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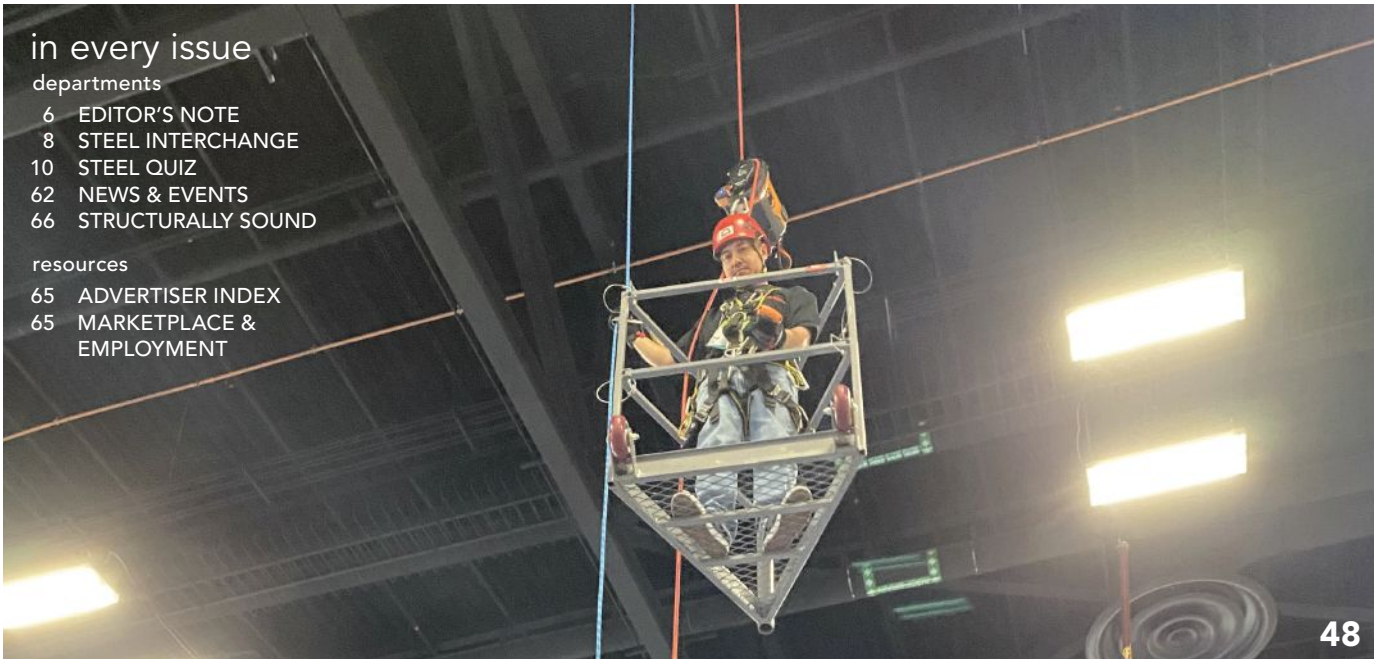

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ON THE COVER: The Lindemann Center's steel frame helps a tight space accomodate a wide range of performances, p. 24. (Photo: Iwan Baan)

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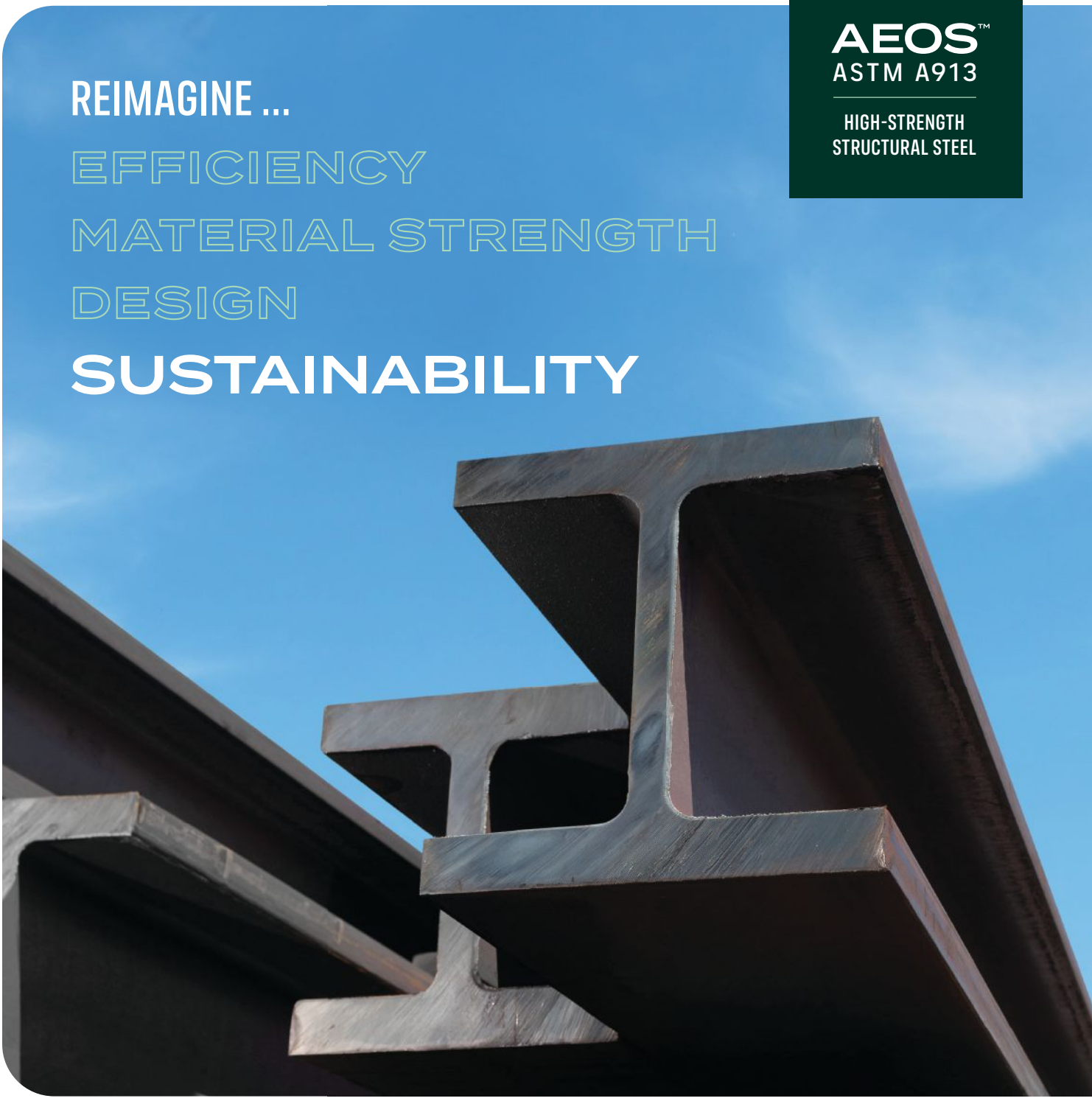

