhorne, Pa.
ph: 267.580.2100
toll free: 800.523.3340
www.metalsusa.com
Structural fabricators across North America trust and rely on Metals USA for their structural steel requirements. Metals USA is the industry leading source for extensive inventory, and sophisticated processing services including plate burning, tee splitting, cambering and press brake forming. Learn more about our wide range of product offerings and find out how we can partner with you to help you get even better results. Steel, Processing, Service and Commitment. Metals USA—Your partner for all your steel needs.

Meyer Borgman Johnson
www.mbjeng.com

Midwest Structural Products, LLC
www.midweststructuralproducts.com

Miller Electric Mfg., LLC
Appleton, Wis.
ph: 920.734.9821
toll free: 800.426.4553
www.millerwelds.com
Solutions Designed for Welding in the Shop or Field! Whatever and wherever you build, there are Miller solutions specifically developed to support you—so you can effectively manage your labor pool, achieve productivity goals, maintain quality, and reduce expenses. Miller Electric Mfg. LLC, a leading worldwide manufacturer of Miller brand arc welding, provides welding, cutting, and heating solutions consistently delivering the highest level of performance and quality.

Miner Grating Systems, a Powerbrace Company
Dallas, Texas
ph: 214.630.0033
www.minergrating.com
Miner Grating Systems is North America's leading manufacturer and fabricator of grating products. Our lines consist of bar grating (Premier Grate), diamond safety grating (Premier Diamond), and round hole safety grating (Premier Grip). Our mission is to provide the highest quality grating products and be the most cost effective solution provider.We welcome the opportunity to partner on any projects requiring grating for steps, platforms, or walkways for use on OEM equipment or in plant maintenance.

exhibitors

Modern Steel Construction magazine

Chicago, Ill.
ph: 312.896.9022
www.modernsteel.com
Modern Steel Construction magazine is the official publication of the American Institute of Steel Construction. By focusing on innovative and cost-effective steel designs and applications, *Modern Steel* brings its readers in-depth information on the newest and most advanced uses of structural steel in buildings and bridges. *Modern Steel* is the leading magazine for professionals involved in the design and construction of steel-framed buildings and bridges. Advertising in *Modern Steel* is the best way for you to reach your customers directly.

MOLD-TEK Technologies, Inc.

Cumming, Ga.
ph: 470.302.8178
www.moldtekengineering.com/detailing.html
We offer structural steel detailing and engineering services, connection design certification and sealing with BIM coordination for all the major steel fabricators in the U.S. Our company is a public corporation with HQ in India and our U.S. HQ in Atlanta, Georgia. We have a strong team of 400+ detailers, project managers, checkers, and connections engineers in India in addition to PEs and project oversight from one of our four U.S. offices.

NASCC: The Steel Conference

ph: 231.995.0637
aisc.org/nascc/exhibit
NASCC: The Steel Conference is an affordable and easy way to reach your target customer. As an exhibitor, you can count on The Steel Conference to deliver 5,000+ industry professionals; more than any other industry event of its kind. The Steel Conference exhibit hall is your chance to personally interact with key decision makers in the structural steel industry. When it comes to steel design and construction, these key industry players come to find out what's new, who's got it, and how it can work for them. Don't be left out. Join other top suppliers and manufacturers today!

National Institute of Steel Detailing, Inc.

www.nisd.org

National Steel Bridge Alliance

Chicago, Ill.
ph: 312.670.2400
aisc.org/nsba
The National Steel Bridge Alliance (NSBA), a division of AISC, is a national, non-profit organization dedicated to the advancement of steel bridge design and construction. NSBA functions as the voice of the bridge fabricators and steel mills while also partnering with the bridge design and construction community. NSBA's partners include AASHTO, FHWA, state DOTs, design consultant, contractors, and academia. With these resources, NSBA is uniquely positioned to find solutions to the toughest bridge challenges, including those related to cost, sustainability, and performance.

New Millennium Building Systems
Fort Wayne, Ind.
ph: 260.969.3582
www.newmill.com
New Millennium structural steel building systems support your project and we support you. From steel joists and deck to long-span composite floor systems, we engineer and manufacture solutions that control costs, enhance performance and ensure project success. Together, let's build it better. Over the years, our company has grown into one of the largest providers of cost-efficient, high-performance structural steel joist, joist girder and deck solutions for commercial steel construction projects. We have manufacturing facilities strategically located across North America.

NEW MILLENNIUM
BUILDING SYSTEMS

Nickel Institute/IMOA
www.nickelinstitute.org

Nitto Kohki U.S.A., Inc.
www.nittokohki.com

Nucor – Beam Mill Group
Blytheville, Ark. | Huger, S.C.
ph: 870.762.5500
toll free: 800.289.6977
www.nucoryamato.com
www.nucor.com/products/steel-beam
Nucor has two beam mills: Nucor-Yamato Steel in Blytheville, Ark. and Nucor Steel Berkeley in Huger, S.C. Our Nucor-Yamato facility is the only North American producer of high-strength, low-alloy beams. Manufacturer of wide flange structural steel shapes (up through W14730 columns, and W44 beams), H-piles (including HP16 and HP18), sheet piling, angles, channels, and car building shapes. Grades include ASTM A36, ASTM A572, ASTM A588, ASTM A690, ASTM A709, ASTM A992, ASTM 913; and CSA G40.21-13 Grades 345WM and 345WMT.

Nucor – Corporation
Charlotte, N.C.
ph: 704.366.7000
www.nucor.com
Nucor and its affiliates are manufacturers of steel and steel products, with operating facilities in the United States, Canada and Mexico. Products produced include: carbon and alloy steel—in bars, beams, sheet and plate; hollow structural section tubing; electrical conduit; steel piling; steel joists and joist girders; steel deck; fabricated concrete reinforcing steel; cold finished steel; precision castings; steel fasteners; metal building systems; steel grating; and wire and wire mesh. Nucor is North America's largest recycler.

NUCOR®

Nucor – Fastener Division
St. Joe, Ind.
ph: 260.337.1600
toll free: 800.955.6826
www.nucor-fastener.com
Manufacturer of 100% made in the U.S. carbon and alloy steel hex head cap screws, heavy hex structural bolts, dome head Tru-Tension tension control assemblies, nuts and build-to-print specials in inch and metric sizes in various grades with finishes and thread coatings to meet fastening requirements.

Nucor – Plate Mill Group
Cofield, N.C. | Tuscaloosa, Ala.
ph: 252.356.3700
toll free: 877.626.8267
www.nucorhertford.com
www.nucortusk.com
Manufacturer of carbon, alloy, high-strength low alloy (HSLA), pressure vessel and heat treated (normalized and quench and tempered plate) that is available as discrete, cut-to-length and coiled plate. Nucor Steel Hertford County produces discrete plate through 3 in. thick, 124 in. wide and 1,035 in. long. Nucor Steel Tuscaloosa Inc. produces hot rolled coil and temperleveled plate up through 1 in. thickness and discrete plate up through 2.5 in. thickness, 96 in. in width and 720 in. long.

Nucor Tubular Products
Chicago, Ill.
ph: 708.496.0380
toll free: 800.376.6000
www.nucortubular.com
Nucor Tubular Products is committed to taking care of our customers through unmatched quality and service. With eight locations located across the United States and a wide variety of sizes, we are ready to help you get the job done. NTP manufactures high quality HSS, piling, A53 pipe, fire protection sprinkler pipe, auto mechanical tubing, and electrical steel conduit. Our value added offerings include: in-house bandsaw cutting and mechanical properties testing, I.D. flash removal, Charpy V-notch testing, pipe beveling, and miter cutting. Together, let's build something bigger.

NUCOR®
TUBULAR PRODUCTS

Nucor Vulcraft/Verco Group
North America
See website for contact info.
www.vulcraft.com
www.vercodeck.com
Nucor, Vulcraft/Verco engineers and manufactures steel joists and deck (for structural roof or floor systems), as well as steel bar grating. We also provide, RediCor, a modular steel form system for concrete stair and elevator cores. Nucor, Vulcraft/Verco also provides multiple design aids and resources, such as our online design tools, to support the design community.

NUCOR®
VULCRAFT/VERCO

Ocean Machinery, Inc.
Fort Lauderdale, Fla.
ph: 954.956.3131
toll free: 800.286.3624
www.oceanmachinery.com
Ocean Machinery delivers versatile and affordable solutions for the small to medium fabricator. Including: *OCEAN AVENGER and AVENGER PLUS—the world's best selling CNC beam drill lines *OCEAN CLIPPER II—the most compact CNC angle line *OCEAN LIBERATOR—the most affordable CNC beam coping machine *OCEAN BLASTER—the smallest footprint shot blasting solution *OCEAN CHALLENGER—a compact, automated welding robot, as well as several other game changing solutions that improve the efficiency and profitability of fabricators worldwide!

Ohio Gratings, Inc.
Canton, Ohio
ph: 330.477.6707
toll free: 800.321.9800
www.ohiogratings.com
Ohio Gratings, Inc. is a leading manufacturer of aluminum, carbon and stainless steel bar grating products—all proudly made in the U.S. By delivering a blend of artistry, safety, and seamlessness thats unmatched in the grating market. From design to manufacturing to custom fabrication services, we offer the complete solution. Our drive to keep looking ahead separates us from other grating makers. And its this search for the unexpected that helps us repeatedly surprise and satisfy customers. Let our people, processes and vision move your next project A Step Ahead.

Oliver Van Horn, LLC
www.ohvanhorn.com

OpenBrIM Platform
www.openbrim.org

Ovation Services, LLC
Copley, Ohio
ph: 330.400.2833
www.4ovation.com
Ovation Services is a leading provider of engineering services. Combining experience, technology and a client-centric approach, Ovation Services provides structural steel detailing, connection design and BIM services across the United States. The acquisition of MMW, Inc. a detailing firm with over 30 years experience in the steel industry, gives Ovation Services a talented project management team to ensure a quality product. Strong leadership, global resources and U.S. based checking uniquely qualify Ovation to be your preferred partner.

OVATION
SERVICES LLC

P2 Programs
Dripping Springs, Texas
ph: 512.858.2007
toll free: 800.563.6737
www.p2programs.com
P2 Programs sets the industry standard when it comes to barcoding and efficiently tracking structural steel from raw material receipt to erection at the job site with our NEW web-based product, STSX, allowing instant, real-time information to be viewed from virtually any device. Since 1986, we have been using Auto-ID technology to improve manufacturing process tracking. Using our real-time update capabilities, P2 Programs is the company with the technological expertise and experience you need for an affordable and successful solution to the challenges in your manufacturing operation.

Pacific Stair Corporation
www.pacificstair.com

Pan Gulf Technologies Pvt., Ltd.
Houston, Texas
ph: 832.615.3128
www.pangulftech.com
Pan Gulf Technologies Pvt. Ltd. an ISO 9001:2015 company) is a structural and concrete steel detailing company. We have a front office in Houston and design center in Mumbai, India. As one of the top five steel detailing subcontractors in India, we use Tekla (135+ licenses), SDS2 (20+) and STAAD Pro to design and detail drawings for commercial, industrial and infrastructure projects, for American and European fabricators, design consultants and contractors. We have worked on projects ranging from 200–10,000 tons in structure and 50–50,000 tons in concrete, with a man power of 350+ team members.

Pannier Corporation
Pittsburgh, Pa.
ph: 412.323.4900
toll free: 877.726.6437
www.pannier.com
Industrial marking systems for structural steel identification. Automatic dot peen marking systems make deep marks that remain legible after cleaning and coating. Embossed metal tags remain legible after galvanizing and painting. Industrial ink jet systems and dot and stripe printers for easy, reliable piece marking. With over 100 years of experience, we can help you with your most challenging product identification needs. Visit www.pannier.com/steelfab for more information.

Paramount Roll and Forming, Inc.
www.paramount-roll.com

Peddinghaus Corporation
Bradley, Ill.
ph: 815.937.3800
www.peddinghaus.com
Peddinghaus Corporation, headquartered in Bradley, Illinois, U.S., is an American manufacturer of CNC controlled equipment for the structural steel and heavy plate fabrication industries. With two manufacturing locations within the U.S., Peddinghaus focuses on providing highly innovative, and long lasting solutions to fabricators of all shapes and sizes. These solutions are designed to increase the production of steel components, and reduce costs for fabricators thus enhancing profitability. Beyond just machinery, Peddinghaus offers a 24 hour customer help line and consumables department.

Peddinghaus

Power of Design Group, LLC
www.podgrp.com

PPG Protective & Marine Coatings
Pittsburgh, Pa.
toll free: 888.9PP.GPMC
www.ppgpmc.com
PPG delivers protective coating solutions for a wide range of industries. Whether our customers need proven protection from corrosion, high temperatures and fire or want to ensure durability and aesthetic performance that will protect valuable assets, we have the advanced coating systems that can meet the specific needs of any environment.

Prodevco Robotic Solutions, Inc.
Concord, Ontario
Canada
ph: 905.761.6155
www.prodevcoind.com
Prodevco Robotic Solutions offers Advanced Robotic Plasma Steel Cutting sytems. There are three models the PCR42, PCR41 and PCR 31 that will process standard structural steel profiles, and round tubes from 4 to 26 in., cuts copes, notches, holes and weld preps, splits beams, and scribes and marks on all four faces of H-beams, channels, angles, HSS and plates using automated robotic technology. All-in-one system reduces fabrication time, manpower and materials to meet everyone's goal: lower manufacturing costs.

Project + Quality Solutions
Portland, Ore.
ph: 503.550.9918
www.projectqualitysolutions.com
At any stage of a project, PQS represents the project owner, contractor and fabricator to provide third party representation, interpret project specifications, deliver reasonable solutions, maintain project schedule, train and certify personnel, provide expert witness services and maintain project schedule. For quality assurance, process planning and evaluation, quality control inspections, project management and engineering, count on industry experts from PQS. We offer scalable resources, value engineering, project management/engineering, nondestructive testing and dispute resolution.

Qnect, LLC
Hadley, Mass.
ph: 413.387.4375
www.qnect.com
Qnect, an intelligent, cloud-based connection service gives fabricators, detailers and engineers fast and flexible connections with significant cost and schedule savings. In minutes, connect most steel buildings without capital cost and with minimal training. With Qnect, prevent schedule drift, utilize one-station fabrication and reduce time to fabricate and erect.

Qualis Solutions, LLC
Highlands Ranch, Colo.
ph: 303.493.5400
www.qualissolutions.com
The team at Qualis Solutions has over 30 years' experience detailing structures thoughout the U.S. using AISC standards. Over the years, we've created drawings for a wide range of projects including office buildings, hospitals, schools, warehouses and airports. Qualis is best known for our focus on miscellaneous metal detailing. Our team of 18 detailers have mastered the art of stairs, railing, canopies, balconies and many other miscellaneous designs. You'll find us easy to work with and a reliable part of your project.

Quality Emphasis Steel Solutions Pvt., Ltd.
Thane, Maharashtra
India
ph: 973.536.2660
www.qessindia.com
QESS is an innovative steel detailing company dedicated to delivering high quality steel detailing services to steel fabricators, engineers, contractors and the construction industry since 2006. Quality, accuracy, efficiency and business integrity are the fundamentals we employ to ensure each job is done right the first time. Our total experience in detailing field can be counted at 36 years. QESS is in business since past 14 years.

QuickFrames USA
Mesa, Ariz.
ph: 480.464.1500
www.quickframes.us
QuickFrames USA is leading the industry with its bolt-on, adjustable, engineered structural support systems created for commercial roofs and floors. Designed for new construction and tenant improvement, QuickFrames can be easily moved when locations change and can be installed from under the deck. The company is based in Mesa, Arizona, and has earned a strong reputation around its exceptional customer responsiveness, quality and frames-to-job-site speed.