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editor's note

Along with many of you, I was in San Antonio this past March for NASCC: The Steel Conference—and I didn't see the Alamo. Fewer cities are so closely associated with a specific building than San Antonio, so it felt a bit odd.

Did I eat Tex-Mex, one of the staple foods of my youth and something I can never truly get enough of? Several times. Did I make the requisite late-night visit to Whataburger? Obviously. Did I wander along the River Walk, eventually reaching the stretch where the tourists fade away and the serenity creeps in? Of course. Did I drink margaritas? Did I ever! But no Alamo for me.

To be fair, I've seen it multiple times on previous visits, so it had already been checked off the bucket list. Besides, who needs limestone when you've got steel?

And there was plenty of steel-related activity a stone's throw from the famed fort and mission in the Henry B. González Convention Center, which hosted this year's edition of The Steel Conference. Nearly 7,000 steel industry professionals trekked to deep in the heart of Texas for the show, topping the previous in-person attendance record by nearly 1,000, to check out as many of the 250-plus technical sessions and visit as many of the 355 exhibitors as possible.

One of the show's highlights was the Wednesday keynote, whose speaker, Chad Hymas, suffered a traumatic injury years ago that left him wheelchair-bound for the rest of his life. In his presentation, he encouraged the audience not to take things for granted before they become sacred. He also used his accident, which involved a farm equipment malfunction that resulted in a massive hay bale being dropped on him, as a cautionary tale, urging not to ignore warning signs simply because you've gotten away with it before.

Despite this monumental setback, Chad learned to adapt to, live with, and even thrive in his new reality. The message of adaptability was prevalent throughout his talk. He shared the example of how he had trouble gaining traction with the ground when he was first relying on a wheelchair to get around. So he changed his slick tires to mountain bike tires, an adjustment that led to a better, more efficient, and less tiring way of moving around.

An adjustment mindset was also present in the Steel Conference's exhibit hall, where the various product manufacturers, service providers, and software developers were all demonstrating how their offerings could lead to a better, more efficient, and less tiring way to perform tasks and processes up and down the structural steel supply chain. As a matter of fact, we've compiled a collection of more than three dozen of these innovative tools in our Hot Products section, starting on page 48. You can also read a recap of the conference on page 44, which highlights sessions, research, and highlights from the exhibit hall, and details AISC's new Fabricator Education Training Program, which is designed to provide AISC members with an easy way to introduce basic concepts to new employees at their fabrication shops.

If you didn't make it to San Antonio but are interested in the sessions, fear not! We've posted recordings of them at **aisc.org/learning**, where you can view them at your leisure.

I'd personally like to extend my heartfelt thanks to everyone who worked or volunteered at, attended, exhibited at, and sponsored the conference! We couldn't do it without you, and you make this event a success every year! Speaking of which, next year's show takes place April 2–4 in Louisville, Ky. We'll see you there!

Geoff Weisenberger
Editor and Publisher

Modern
Steel Construction

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

Editorial Contacts
EDITOR AND PUBLISHER
Geoff Weisenberger
312.493.7694
weisenberger@aisc.org

ASSOCIATE EDITOR
Patrick Engel
312.550.9652
engel@aisc.org

SENIOR DIRECTOR OF PUBLICATIONS
Keith A. Grubb, SE, PE
312.804.0813
grubb@aisc.org

GRAPHIC DESIGN MANAGER
Kristin Hall
773.636.8543
hall@aisc.org

EDITORIAL DIRECTOR
Scott Melnick
312.804.1535
melnick@aisc.org

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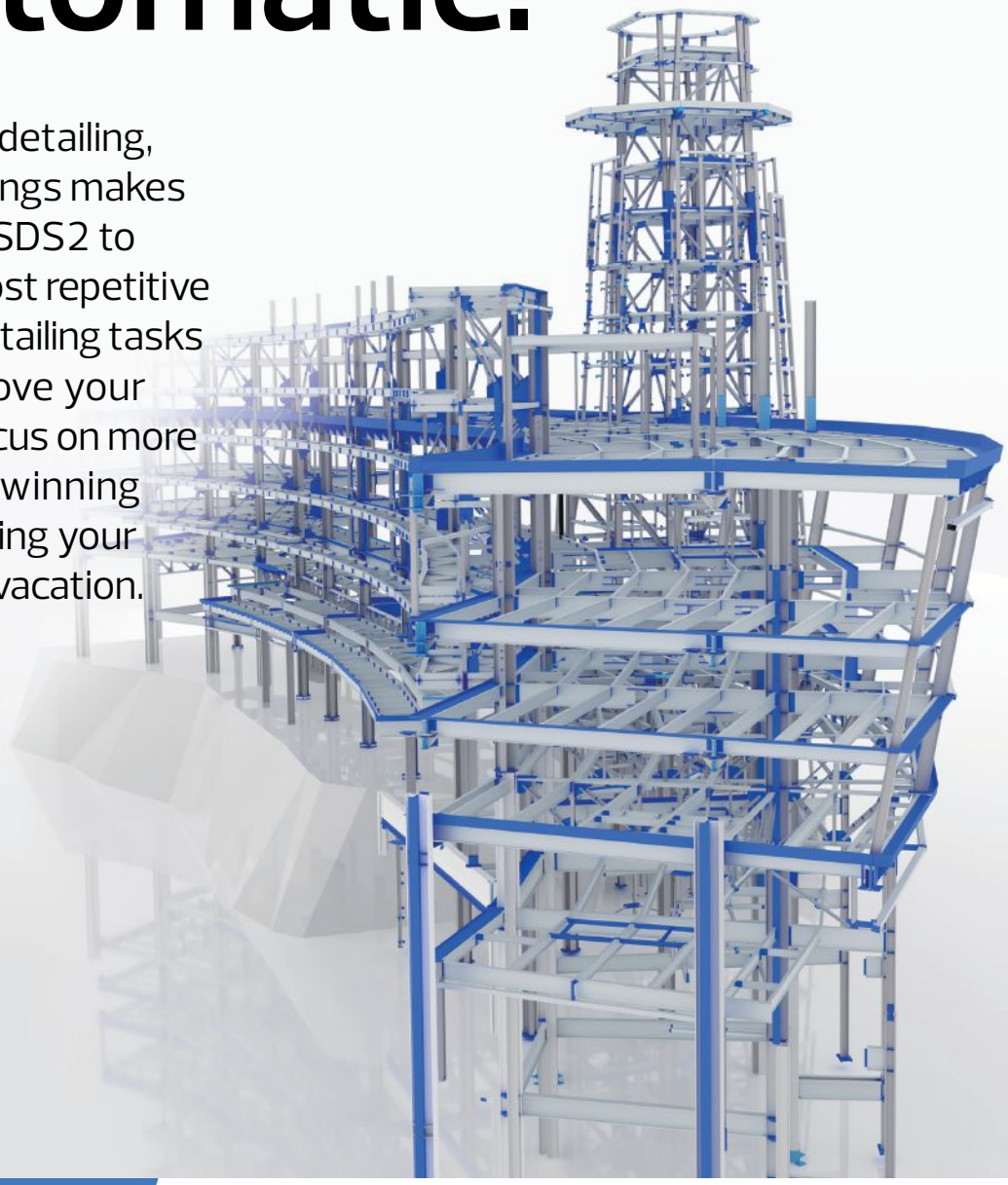

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If you've ever asked yourself "Why?" about something related to structural steel design or construction, *Modern Steel*'s monthly Steel Interchange is for you! Send your questions or comments to **solutions@aisc.org**.

Structural Steel Dimensioning Tool – Metric Version

I am a structural designer and user of the AISC Structural Steel Dimensioning Tool (found at aisc.org/dimensioningtool). Does a metric version of this tool exist?

No, we do not have a metric version of this tool. However, we do have a few other resources to obtain metric shape properties:

Shapes Database: Our shapes database, found at **aisc.org/shapesdatabase**, can be downloaded for free and has metric values included. The metric values are after the U.S. customary units (so, in columns CG through FJ). There is an explanation of what each value in the different columns included in the excel tab "Database v16.0" are in the tab titled "v16.0 Readme."

These are consistent with the shapes shown in the 16th Edition *Steel Construction Manual*. The 15th edition shapes database, which is consistent with the 15th edition *Manual*, can be found at **aisc.org/oldshapes**.

Steel Construction Manual: The *Manual* (available at **aisc.org/publications**) lists the SI equivalents of standard U.S. shape profiles in Part 17. Only the equivalent shapes are listed, not all the properties.

Yasmin Chaudhry, PE

Steel Corrosion Evaluation

How do I evaluate corrosion on a steel column-to-base plate connection? Is there an acceptable limit or amount of corrosion loss?

Corrosion is evaluated on a case-by-case basis and depends on various factors, such as the amount of corrosion loss, where the corrosion loss is, the load on the member, among other factors.

The first step is to evaluate how much section loss has occurred, which can be accomplished by scraping off the rust scale and measuring the remaining section with calipers or ultrasonic testing instruments. Note that when steel corrodes, the resulting rust is larger in volume than the original steel. Because of this expansion, the corrosion often looks worse than it is, so it's important to figure out how much of the remaining section is left.

The remaining section is evaluated to determine if the section loss has a detrimental effect on the strength and stability of the member or connection, which varies case by case. For example, an engineer might determine that because the loads are small relative to the capacity of the member, a small amount of section loss is not detrimental to the strength and stability of a particular member.

Some excellent references exist that focus on corrosion in bridges, and they can provide insight into other applications. Appuhamy et al. (2013) classified corrosion section loss as minor, moderate, or severe based on the corrosion depth ratio. They also developed equations for the effective thickness of corroded elements. Kulicki et al. (1990) developed a comprehensive document for evaluating corrosion effects in steel members.

It is important to remember that if the steel has corroded, it will continue to do so unless steps are taken to protect the steel from continued corrosion. The NSBA has a compilation of corrosion references that could also be helpful. The compilation is found at **aisc.org/nsba/corrosionprotection**.

Yasmin Chaudhry, PE

References

Appuhamy, J.M.R.S., Ohaga, M., Kaita, T., Chun, P. and Dissanayake, P.B.R. (2013), "Development of an Efficient Maintenance Strategy for Corroded Steel Bridge Infrastructures," Journal of Bridge Engineering, *American Society of Civil Engineers, Vol. 18, No. 6, June, pp. 464-475.*

Kulicki, J.M., Prucz, D.F., Sorgenfrei, D.F., Mertz, D.R. and Young, W.T. (1990), Guidelines for Evaluating Corrosion Effects in Existing Steel Bridges, NCHRP Report 333, *Transportation Research Board, December.*

Minimum Inside Radius for Cold-Bending Structural Stainless Steel

Table 10-13 in the 16th edition *Manual* provides guidance on the minimum inside radius for structural steel. I could not find similar guidance provided in AISC Design Guide 27: *Structural Stainless Steel* (a free download for members at aisc.org/dg). Do you know of any recommendations?

Stainless steel flat sheet/plate and bar products can be bent using a press brake or bending machine. The work should be executed as quickly as possible due to work hardening characteristics of stainless steels, and a degree of overbending is necessary to counteract the spring back of the bend. The power requirements for bending stainless steel are higher than for bending geometrically similar carbon steel components due to work hardening (by about 50% in the case of the austenitic steels or even more in the case of duplex stainless steel).

In general, limiting the minimum inside bend radius to a value of at least $0.5t$ is recommended for annealed (i.e. softened) austenitic stainless steels. If the material is cold-worked, then a larger bend radius will be needed.