Radley Corporation
Grand Rapids, Mich.
ph: 616.541.6010
www.radley.com/steel
Increase visibility to materials with Job-site Tracking and Traceability while maximizing your workforce with Labor Tracking. Streamline and automate work flows with bar code or RFID scans while reducing errors with real-time data validations. Track Work-in-Progress (WIP) and validate loads against FabTrol, PowerFab (FabSuite), or other business systems.

RISA
Foothill Ranch, Calif.
ph: 949.951.5815
toll free: 800.332.7472
www.risa.com
RISA has been developing leading-edge structural design and optimization software for over 30 years. Our products are used by 24 of the top 25 U.S. design firms in over 70 countries around the world for towers, skyscrapers, airports, stadiums, petrochemical facilities, bridges, roller coasters, and everything in between. The seamless integration of RISAFloor, RISA-3D, RISAFoundation, and RISAConnection creates a powerful, versatile, and intuitive structural design environment, ready to tackle almost any design challenge.

Scougal Rubber Corp.
www.scougalrubber.com

SDS2
Lincoln, Neb.
ph: 402.441.4000
toll free: 800.443.0782
www.sds2.com
SDS2 is driving success in structural steel construction through advanced 3D modeling and automated design. Our solutions leverage proprietary, AI-powered design to optimize your projects for fabrication and construction efficiency, accelerating projects workflows from concept to completion and powering up your productivity.

SE University by SE Solutions, LLC
Holland, Mich.
ph: 616.546.9420
www.learnwithseu.com
SE University helps structural engineers get high quality continuing education via web seminars in a format that is economical and easy to use. Every subscription includes access to past session recordings through the SEU Session Library. Provide the benefit of ongoing education to your engineers by participating in SE University!

Seismic Bracing Company
Salt Lake City, Utah
ph: 801.550.7745
www.thesbcllc.com
We are makers of Buckling Restrained Brace (BRBs). The state of the art braces for bracing buildings and other structures during earthquakes. As the name implies, BRBs do not buckle. They smash and stretch axially absorbing seismic energy. We have patented a simple, easy and repeatable methods to manufacture BRBs, which brings better value to projects. Our methods have been fully tested and exceed governing building code requirements. All our projects to date have been a great success for our clients and us, delivering on time and without erection issues.

Shandong Hanpu Machinery Industrial Co., Ltd.
www.hanputool.com

Sherwin-Williams Protective and Marine
protective.sherwin.com

Short Span Steel Bridge Alliance
Washington, D.C.
ph: 202.452.7100
www.shortspansteelbridges.org
The Short Span Steel Bridge Alliance (SSSBA) is a group of bridge and buried soil steel structure industry leaders who have joined together to provide educational information on the design and construction of short span steel bridges in installations up to 140 ft in length.

SidePlate Systems, Inc.
Mission Viejo, Calif.
ph: 949.238.8900
toll free: 800.475.2077
www.sideplate.com
At 26 years old, SidePlate is showing no signs of slowing down. Our newest innovation, the All-Bolted Connection eliminates all shop and field welding to expedite your project. SidePlate is a design optimization process that puts steel exactly where it is needed in a building. Our process reduces overall tonnage, minimizes required connections and accelerates erection times. The SidePlate team gets involved early and stays involved through the engineering, detailing, fabrication and erection phases to ensure a simple and successful project.

SIDEPLATE® POWERED BY MiTek®

Simpson Strong-Tie Co.
Pleasonton, Calif.
ph: 925.560.9000
toll free: 800. 999.5099
www.strongtie.com
For over 60 years, Simpson Strong-Tie has focused on creating structural products and software solutions that help people build safer and stronger structures. Simpson Strong-Tie was one of the first companies to develop connectors specifically for steel framing. Today, we continue to invest in product research and development to offer our customers connectors, fasteners, anchors, steel shearwalls and special moment frames, which feature our innovative Yield-Link® connection. Our commitment to the steel industry has never been stronger.

SIMPSON Strong-Tie®

Skidmore-Wilhelm
Solon, Ohio
ph: 216.481.4774
www.skidmore-wilhelm.com
For more than 60 years, Skidmore Wilhelm been the standard tool to verify bolting methods (pre-installation verification). Recently we have developed an online training program to save time and help Ironworkers to safely do their jobs. Please visit our training site at www.skidmore-training.com. We are also the leading supplier of devices to test impact wrenches.

SKM Industries, Inc.
www.skmproducts.com

SlipNOT Metal Safety Flooring
www.slipnot.com

SNC Engineering, Inc.
www.snceng.com

Soitaab USA, Inc.
www.soitaabusa.com

exhibitors

SRG Onesource, LLC
www.srgonesource.com

St. Louis Screw & Bolt
Madison, Ill.
ph: 314.389.7500
toll free: 800.237.7059
www.stlouisscrewbolt.com
Selling direct to structural steel fabricators, St. Louis Screw & Bolt is one of the oldest structural bolt manufacturers in the U.S. Specializing in ASTM F3125 heavy hex and tension control structural bolts in grades A325/F1852/120ksi and A490/F2280/150ksi, types I and III, plain, mechanically galvanized, hot dip galvanized, F1136 and F2833 coatings. St. Louis Screw & Bolt also has a very large inventory of other construction fasteners including anchor bolts, weld studs, and concrete anchors just to name a few.

Stainless Structurals America
www.stainless-structurals.com

Steel and Pipe Supply
www.steelandpipe.com

Steel Deck Institute
Glenshaw, Pa.
ph: 412.487.3325
www.sdi.org
Founded in 1939, the Steel Deck Institute (SDI) is a trade association representing steel deck manufacturers and those manufacturing products used in conjunction with steel deck. The SDI actively publishes design manuals, develops standards for steel roof and floor deck, offers website tools, provides an industry standard EPD, offers educational opportunities, and supports research related to steel deck. Our most recent publications are the Second Editions of the Roof Deck and Floor Deck Design Manuals, which include additional information regarding concentrated loads.

Steel Dynamics Long Products Group
Columbia City, Ind.
ph: 625.625.8100
toll free: 866.740.8700
www.stld-cci.com
Steel Dynamics, Inc. is one of the largest domestic steel producers and metals recyclers in the United States based on estimated annual steelmaking and metals recycling capability, with facilities located throughout the U.S. and in Mexico. Steel Dynamics produces steel products, including hot roll, cold roll, and coated sheet steel, structural steel beams and shapes, rail, engineered special-bar-quality steel, cold finished steel, merchant bar products, specialty steel sections and steel joists and deck.

Steel Erection Bid Wizard
Bluffton, S.C.
ph: 505.249.2390
www.steelestimatingsolutions.com
Introducing the Steel Erection Bid Wizard "only software on market created for steel erectors by a steel erector." Reduce the time it takes to estimate by 50% or more! Steel Erection Bid Wizard uses more than 300 built-in task as well as offers complete customization to make estimation a snap… Get immediate estimates of your costs—including labor, cranes, welders, fuel and equipment. Learn how over 250 Steel Erectors have revolutionized the way they estimate. Take your estimating department digital with the Steel Erection Bid Wizard.

Steel Erectors Association of America
www.seaa.net

Steel Founders' Society of America
Crystal Lake, Ill.
ph: 815.455.8240
www.sfsa.org
SFSA, akin to AISC, is a technical association. Members of SFSA are steel foundries that supply a range of cast steel products for demanding environments such as railroad, mining, construction, military, and nuclear. SFSA can assist you in utilizing steel castings for building construction. Steel castings offer performance, aesthetics, design freedom, and green manufacturing. SFSA leads the Steel Performance Initiative (SPI) program, a collaborative structure of steelmakers (mills, forge, cast), researchers, and end-users to advance steel technology development for commercial and defense applications.