All mentioned AISC publications, unless noted otherwise, refer to the current version and are available at **aisc.org/publications**. *Modern Steel* articles can be found at **www.modernsteel.com**.

Duplex stainless steel alloys require a more generous bend radius because of their higher strength; it is recommended that the minimum bend radius should be at least double the radius of standard austenitic alloys, depending on the strength of the duplex stainless steel alloy.

Nancy Baddoo

Torsion and Weak-Axis Bending

I believe equations 3.9 and 3.10 in AISC Design Guide 9: *Torsional Analysis of Structural Steel Members* (a free download for members at aisc.org/dg) are for shear stress due to beam action bending about the major axis. Do we need to replace Q_f and Q_w with the first moment of inertia calculated about the minor axis for minor axis bending?

$$Q_f = \frac{ht_f(b_f - t_w)}{4} \qquad \textbf{Eq. (3.9)}$$

$$Q_w = \frac{hb_f t_f}{2} + \frac{(h - t_f)^2 t_w}{8} \qquad \textbf{Eq. (3.10)}$$

where, as illustrated in Figure 1

$$h = d - \frac{t_f}{2}$$

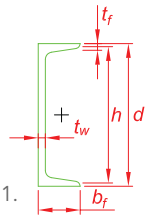


Fig. 1.

Yes, Q_f and Q_w need to be replaced. The shear stresses in the flange that are caused by x-direction shear forces (minor-axis bending) can be calculated using the theoretical equation from any strength of materials textbook which is:

$$v = \frac{VQ}{It}$$

Assuming only the flanges of the I-shaped member resist the shear force, the stress distribution is parabolic. The shear stress is zero at the flange tips and maximum at the mid-width, with the maximum value equal to 50% greater than the average shear stress:

$$v_{max} = \left(\frac{3}{2}\right)\left(\frac{V_f}{A_f}\right)$$

where

V_f = shear force per flange.
A_f = area of one flange = $b_f t_f$.

Bo Dowswell, PE, PhD

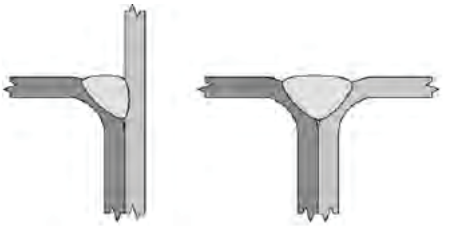
Yasmin Chaudhry (**chaudhry@aisc.org**) is a senior engineer in AISC's Steel Solutions Center. **Nancy Baddoo**, associate director of the Steel Construction Institute, and **Bo Dowswell**, principal with ARC International, LLC, are consultants to AISC.

steel quiz

This is the second part of a two-part quiz on hollow structural sections (HSS) focusing on the newly updated AISC Design Guide 24: *Hollow Structural Section Connections*, 2nd Ed. This updated guide includes many new connection types and a dozen new examples and greatly expands upon the background discussion for each connection. Download your copy today at **aisc.org/dg**.

1 **True or False:** A fillet weld directional strength increase factor, k_{ds}, per the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22) equals 1.5 for fillet welds to the ends of rectangular HSS loaded in tension.

2 **True or False:** Flare groove welds are required to be filled flush, as shown in the figure below.



3 **True or False:** HSS wall distortion and tension pullout are additional limit states, beyond conventional fastener limit states, that should be considered for bolts in tension fastened to HSS members.

4 **True or False:** The force transmitted through a fillet weld is uniform for elements connected transversely to the HSS face.

5 **True or False:** Reinforcing HSS walls to locally strengthen a member at a connection is typically an economical solution.

6 Which of the following are techniques for bolting HSS where access to the inside of the HSS is not required?

a. Blind bolts
b. Structural nut holders
c. Through bolts
d. All of the above
e. None of the above

TURN TO PAGE 12 FOR ANSWERS

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steel quiz ⋮ ANSWERS

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**.

Answers reference the recently published AISC Design Guide 24: *Hollow Structural Section Connections*, 2nd Edition. Again, you can download a copy at **aisc.org/dg**.

1 **False.** *Specification* Section J2.4(a) does not allow the use of the fillet weld directional strength increase factor for fillet welds to the ends of rectangular HSS loaded in tension, i.e., k_{ds} = 1.0. It was found that the use of the fillet weld directional strength increase factor does not provide adequate structural reliability (safety factor) for tension-loaded rectangular HSS-to-rigid plate welded joints (Section 3.1).

2 **False.** There is no requirement for flare groove welds to be filled flush; if the throat of an underfilled joint is sufficient to transfer the applied loads, considerable economy can be achieved with underfilled joints as compared to flush-filled joints, but the welder and inspector then must measure the amount of underfill. This is explained further in Section 3.4.5 of Design Guide 21: *Welded Connections – A Primer for Engineers*, and Section 3.1.4 of Design Guide 24.

3 **True.** Conventional fastener limit states found in *Specification* Section J3 apply to mechanically fastened HSS connections. Additional limit states to consider for bolts in tension fastened to HSS members are pullout (or punching shear of the fastener through the HSS face) and HSS wall distortion (associated with the flexibility of the HSS wall). Both limit states are discussed in Chapter 4.

4 **False.** For elements connected transversely to the HSS face, the force transmitted through a fillet weld is not uniform due to the variation of flexural stiffness of the HSS wall across its section width. Figure C-K1.3 in the *Specification* and Section 2.4 of Design Guide 24 illustrate the uneven load concept.

5 **False.** When designing connections to HSS members, a key point to remember is that reinforcing HSS walls to strengthen the member locally if needed is typically not an economical solution. Connections should be evaluated at the time the member size is determined, since the local strength of an HSS member at a connection may control the capacity of the connection (Chapter 5 and 6).

6 **d.** All of the above. Several alternative techniques for bolting HSS have been developed where access to the inside of the HSS is not required. These techniques include the use of through bolts and several different single-sided methods or bolts that are proprietary, such as blind bolts and structural nut holders (Section 4.5).

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Joist Journey

BY BRUCE BROTHERSEN, PE, AND KEN CHARLES

Evaluating open web steel joists for potential modification is both an art and a science.

OPEN WEB STEEL JOISTS and joist girders are key components of steel construction.

There are millions of open web steel joists and joist girders in roofs and floors of thousands of buildings throughout the United States, Mexico, and Canada. As building needs change, the joists will have new requirements as well. Additionally, as steel making and steel grades have evolved, as the specifications of open web steel joists progressively changed.

Evaluating and determining if a joist needs modification is a valuable skill that's an art and a science. The art is easier than most might think, and there are tools to assist with the science. The Steel Joist Institute (SJI), formed in 1928, has developed Technical Digest 12, *Evaluation and Modification of Open Web Steel Joist and Joist Girders*, which explains methods and techniques to evaluate and modify existing joists.

Open web steel joists have five main components. In simple terms, the chords are axial force carrying components on the top and bottom of the overall member. These members are usually horizontal, with some exceptions. The webs are members connecting the chords that transfer the shear forces. Bearing seats are the means on both ends of the joists to distribute the forces to the supporting structure and are connected to the supporting structure by welding or bolting. Welding connects all joist components. Bridging is the method for laterally bracing the chords during erection and service.

Manufacturers will not have the exact same method for building joists, but even with minor differences, open web products are simple and amazingly strong.

Each project is different, and the evaluator will need to gather as much information as possible on the existing structure. Sometimes, fact finding is easy. Other times, it's arduous and time-consuming.

The older the building, the less likely information such as shop bills or drawings will be available. On projects completed within the last 20 years, it's likely the joist manufacturer can be contacted, and it may have all the necessary information.

Older projects with limited available information make joist engineering an art and less exact. The art is careful approximation based on available data and facts to determine enough information to employ the more formulaic and precise science.

Evaluation questions to ask are listed in the Joist Investigation Form (Figure 1), found on the website or in Appendix A of Technical Digest 12. They're a strong basis for creating a guideline or checklist for information gathering.

With enough information, you can zero in on which specification was used for the joist design. You can also make some safe assumptions on the loading. Just by identifying the seat depth, you can usually assume the joist is either a K-series (2½ in.) or LH-Series (5 in.).

Part of the art of joist design is understanding most manufacturers do not purchase angle stock that would match angle sizes in the 16th Edition *Steel Construction Manual* (current and previous editions can be found at **aisc.org/manuals**). In fact, for joist use, you would likely find a 2 in. by 2 in. angle in seven different leg thicknesses, ranging from .137 in. to ¼ in.

To practice the art, take a micrometer thickness reading on the bottom chord. Determine the maximum tensile force by multiplying the bottom chord cross sectional area by $0.6F_y$. From there, based on

What year was the building constructed (or approximate age of the structure)? _____

Who was the joist manufacturer? _____

Is there a tag on the joist? ○ No ○ Yes Provide tag information _____

What type of trusses are the joists? ○ Warren ○ Modified Warren ○ Pratt ○ Other _____

What were the joists used for? ○ Roof loading ○ Floor loading

What type of bridging is used? ○ Horizontal ○ Diagonal

What is the joist span or length of joist? _____ **What is the joist spacing?** _____

What is the interior panel point spacing? _____ **What is the joist depth?** _____

What is the height of the joist seat? ○ 2½" ○ 5" ○ Other _____

Note: Top chord and bottom chord are usually NOT the same size, so please make sure you measure both.

Top chord
○ 2 Angles Top chord leg size _____ Top chord thickness _____
○ 2 Rounds Top chord diameter _____
○ Proprietary shape cross section (provide sketch)

Bottom chord
○ 2 Angles Bottom chord leg size _____ Bottom chord thickness _____
○ 2 Rounds Bottom chord diameter _____
○ Proprietary shape cross section (provide sketch)

Vertical webs
○ 1 Angle Vertical web leg size _____ Vertical web thickness _____
○ 2 Angles Vertical web leg size _____ Vertical web thickness _____
○ Crimped Vertical web leg size _____ Vertical web thickness _____
○ 1 Round Vertical web diameter _____
○ Other (provide sketch)

Diagonal webs
○ 1 Angle Diagonal web leg size _____ Diagonal web thickness _____
○ 2 Angles Diagonal web leg size _____ Diagonal web thickness _____
○ Crimped Diagonal web leg size _____ Diagonal web thickness _____
○ 1 Round Diagonal web diameter _____
○ Other (provide sketch)

How were these measurements obtained? ○ Tape ○ Micrometer ○ Caliper ○ Other _____

Fig. 1.

the effective depth of the joist, a maximum moment capacity can be determined. The design uniform load, w, can be determined by back calculating $M = (wL^2)/8$.

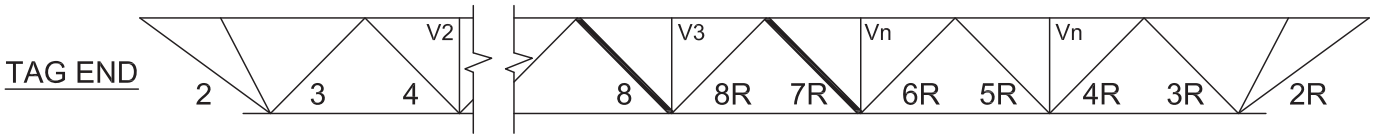
The SJI has resources to assist the engineer with the evaluation and modification process. Technical Digest 12 has many examples of different joists. Additionally, SJI's webinars include examples from Technical Digest 12 in even more detail. Ideally, the required number of repairs is minimized, and evaluating the existing joist only for the required loads is key. The act of reinforcing or repairing joists is a matter of balancing the benefits of a stronger joist with the actual requirements. Designers should never gamble on safety, and using building code load cases for an appropriate force can minimize the number of repairs.

In the field, labor is always more expensive than material. The goal is to minimize the different materials or add more material if it reduces the required labor.

The last part of the process is communicating the modification to the jobsite—arguably the hardest part. Generally, happenings in the field are not usually under the direction of the specifying engineer. Communicating to the field is an art, not a rigid formula.

Here is an example of general notes for communicating modifications from Technical Digest 12:

- No modification that affects the strength of a steel joist or steel joist girder shall be made without the approval of the project structural engineer of record. See OSHA 29 CFR 1926.757 (7).
- The details used herein were taken from the typical details provided in SJI Technical Digest 12 and require verification and approval by the structural engineer of record.
- All repairs shall be done in a professional and quality manner. Workers performing repair are responsible for the workmanship of the repair.
- All steel shall be a minimum yield of F_y = 50 ksi, unless noted otherwise.
- All welding shall be performed by a welder currently certified in accordance with the AWS requirements. The welder must be qualified for the welding positions required to properly install the reinforcing.