Steel Joist Institute
Florence, S.C.
ph: 843.407.4091
www.steeljoist.org
The Steel Joist Institute (SJI), a nonprofit organization of active joist manufacturers and other organizations and companies connected to the industry, was founded in 1928 to address the need for uniform joist standards within the industry. Today, the Institute continues to maintain the standards for steel joist construction. In addition, the SJI provides educational opportunities for construction professionals utilizing a library of printed publications and both live and recorded webinars. We also offer assistance in identifying existing joists in buildings undergoing retrofit.

Steel Projects Corp.
www.steelprojects.com
Steel Projects is a company that has been editing software solutions for steel fabricators since 1994. We offer a complete, digitalized and optimized management of steel fabricators' shop floors, including both CNC machines and manual workstations. Our main features include: project and production management, section and plate nesting, automatic CNC programming, live production monitoring, stock and purchasing management and traceability management. Some of them are available on a dedicated Android mobile application. Today, our ambition is to remain one of the world leaders in the field.

Steel Studio, Inc.
www.steelconnectionstudio.com

Steel Tek Unlimited
www.steelteku.com

Steel Tube Institute
Glenview, Ill.
ph: 847.461.1701
www.steeltubeinstitute.org
The Steel Tube Institute is the leading technical resource in North America for all steel tube products. Our main goal is to increase utilization of HSS and other tubular products in construction and other industries, and to reveal the wealth of possibilities afforded by designing with HSS. STI's programs include continuing education, technical resources, technical assistance, and safety programs as we promote best practices in manufacturing techniques, industry safety, environmental concerns, and the overall steel industry.

Steelweb, Inc.
Coral Springs, Fla.
steelweb.com/
Steelweb Inc. has offered comprehensive steel detailing services for over 25 years. Based in Florida the company specializes in 3D detailing of medium to large industrial and commercial projects such as schools, hospitals, offices, with the occasional small scale jobs or difficult revamps. Our Mission is to deliver the highest quality, error-free shop and erection drawings in a timely and efficient manner. Our team of 50 engineers and detailers provide the best services including project management, BIM coordination, connection design and estimating. We work with both Tekla and SDS2 software.

Strand7 Pty., Ltd.
www.strand7.com

Stronghold Coating Systems
www.strongholdone.com

Structural Bolt and Manufacturing, Inc.
Nashville, Tenn.
ph: 615.255.2540
toll free: 800.423.1730
www.structuralbolt.com
Since 1985, Structural Bolt and Manufacturing has been providing the finest products and services in the structural fastener industry. We specialize in heavy construction fasteners and anchoring products for the structural steel industry. As one of today's leading anchor rod manufacturers and structural fastener distributors in the United States, our capabilities are limited only by an engineer's imagination.

Structural Engineering Institute of ASCE
Reston, Va.
ph: 703.295.6195
www.asce.org/sei
Join more than 30,000 members of SEI of ASCE to advance your career and build the future of the structural engineering profession. SEI stimulates technological advancement, improves professional practice, and drives the practical application of cutting-edge research. Visit www.asce.org/SEI for Virtual Events: #SEILive, Standards Series, Structures Virtual, career resources, the latest knowledge incl free performance-based design pre-standards, Confidential Reporting on Structural Safety, SE 2050 Commitment program, and get involved. Join us at Electrical Transmission & Substation Structures Conference Sept 19–23.

Structural Stability Research Council
Chicago, Ill.
ph: 312.670.7015
www.ssrcweb.org
The Structural Stability Research Council is a technical organization that focuses on the state-of-the-art understanding of the impact of stability related issues on the analysis, design, and behavior of metal structures. SSRC is comprised of engineers, educators, and industry members with an interest in stability related issues.

STRUMIS, LLC
www.strumis.com

Stubbs Engineering, Inc.
Las Cruces, N.M.
ph: 575.993.5228
www.stubbseng.com
Stubbs Engineering, Inc. is a full service structural engineering firm specializing in providing creative, economical structural designs that provide our clients with the aesthetics they desire at the most cost efficient means possible. Our vast experience in both design and construction methods gives us the unique ability to provide our clients with a level of service beyond that of our competition. We work diligently to ensure our clients receive the best structural designs, communication, cost awareness, and project management possible.

Sugar Steel Corporation
www.sugarsteel.com

Sumter Coatings, Inc.
Sumter, S.C.
ph: 803.481.3400
toll free: 888.471.3400
www.sumtercoatings.com
Sumter Coatings is a manufacturer of premium industrial and specialty coatings, with a strong emphasis on corrosion resistant primers, intermediates and topcoats for structural and miscellaneous steel. Sumter Coatings is dedicated to producing coatings that protect, beautify, renew and extend the life of our customer's assets while meeting or exceeding the stringent specifications required by today's architects and engineers.

SY Stairs
Louisville, Ky.
ph: 502.361.5445
www.systairs.com
A LEADER IN COMMERCIAL STAIRS SINCE 1945, SY Stairs was formed from the partnership of Sentry Steel Inc. in Louisville, Kentucky and Yokomori in Japan who, together, have a rich history designing and manufacturing stairs around the world. For over 70 years, we have pursued continuous innovation, giving you a product perfected over decades of experience unrivaled in the industry. We take pride in the fact that our stair system is used in 85% of of the high-rise buildings in Japan, and that we are expanding rapidly in the U.S. market is a testament to our ability to meet and exceed our customers' high expectations.

Taylor Devices, Inc.
North Tonawanda, N.Y.
ph: 716.694.0800
www.taylordevices.com
Taylor Devices is the world leading manufacturer of Fluid Viscous Dampers, Lock-up Devices, Shock Transmission Units, Shock Absorbers, Cable Dampers and custom Tuned Mass Damping systems. These devices and systems can be used to protect building and bridge structures from the devastating vibrations caused by earthquakes, wind, hurricanes and other vibrational disturbances.

TDS Industrial Services, Ltd.
www.tdsindustrial.com

Tectonix Steel, Inc.
Orem, Utah
ph: 801.377.0315
www.tectonixsteel.com
Tectonix Steel offers over 30 years of experience providing the highest quality steel detailing using the latest technology. We are an established detailing firm with the ability to handle virtually any size job. We specialize in structural and industrial projects ranging from 200 tons to 3,000 tons.

Terracon Consultants, Inc.
Olathe, Kan.
toll free: 800.593.7777
www.terracon.com
Terracon is a 100 percent employee-owned consulting engineering firm that has provided quality engineering services to clients since 1965. From its roots in geotechnical engineering, Terracon has evolved into a successful multidiscipline firm specializing in environmental, facilities, geotechnical, and materials services for private and public sector clients. Terracon currently provides services in all 50 states with more than 5,000 employees and ranks 22nd on *Engineering News-Record*'s list of the 2020 Top 500 Design Firms.

Thermal Bridging Solutions
www.thermalbridgingsolutions.com

Tnemec Company, Inc.
Kansas City, Mo.
toll free: 816.483.3400
www.tnemec.com
Established in 1921, Tnemec Company, Inc., understands the importance of providing facilities with the most high-quality products available. Tnemec's combination of time-tested coatings technology has produced an advanced coatings system featuring Aerolon—a fluid-applied, thermal insulating coating that can be applied in areas where traditional installations are problematic. With over a 120 architectural and industrial coating products and invaluable technical support, Tnemec provides coating specification assistance to engineers, owners and contractors around the globe.

Trilogy Machinery, Inc.
Belcamp, Md.
ph: 410.272.3600
toll free: 888.988.ROLL
www.TrilogyMachinery.com
Trilogy Machinery, Inc. is the Exclusive North American distributor for SWEBEND Bending Rolls as well as Exclusive U.S. Distributor for SUNRISE Ironworkers including CNC Models, LEMAS Plate Bending Rolls, BSP Tube Punching Systems, INDUCTAFLEX Machines and United States Distributor for Turkish Bending Rolls. Trilogy offers sales, service and support for every brand they sell from their Maryland headquarters as well as local dealers around the country.