DIAGONAL WEBS ARE NUMBER IN SEQUENCE FROM TAGGED END TO CENTER OF JOIST AND ARE SYMMETRICAL ON OPPOSITE OR RIGHT END WITH "R" DESIGNATION. VERTICAL WEBS NUMBERED IN SEQUENCE AS Vn FROM THE TAGGED END TO OPPOSITE END.

Fig. 2.

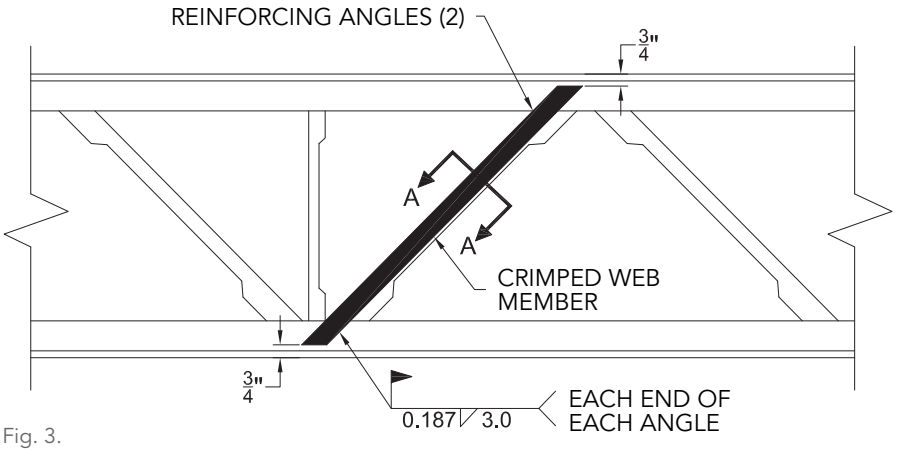


Fig. 3.

- All welds are to be made using E70XX electrodes. Weld requirements are as specified in the details above.
- Repairs shall be inspected by an AWS certified weld inspector.

A critical part of communicating to the field is sequenced step-by-step instructions. Even a simple repair of replacing a damaged web requires some instruction. Here is an example of field repairs procedures that explains the damaged web should not be removed until after the new web is in place:

- Measure and cut the reinforcing angle to proper length.
- Place reinforcing angles on side(s) of damaged web. Use two L2×2×¼ F_y = 36 ksi.

- Weld reinforcing angle to chords in accordance with the provided repair sketch.
- Remove the damaged web without damaging joist chords.

Clear details and sketches make work in the field significantly easier. The details and sketches should clearly show which members on the joist need repair. Figure 2 is one example of a sketch, and Figures 3 and 4 show clear and definitive sketches, helping the field labor achieve the intended result.

One reason steel is the best material in a circular building economy is because it's flexible in design and relatively easy to strengthen and modify, and joists are no exception. Readily available resources make joist evaluation and modification navigable rather than daunting. With each project, your art and science skills will be enhanced.

In addition to Technical Digest 12, the SJI provides two live webinars every year, one on the evaluation of existing joists and the other on the modification of existing joists.

The SJI also has free tools that can be downloaded at **www.steeljoist.org**. These tools include Historical Load Tables, Steel Joist Uplift Analysis Tool, Joist Girder Analysis Tool and the Joist and Joist Girder Reinforcement Tool.

All of these resources can help you quickly grow comfortable with the process of evaluating and modifying open web steel joists and optimizing their use in your projects. ■

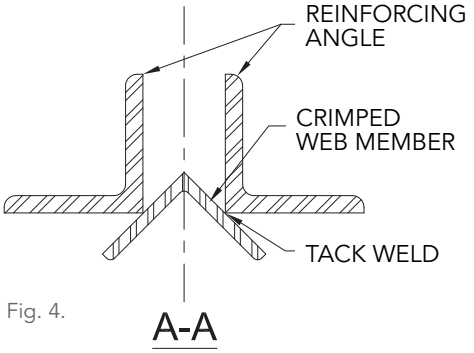


Fig. 4.

Bruce Brothersen (**bruce.brothersen@nucor.com**) is a senior innovator with Nucor-Vulcraft, and **Ken Charles** (**kcharles@steeljoist.org**) is managing director of the Steel Joist Institute.

Giving Back

INTERVIEW BY GEOFF WEISENBERGER

Onur Avci pivoted from a career as a practicing engineer to academia, fulfilling his wish to share his wealth of knowledge with the next generation of engineers.

ONUR AVCI came to the United States with grand visions for his structural engineering career. He started by completing two graduate degrees at Virginia Tech before moving to Las Vegas for his first job, with Walter P Moore, then relocated to New York City to take a job with Weidlinger Associates. He later worked for AECOM in New York.

It was the path he envisioned, but he eventually realized something was missing.

Avci had accumulated plenty of knowledge from his studies and experience. He felt compelled to share it with young minds.

An academic career that began in 2012 initially led Avci overseas, then he and his family returned to the United States. He found a tenure track position at West Virginia University, where he's the Herbert P. Dripps faculty fellow in the school's Statler College of Engineering. His work there earned him an AISC 2024 Terry Peshia Early Career Faculty Award, which recognizes those who build a brighter future by supporting tomorrow's leaders. He was honored for his exceptional promise and continued excellence in structural steel research, teaching, and service to the industry.

Avci spoke with *Modern Steel Construction* at NASCC: The Steel Conference in San Antonio about his path, research interests, and more.

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**.

I always like to start at the beginning. Where are you from and where did you grow up?

I grew up in Ankara, Turkey, and I did my bachelor's at Middle East Technical University in Ankara. After that, I moved to the United States for my master's and PhD at Virginia Tech. I worked at structural engineering firms in Las Vegas and New York City.

I was really fortunate to be part of signature projects in New York, including One World Trade Center and the Second Avenue Subway. It was an excellent time to be in New York City. The projects I worked on were diverse—low-rise, mid-rise, high-rise, below-ground, above-ground, with seismic emphasis, within the U.S., and overseas—you name it.

But after that, I wanted to go back to academia. I moved to Qatar to be close to family members in Turkey. I was at Qatar University for about five years. Then, I came back to the U.S., and I was a non-tenure track faculty member at Iowa State University for about two years. West Virginia hired me in 2022, and here I am.

What project from your time in New York are you most proud of?

It's hard to name one. One World Trade Center was a signature project. It had a lot of people—engineers, technicians, and architects. I'm really proud to have been part of a project like that. I learned from everybody around me.

Another important project was the PATH Terminal Station right outside One World Trade Center, which has a huge cantilever (the Oculus area) and required a lot of vibration research. It cantilevers about 60 ft out, if I remember correctly.

I also did work on about ten U.S. embassies. I worked on the embassy in Skopje, Macedonia. I spent a lot of time on the U.S. embassy in Afghanistan. The different U.S. embassy, though, was the one in London. It's about 30 to 35 ft high at the entry level, which made progressive collapse design challenging. I did not work on that project, but I was part of the Weidlinger Associates (which later became a part of Thornton Tomasetti) team that won the project bid.

I was part of the Walter P Moore project team that designed the new Sheraton Hotel in downtown Phoenix and Terminal 3 of what's now Harry Reid International Airport in Las Vegas. I was lucky to be part of design teams that worked on such big and public projects. We're serving the community, and I am happy about that. People just come and go through these structures. They don't necessarily know us, but the fact that they've been through these structures that we worked on is a good feeling.

What made you want to get back into academia?

I always wanted to come back to academia because I wanted to connect with students. I was very lucky to have great role models in teaching: Thomas M. Murray, W. Samuel Easterling, and Daniel J. Inman. They truly inspired me.

After the industry experience, I felt like I had put in time as a practicing engineer, and it was time for me to go back and teach it in an understandable way. I'm a big believer in hands-on experience. Being in a design office witnessing design problems—engineers are there to solve problems—is not like what you see in a textbook. When you're in the game, you see different perspectives of things.

I wanted to transfer all the knowledge and experience to students. It's the ultimate job satisfaction for me. It's more than the projects, publications, and citations. It's the ultimate job satisfaction because the students are ready to learn from someone who was part of an NFL stadium design or a signature tall building design. All this

experience, all this headache from solving problems, and all that energy now has better meaning because I can pass it on to students. I think university faculty who teach design classes must have real design experience in an office and at jobsites.

In addition to the teaching side of things, I have always been passionate about research. I started on floor vibration serviceability in grad school. Then, I switched to structural health monitoring—still using acceleration data and vibration behavior observed in civil engineering structures. I've been working on implementing machine learning and deep learning tools to structural health monitoring to elevate and modernize conventional monitoring practices to real-time data-driven structural damage detection.

By looking at the vibration response of structures and forming baseline conditions, we can now detect, localize, and quantify damage with respect to the baseline conditions for several types of structures. It's possible just by monitoring acceleration information on the structure.

Our several publications on this topic have been cited a lot because—to me—we performed and published pioneering research using acceleration information with machine learning tools. After a couple of successful publications, we were getting a lot of questions from all over the world, and I told my graduate students at the time that we should have a website so people can find the answers without asking us.

So, we formed the structuraldamagedetection.com website. It has a set of vibration data corresponding to 31 damage scenarios for an inclined steel grid laboratory structure (to represent the inclined seating flavor of a stadium). It's a benchmark database for structural damage detection.

I thought we'd have fewer questions from all over the world after we built the website. Instead, we've probably tripled the questions, and I realized we were onto something big. We wanted to share the data for that research and make it publicly available. It's always interesting to interact with other researchers. For instance, when people look at our data and ask us questions, it's always a good feeling to see others on the planet using the data we generated, and the most important thing to me is that they care about it. We're glad it has been cited a lot.

I had tremendous colleagues and collaborators, and I'm really proud of that chapter in my research. We performed the research and people paid attention. To me, the mission is accomplished there. And of course, we didn't stop. We're working on making it even better, faster, and cooler.

Was it intimidating at all the first time you got up in front of a lecture hall?

Yes, and sometimes it still is. You have to have adrenaline and have to feel it. You need to be passionate about the topic so that the students can receive your energy. You should be excited that the football is being thrown at you—can you catch it? Well, I caught it in practice; can I catch it in a real game when it matters? This is how I look at it for the lectures; the students ask a stud question, and the instructor should answer it on the spot correctly and surely. That goes back to my previous comment on the design office experience.

I look at teaching from this perspective: Let's say you have $1 million, and I need $100. If you're that rich, and if I need $100, and you cannot give it to me, it doesn't mean much to me that you have $1 million. I have all this information. When the students ask about it, can I tell a story, are we going to click, and is the question answered? Otherwise, it doesn't matter if the instructor waves his hands and goes over the slides. If the student thinks the question isn't answered, the job isn't done.

You must prepare yourself to be in the classroom. You should be under a little pressure so when the time comes, you're ready to start teaching and pass the information. When you have an example problem, they should be able to follow what you described. It's not that easy, especially if you want to do a 120% complete job.

I'm lucky because I've received positive comments so far in multiple countries with different cultures and backgrounds. The Peshia Award is exciting. It fuels me and puts more pressure on me to do better things, which I like. I like to teach and research at the same time.

What's the next big research project on tap for you?

I'm really happy to be part of AISC's FastFloor project and its outstanding team. We have five universities, the Pankow Foundation, the MKA Foundation, AISC, and many other contributors. It's a long list; I don't want to miss a name. I'm truly grateful to everyone involved in the FastFloor project.

My role is related to vibration serviceability and acoustic testing. Structures are becoming lighter and slenderer, and thus

A 10 ft by 40 ft FastFloor module being tested at West Virginia University's Structures Laboratory under the supervision of Onur Avci.

Onur Avci

vibration serviceability is becoming more critical. Even if you get the job done for strength and other limit states for deflections, that's not necessarily good enough when things are prone to vibration. For example, when you are sitting in front of your computer, somebody walks by, and your screen shakes, it's not exactly pleasant. You're trying to focus, but your focus was disrupted by people walking or other human-induced excitation. But you cannot blame people for walking.