Triple S Steel Holdings
www.sss-steel.com

TurnaSure, LLC
Langhorne, Pa.
ph: 215.750.1300
toll free: 800.525.7193
www.turnasure.com
TurnaSure announces their ViewTite™ self-indicating Direct Tension Indicator. ViewTite's innovative and unique design provides a highly visible green indication once the bolt is properly tensioned. Inspection is quick, easy, and reliable. ViewTite™ DTIs, and the new SnugR™ washer for visibly tight snug tight bolts, are now part of the world's most comprehensive product line of Direct Tension Indicators. DTIs provide a cost-effective solution to tensioning high-strength bolts, studs, and anchors. All TurnaSure DTIs are proudly manufactured in the U.S. to ASTM and EU Standards.

V&S Galvanizing
Columbus, Ohio
ph: 800.801.3648
www.hotdipgalvanizing.com
V&S Galvanizing is a leader in the hot-dip galvanizing industry, with eight locations on the East Coast and Midwest. Specializing in corrosion protection of steel with zinc by hot-dip galvanizing. We offer the DUROZINQ system of galvanizing, packaging, tagging and guaranteed service. We also offer our COLORZINQ system (paint over galvanizing) that adds brilliant color to a base of corrosion protection. V&S offers trucking and many other value added services. V&S Galvanizing is part of Voigt & Schweitzer LLC, a holding of Hill & Smith Holdings, PLC.

Valmont Coatings
Omaha, Neb.
ph: 402.359.6145
www.valmont.com
As a full-service coatings company, Valmont Coatings provides quality surface finishes that extend the service life and improve the appearance of metal products throughout the country. In fact, Valmont Coatings is one of the largest custom galvanizers in North America. Our processes and transportation capacities are designed to efficiently handle steel products of all shapes and sizes for customers anywhere in the country.

Valmont Industries, Inc.
Valley, Neb.
ph: 402.359.2201
www.valmont.com
HSS SuperStruct custom steel structural tubes are BUILT TO FIT into your architectural, construction, and OEM projects. We are capable of fabricating custom HSS squares from 12–60 in. and rectangles from 12×10 in. to 60×58 in. outside diameter with wall thickness from .313–.750 in. in a variety of steel grades. We can also fabricate shapes! These large tubes are available in lengths up to 55 ft with our standard 2 in. inside corner radii. Find out how HSS SuperStruct can make your project one of a kind!

Valmont Structures
www.constructbridge.com

Vegazva Engineering
www.vegazva.com

Viking Blast & Wash Systems
Rose Hill, Kan.
ph: 316.634.6699
toll free: 800.835.1096
www.vikingcorporation.com
Viking Blast & Wash Systems offer a full line of industrial cleaning equipment including airless shot blast systems, parts washers, and vibratory degreasers. This equipment cleans and removes mill scale, dirt and rust from a wide variety of materials including plate steel, structural I-beams, weldments and pipe. Vikings abrasive blast systems provide clean, uniform surfaces for better paint adhesion or other finishing operations.

VIRTUELE
San Jose, Calif.
ph: 415.889.8480
www.sanriaengineering.com
We believe in simple solutions for solving complex problems. VIRTUELE is a cloud-based software platform for the steel industry. Our AI and ML based applications change the way you work and solve your problems. Our applications address the existing gaps in BIM implementation and take your BIM models from design to construction with ease.

Voortman Steel Group
Monee, Ill.
ph: 708.885.4900
www.voortmancorp.com
Voortman has designed, developed and manufactured machinery for steel fabrication and plate processing related industries for more than 45 years. With international subsidiaries responsible for sales and service, we are a globally recognized supplier with thousands of Voortman systems installed. We continually develop our equipment range to enable us to keep at the forefront of technology and in step with any new developments in the market. Voortman partners receive long-lasting cutting edge CNC machinery that processes profiles and plates utilizing high-speed precision processing technology.

Voss Engineering, Inc.
Lincolnwood, Ill.
ph: 847.673.8900
toll free: 800.323.3935
www.vossengineering.com
Voss Engineering, Inc. provides expansion/slide bearing assemblies, bearing pads, and isolation materials for highway bridges, industrial structures, machines, process piping, and commercial buildings. Voss' product line includes the following structural bearing pad materials: SORBTEX (preformed fabric pad/cotton duck pad/CDP), VSB Slide Bearings (PTFE and steel plate), VTB (thermal break pad), NEOSORB [AASHTO grade neoprene (polychloroprene)], and FIBERLAST or VOSSCO (random oriented fiber pads).

Weinstock Bros., Inc.
www.weinstockbros.com

Whiteboard Technologies Pvt., Ltd.
ph: 612.605.5833
www.whiteboardtec.com
For over two decades, Whiteboard has perfected the art of professional steel detailing with an unwavering focus on quality and design-based thinking in all our projects. We invest heavily in having the right people who understand steel from a value perspective and deliver contemporary solutions to a diverse range of construction projects. Our Hybrid-Delivery model offers onsite and offshore to ensure that there is maximum utilization of resources round the clock. We use 3D BIM software to detail the steel ranging from 50–15,000 tonnes.

Würth Construction
Birmingham, Ala.
ph: 205.949.4183
www.wurthindustry.com
Between Würth owned companies, Weinstock Bros., Inc., and House of Threads, we offer more than 150 years of service to the Construction industry. These companies have served the needs of the construction industry to build some of the nation's most renowned high-rise buildings, skyscrapers and bridges, such as the new World Trade Center, Tappan Zee Bridge, Comcast Building, Goldman Sachs Building, Tower A at Hudson Yards, Goethals Bridge, and many others.

Z Modular, a division of Zekelman Industries
ph: 312.275.1608
www.z-modular.com
To get your building on the ground, it seems like you have to choose between speed, quality and cost. But with Z Modular, you get all three. With up to 80% of total project labor done inside factories across North America, we control every step of the process so you can meet more ambitious business goals—where you need one building per year or one per month. Markets we serve: hospitality, multi-family residential, student housing, senior housing and more.

Z Modular®
ALIGN TO BUILD BETTER

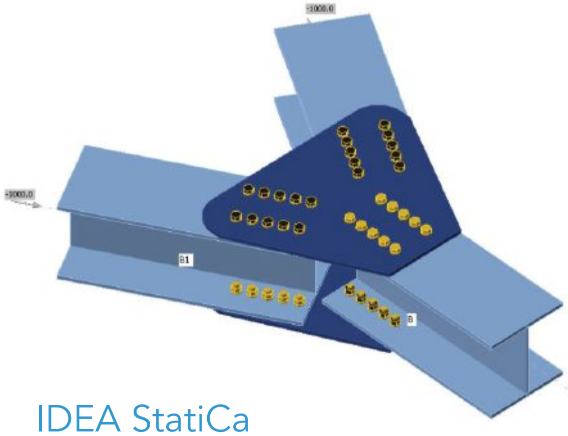
new products

This month's offerings include a moment connection solution with new sloped beam and multi-axis capabilities, a steel connection design software package that recently received its patent, and a downsized robotic welding gantry.

Simpson Strong-Tie Yield-Link

The Yield-Link moment connection for structural steel now features newly validated sloped beam and multi-axis moment applications. Designed to absorb forces in a seismic or high-wind event, the moment connection requires no field welding and allows beams to be designed without supplemental lateral bracing. At the roof level, structural steel beams are often sloped to accommodate drainage, and two new solutions provide greater design flexibility and streamlined field connections when using the Yield-Link in slope beam applications. Designed for corner, three-sided, and four-sided column connections, Yield-Link multi-axis moment connection solutions provide a connection that resists moment demand in both directions of the column.

For more information, visit **www.strongtie.com**.



IDEA StatiCa

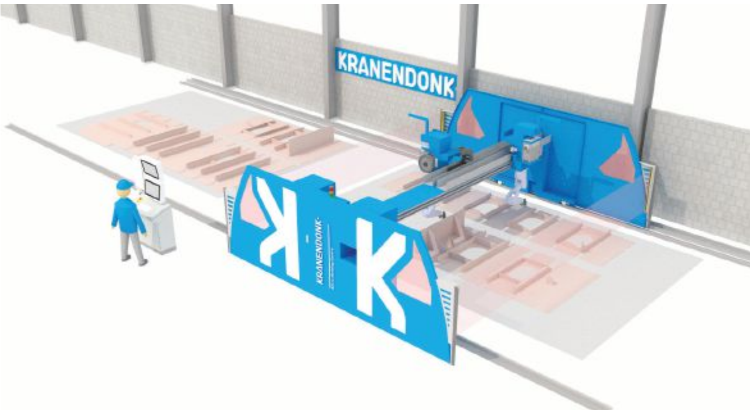
IDEA StatiCa is a steel connection design software package for all types of welded and bolted connections, base plates, footings, and anchoring. It also enables designers to solve buckling and stability of steel members. And it just became patented! The software can now design and code-check all types of connections, not just those in design guides, thanks to its component-based finite element method approach, which effectively combines all the code equations and conditions with finite elements, breaking down the topology and loading limits of older methods.

For more information, visit **www.ideastatica.com**.

Kranendonk Artemis Micro Welding Gantry

The Artemis Micro Welding Gantry—which can fit in a 40-ft container—was developed for maximum efficiency in smaller spaces. The gantry is constructed so that the side covers can be positioned along the gantry beam. Even the robots do not need to be removed for transport. The solution can be implemented into an existing production process and become fully operational within days. The system comes with one or two robots, with the second robot increasing production capacity and enabling optional double fillet welding (with both robots welding on the same stiffener). This optimizes welding and product quality by limiting distortion from heat input.

For more information, visit **www.kranendonk.com**.



Welcome to Safety Matters, which highlights various safety-related issues. This month's topics are brain injuries and hard hat replacement.

Brain Injuries

Traumatic brain injuries (TBIs) result in millions of emergency room visits, hospitalizations, and deaths per year in the U.S.—2.87 million such incidents in 2014, as a matter of fact. A TBI is caused by a bump, blow, or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Not all blows or jolts to the head result in a TBI, and the severity of a TBI may range from "mild" (a brief change in mental status or consciousness) to "severe" (an extended period of unconsciousness or amnesia after the injury.

A recent CDC (Centers for Disease Control and Prevention) report, *Deaths from Fall-related Traumatic Brain Injury*, found that in most states, the rate of fall-related TBI deaths has increased significantly, and the country as a whole saw a 17% increase in fall-related TBI deaths from 2008 to 2017. The most notable increases in fall-related TBI deaths were observed among persons 75 years of age and older and persons living in the most rural counties. This report highlights the importance of expanding efforts to stem the continued growth in the rate of fall-related TBIs among at-risk groups.

Effects of TBIs can include impairments related to thinking or memory, movement, sensation (e.g., vision or hearing), or emotional functioning (e.g., personality changes, depression). Falls are a leading cause of TBIs and typically account for nearly half of all TBI-related emergency room visits, and being struck by or against an object is another leading cause of TBI-related emergency room visits. Concussions are a common TBI, and it's important to recognize the signs:

- One pupil larger than the other
- Drowsiness or inability to wake up
- A headache that gets worse and does not go away
- Slurred speech, weakness, numbness, or decreased coordination
- Repeated vomiting or nausea, convulsions or seizures (shaking or twitching)
- Unusual behavior, increased confusion, restlessness, or agitation
- Loss of consciousness (passed out/knocked out)

Even a brief loss of consciousness should be taken seriously, and anyone who has been thought to suffer a concussion should be seen by a healthcare provider.

Properly used fall-arrest equipment and hard hats are key to minimizing TBIs in steel construction work, whether in the shop, on the job site, or somewhere in between.

Hard Hats

When it comes to hard hats, some companies are switching to helmets instead. ANSI Z89.1 Type II helmets provide protection from lateral impact in addition to the top impact protection provided by Type I hard hats. Many also have chin straps, which help improve their record of preventing injury. Note that not all climber-style helmets are ANSI Z89.1 Type II. Look for the type marked on the helmet.

The current standard for head protection is ANSI Z89.1-14 (R2019). Each ANSI Z89.1 hard hat must have the following information clearly marked inside the hat:

- Manufacturer's name
- ANSI standard that the hard hat conforms with, such as "ANSI Z89.1-2009"
- ANSI type (Type I or II) and class designation (G, E, or C)
- Size range for fitting
- Date of manufacture
- If the hard hat meets Z89.1-2009 or later, it must also contain the following:
- Two arrows curving to form a circle when the helmet can be worn forwards or backward
- LT if the helmet is designed to provide protection at low temperatures -22 °F (-30 °C)
- HV if/when the helmet meets all requirements for high visibility

Type II hard hat and helmet.

Hard hats must be replaced if they show signs of damage (dents, cracks, penetration, or fatigue due to rough treatment), and it is essential to inspect hard hats for damage and signs of fatigue each time they are used. In addition to visual inspections, another way to test a hard hat is to grasp it in two hands and apply force by squeezing the hat. If you hear creaking or other unusual sounds, it is time to replace the hard hat.

While OSHA has no specific provision for an expiration date, manufacturers are allowed to determine if their equipment expires on a specific calendar date. In lieu of an expiration date, a generally accepted rule is to replace the support strap yearly and to replace the hard hat every five years. Harsh chemicals and extreme temperatures can make a hard hat degrade more quickly. UV light exposure deteriorates shells and is a particular concern of those who work outside. Be sure to check with the manufacturer for guidelines on hard hat replacement and maintenance.

We are always on the lookout for ideas for safety-related articles and webinars that are of interest to AISC member companies. If you have safety-related questions or suggestions, we would love to hear them. Contact us at **schlafly@aisc.org**. And visit AISC's Safety page at **aisc.org/safety** for various safety resources. In addition, AISC has established its own resource page with information on employment, contract, and safety issues regarding COVID-19. It's at **aisc.org/covid19**.

BRIDGES

AASHTO Selects Steel Press-Brake-Formed Tub Girder as 2021 Focus Technology

The American Association of State Highway and Transportation Officials (AASHTO) Innovation Initiative (AII) selected the steel press-brake-formed tub girder (PBTG) bridge system as a 2021 Focus Technology. AII will invest time and resources to accelerate the system's adoption among AASHTO member associations, local agencies, and industry partners to improve U.S. infrastructure.

Researched and tested by the Short Span Steel Bridge Alliance (SSSBA)—of which the National Steel Bridge Alliance (NSBA) is a member organization—the PBTG is an accelerated bridge construction system consisting of modular galvanized shallow trapezoidal boxes fabricated from cold-bent structural steel plate. Anchor Bay Drive along Lake St. Clair in Clay, Mich., a 2020 Prize Bridge Award winner, is an example of a PBTG bridge; see the July 2020 issue in the Archives section at **www.modernsteel.com**.

"We are honored to have PBTG selected and thank the AII selection committees for their recognition of its economical and sustainable benefits," said David Stoddard, senior steel applications engineer for SSAB Americas and chairman of the SSSBA. "Since AII advances innovation from the grassroots up, this opportunity will fast-track this economical system further into the mainstream, providing an optimal steel solution to meet the nation's infrastructure challenges."

Learn more about the PBTG system at **www.buildusingsteel.org**.

PUBLIC REVIEW

Several AISC Standards Available for Public Review

A draft of the 2022 edition of the AISC *Specification for Structural Steel Buildings* (AISC 360) is available for public review until March 5, 2021. This is the second public review period for this specification, which is expected to be completed and available in late 2022.

Also, the 2022 edition of the AISC *Seismic Provisions for Structural Steel Buildings* (AISC 341) is available for public review from March 5 until April 2.

In addition, two new AISC standards are available for public review until April 12: the AISC *Specification for Structural Stainless Steel Buildings* (AISC 370) and the AISC *Code of Standard Practice for Structural Stainless Steel Buildings* (AISC 313). Both standards are expected to be available by the end of 2021.

All draft standards and related review forms can be downloaded from the AISC website at **aisc.org/publicreview**. Hard copies of review drafts are available (for a $35 charge each) by calling 312.670.5411. Please submit comments using the forms provided online or to Cynthia J. Duncan, AISC's director of engineering (**duncan@aisc.org**), by the dates indicated for consideration.

corrections

The Individual Awards news item in the February 2021 issue listed the incorrect award type for a handful of winners. Please note the following corrections:

- Dennis Noernberg, Jeffrey Packer, and Rafael Sabelli received Lifetime Achievement Awards, not Special Achievement Awards.
- Scot Becker and Dale Ison received Special Achievement Awards, not Lifetime Achievement Awards.

In addition, the January 2021 article "Century of Service" (**www.modernsteel.com**) included a list of AISC member fabricators that have been in operation for over 100 years. **American Bridge Company** has been in existence since the 1800s, and **AFCO Steel**, now part of **W&W/AFCO Steel,** was founded in 1909. Both companies should be included in this list. If you happen to know of another 100-year-old fabricator that wasn't on the list, please email Carly Hurd at **hurd@aisc.org**.

People & Companies

Bridge engineering and supply company (and AISC member) **Acrow** announced that it has provided 26 modular steel bridges to Administração Nacional de Estradas (ANE), the National Road Administration of Mozambique. The bridges will be installed in rural areas of Mozambique to restore vital transportation routes damaged by cyclones in 2019.

Canam Steel Corporation (CSC), an AISC associate member and manufacturer of open-web steel joists and steel deck products, announced that **Chris Ervin** has become regional general manager (RGM) of the Southeast Region. With nearly 30 years of professional experience in the industry, Ervin will be responsible for expanding CSC's new brand identity, spurring from its recent separation from its former parent company.

Thornton Tomasetti announced that **Brian G. Morgen, SE, PE, PhD**, has joined the firm as vice president and Seattle office director. Morgen has more than 16 years of experience in the Seattle market and an extensive background in structural analysis and design and project management. He has collaborated with project teams on many technically challenging structures, including office and residential towers, healthcare facilities, civic and cultural centers, and mixed-use complexes. Morgen is a specialist in performance-based seismic design and played a key role in the design of several high-performing buildings in earthquake-prone areas in the Western U.S. and Asia.

marketplace & employment

SMITH-EMERY
Inspection • Testing • Metallurgy
Assuring Structure & Life Safety Since 1904

Non-Destructive Testing
- PAUT
- Visual (CWI, CWB, CSWIP)
- MT
- UT

Owner QA
- Fabrication Oversight
- Specification Review
- Field Inspections
- WPS Reviews

Metallurgical Laboratory
Environmental Laboratory
Firestop Inspection

Supplier Audits
- IAS
- IAPMO
- City of Los Angeles
- Clark County, NV

Contractor QC
- Fabrication Shop NDT, CWI
- Vendor Audits
- QMS Development
- WPS and PQR Testing

Curtain Wall Performance Testing
Concrete Testing
Chemical Laboratory

1.833.405.0536
steel@smithemery.com
www.smithemery.com

AASHTO ACCREDITED · IAS ACCREDITED Inspection Agency · IAS ACCREDITED Testing Laboratory

DETAILING MANAGER

Southwest Ironwork, Inc.
www.southwestironworkinc.com

- Requires Autocad
- Tekla Software Experience
- DetailCad Desired
- Manage Detailing Department
- Customer Interactions
- Pay Determined On Experience
- Albuquerque, New Mexico

CONTACT: shawn@southwestironworkinc.com

Modern Steel Construction

All of the issues from *Modern Steel Construction*'s 60+ years are now available as free PDF downloads at **modernsteel.com/archives**.

Structural Engineers

Are you looking for a new and exciting opportunity?

We are a niche recruiter that specializes in matching great structural engineers with unique opportunities that will help you utilize your talents and achieve your goals.

- We are structural engineers by background and enjoy helping other structural engineers find their "Dream Jobs."
- We have over 30 years of experience working with structural engineers.
- We will save you time in your job search and provide additional information and help during the process of finding a new job.
- For Current Openings, please visit our website and select Hot Jobs.
- Please call or email Brian Quinn, PE: 616.546.9420 | **Brian.Quinn@FindYourEngineer.com** so we can learn more about your goals and interests.
  All inquiries are kept confidential.

SE Impact by SE Solutions, LLC | **www.FindYourEngineer.com**

LATE MODEL STRUCTURAL STEEL MACHINES AVAILABLE IMMEDIATELY

Ficep 1003 DVB Structural Steel Drill, SGB 1045 Saw & 1261 TT Thermal Coping Line, Upgraded 2015, #31222

Peddinghaus HSFDB 2500/B Plate Processor, 3" Max. Plate, 96" Max. Width, HPR400XD, 48 HP Drill, 2012, #31085

Peddinghaus PCD1100/3B & ABCM 1250/3D, 40" Beam Drill & Oxy Coper Tandem Line, 2013, #30825

Peddinghaus 643E Anglemaster, 6" x 6" x 1/2", 200 T Shear, 66 T Punch, Fagor CNC, 40' Conveyor, 1991, #30325

Franklin 4280, 8" x 8" x .75" Max. Capacity, 100 Ton Punch, 30' Infeed, 25' Outfeed, Auto Loading, 2010, #31230

Peddinghaus FPB-500/3C, 150 Ton Triple Gag Punch, 20.8" x 40' Plate, 200 Amp Plasma, Control & Drive Upgrade '09, #30803

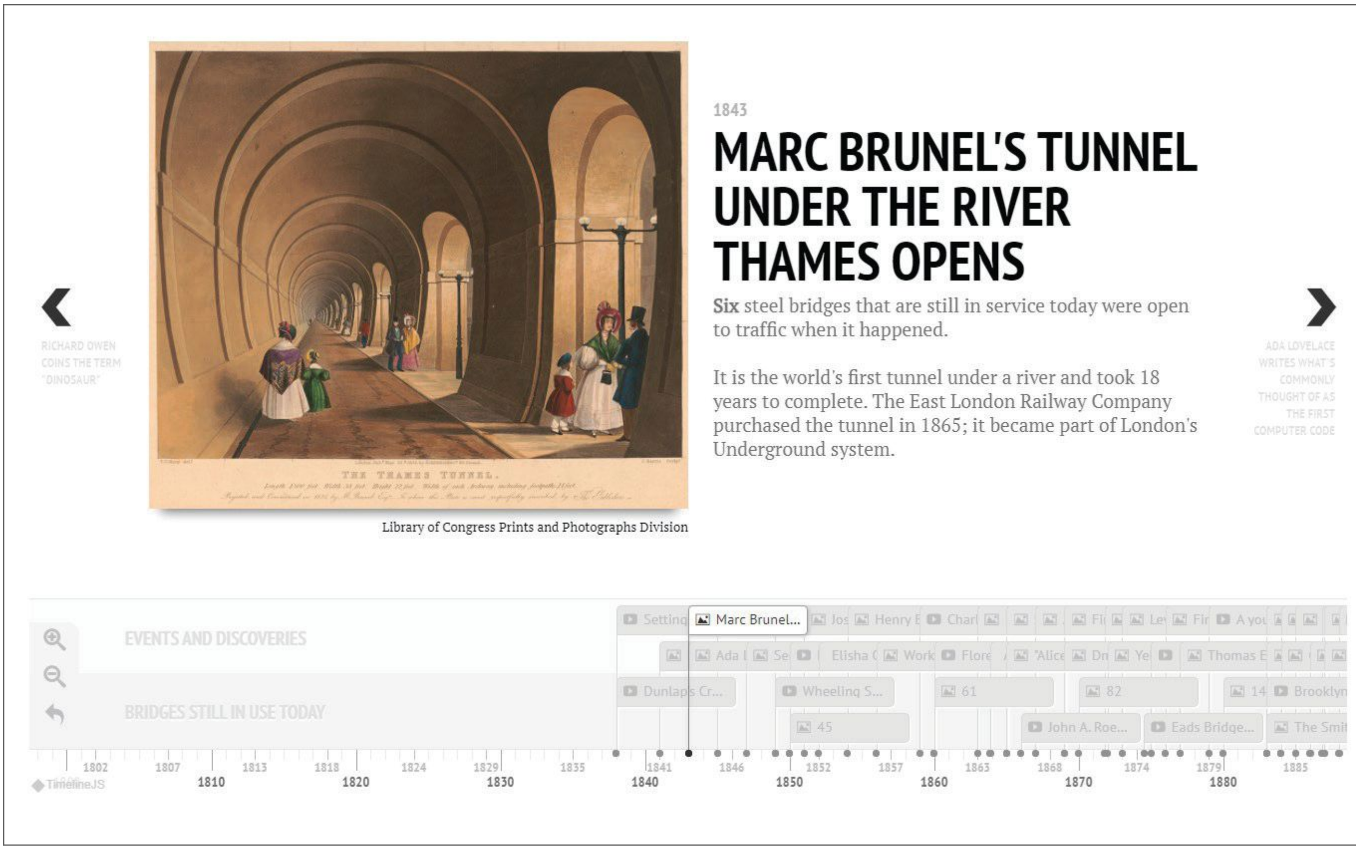
PRESTIGE EQUIPMENT

We are actively looking for used Structural Steel Equipment, Contact
claire@prestigeequipment.com

www.PrestigeEquipment.com | (631) 249-5566

Search employment ads online at **www.modernsteel.com**. To advertise, contact M.J. Mrvica Associates, Inc.: 856.768.9360 | **mjmrvica@mrvica.com**

advertiser index



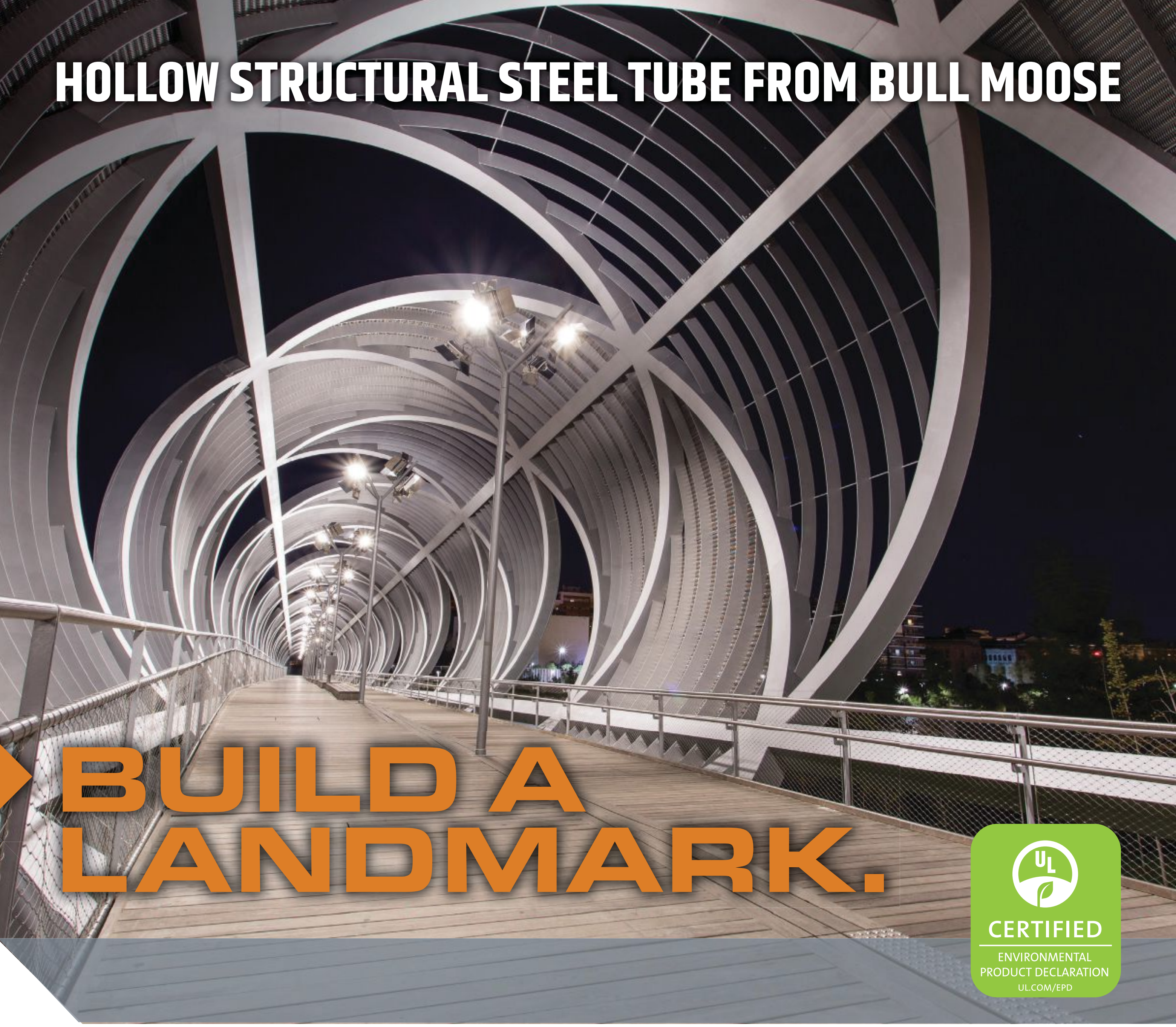
TEST OF TIME

A LOT HAS HAPPENED since the first U.S. steel bridge still in service—Dunlap's Creek Bridge in Brownsville, Pa. (technically a cast iron bridge)—opened in 1838. And today, there are thousands of 100-year-old (and then some) steel bridges across the country.

An interactive timeline on AISC's website lets you take a stroll back in time—to 1838 and even earlier—highlighting major world events and aligning them with the number of U.S. steel bridges, still in service today, that were already open to traffic when they happened. For example, in 1843, Marc Brunel's tunnel opened under the Thames River in London. It was the world's first tunnel under a river and took 18 years to build, and eventually became part of the London Underground mass transit system. As impressive as that feat was, there were already six U.S. steel bridges open to traffic at the time that are still in operation today.

You can jump in the time machine at **aisc.org/timeline**.

And speaking of steel entities that have hit the century mark, AISC turns 100 this year! Check out the "Centennial Content" section at **www.modernsteel.com** for content related to this milestone. ■



For projects that will stand the test of time, start with Bull Moose HSS tube.

Our direct-form manufacturing process enables us to use the highest grade HSLA steel...and form it directly into a tube.

With sizes ranging from 1.5" square to 18"x6", and wall thicknesses from 1/8" through 5/8", Bull Moose features one of the largest size ranges of HSS products in the industry.

For strength, versatility and reliability, build with Bull Moose.

BULL MOOSE ADVANTAGES

- Strength ranges of 46 KSI to 110 KSI
- Tighter tolerances, sharper edges, and straighter tubes
- Widest variety of custom sizes/lengths, including metric
- In-line NDT weld testing available on all tube
- Readily available weathering grade steel
- Fast delivery with 8 domestic sites

BULL MOOSE®
For exceptional strength.

1819 Clarkson Rd.
Chesterfield, MO 63017

800.325.4467 | BULLMOOSETUBE.COM