Floor vibration serviceability has become a limit state because we have less damping on structures nowadays. If you think about older structures where you have thick concrete slabs, and, at the same time, have tons of shelves, furniture, and papers, it's a very congested floor with a lot of damping. But right now, if you look at modern electronic offices, the slab is thinner, and you don't see much furniture and bookshelves. Everything is in your hard drive. That means less damping, and you're more prone to vibration when you have less damping.

The global floor area is estimated to double by 2060 with 2.6 trillion sq. ft of new floor added to the global stock. This means there's going to be a lot of construction. People want it fast. When you put on a new floor, you not only worry about the strength side of things, but also about vibration serviceability, and acoustics. These are important and relatively new items right now.

On another note, I'm focusing on other machine learning and deep learning methods, new materials to suppress vibrations, and new structural damage detection tools. I have good team members and good students. I think we are in good shape.

What types of facilities are going to be responsible for the building boom? It sounds like everything.

Yes, and because of that, people want it fast, I assume because we are almost in the second quarter of the 21st century. People don't have the time and patience they did before. Once you rush, though, you don't have the luxury to miss important items. Right now, understanding the dynamic behavior of engineering structures is often overlooked, which can be dangerous. Structural dynamics enables us to design for operational environments and design for serviceability.

Based on all this, in my research, I'm trying to blend fundamental structural dynamics knowledge with machine learning tools. That has enabled my research team to create novel structural damage detection tools to detect, localize, and quantify unseen, small damage. The good news is that we can now generate the dynamic behavior of potential future damage scenarios for any given structure.

In a machine-learning network model, we can even transfer the damage information we learned on one structure to another structure. That's called transfer learning, and we have successfully applied it to structural damage detection applications. My recent publications are more focused on this topic. The bottom line is we're always after the next novel idea in vibration serviceability, structural health monitoring, and damage detection. ■

This article was excerpted from my interview with Onur. To hear more from him, listen to the June 2024 Field Notes podcast at ***modernsteel.com/podcasts****.*

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

Embracing AI

BY BARRY J. BRUNS

Steel fabricators should think about artificial intelligence with an open mind instead of worry.

THE THOUGHT OF AI pushing its way into the steel industry can create some anxiety and nervousness among fabricators. It's a broad term and a nascent technology with a wide range of possible uses—all with the potential to change a business' process of fabricating, ordering, estimating, and other essential functions. It could affect staffing needs and perform jobs currently done by workers.

Uncertainty is scary, but it's not a strong enough reason to push the technology away and consider it poisonous to a business. Rather, fabricators should be open to it and curious about it.

Shift your mental gears: This is not another call to peek outside your regular box, let alone think outside the box. Tear the box down and use it in the bottom of your neighbor's chicken coop.

Park the envelope and pencil you may have long relied upon and engage the biggest, baddest computer systems on earth. Yes, I'm talking about AI and machine learning. Both are booming in everyday life now, for better or worse. Like steam power, internal combustion, jet engines, personal computers, the internet, and social media, AI disrupts norms. There may be fewer things that it does not disrupt than it does.

Like I told a class of astronautical engineering majors at the United States Air Force Academy in 2023, get ready for change, because change is coming fast and furious. It's not what they normally hear, but it grabbed their attention. That line destroyed their box of comfort, helping prepare them for defending our country and our way of life long after us old folks are looking up at the roots instead of down at the grass. To paraphrase writer and aeronautical engineer Robert Heinlein from five decades ago, we can bask in the warm fire of political correctness or live in the bleak uncertainty of reason and change, but we can't do both.

If you want to avoid the disruption that AI is going to send your way, prepare to join the buggy whip manufacturers' association.

Here's a real-life example relevant to steel. I wrote an article in the June 2023 issue of *Modern Steel Construction* titled "Mapping Value" (available at **www.modernsteel.com**) that broke down a process called value stream mapping (VSM), a way of finding non-value-added time in a process. It had a visual of VSM in steel fabrication as an example of a back-of-the-envelope map of steel frame building processes.

In the not-too-distant future, AI can replace the non-production coordination shown at the top of a steel construction VSM, such as coordination between involved parties, evaluating preliminary drawings, and soliciting and responding to bid requests. As it learns to manage CNC production, it will also speed up the shop workflow at the bottom of the VSM: ordering steel, managing inventory, programming machines and workflow, scheduling deliveries, organizing loads, and coordinating with the erector. Even early involvement, with all its advantages, may join Blockbuster in the graveyard of former essentials replaced by more convenient new technology.

What if? Spending time wondering if AI will wedge its way into the steel industry is focusing on the wrong question. Instead, assume it will and ask yourself what that means for the industry.

What if AI replaced all those pre-production processes? What if a builder just asked for a structure that would satisfy all needs on a particular piece of property, and a week later, it was coordinated, approved, and the steel ordered? What if AI handled environmental considerations, permits, and BIM interference, designing all the connections and ensuring they met seismic codes, structural principles, the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22), and other codes?

Maybe you laughed as you read the last paragraph or thought, "No way." But how many of our grandparents and great-grandparents laughed at Henry Ford's first automobile? Former IBM President Thomas J. Watson Jr. famously said his company would sell no more than five computers on its first sales tour. They sold 18.

Laugh at your own peril. It does not take much of an internet search to find a large group of people who laughed all the way to the poor house. The group of people who embraced disruption and rose to the top of the economic heap is much smaller. Steel folks don't usually consider themselves radical change agents. It's time for a few of them to step forward and embrace the disruption.

I would hate to see various fabricators, erectors, and general contractors try to out-compete each other in the AI world. The competition should be the concrete, wood, and other materials against steel—and AI combined with steel's advantage should help steel own the structural construction industries. Even when the other construction material industries employ AI, and they will, the speed and flexibility of steel fabrication and erection should give it an advantage—just as it does now.

Or maybe we can all pick up some empty Blockbuster stores on the cheap. ■

Barry J. Bruns, Col., USAF (Ret.), formerly a fighter pilot for the United States Air Force, is a Puma Steel board member.

Thank You Engineers

(and architects, contractors, builders, designers, inspectors, manufacturers, fabricators, students, and academics...)

Thank You Customers

To all you thousands and thousands.
You skilled artisans around the world.
You sharpen our minds and products.

30 years.

We are humbled. We are also proud of what we have all created together.

All the best,

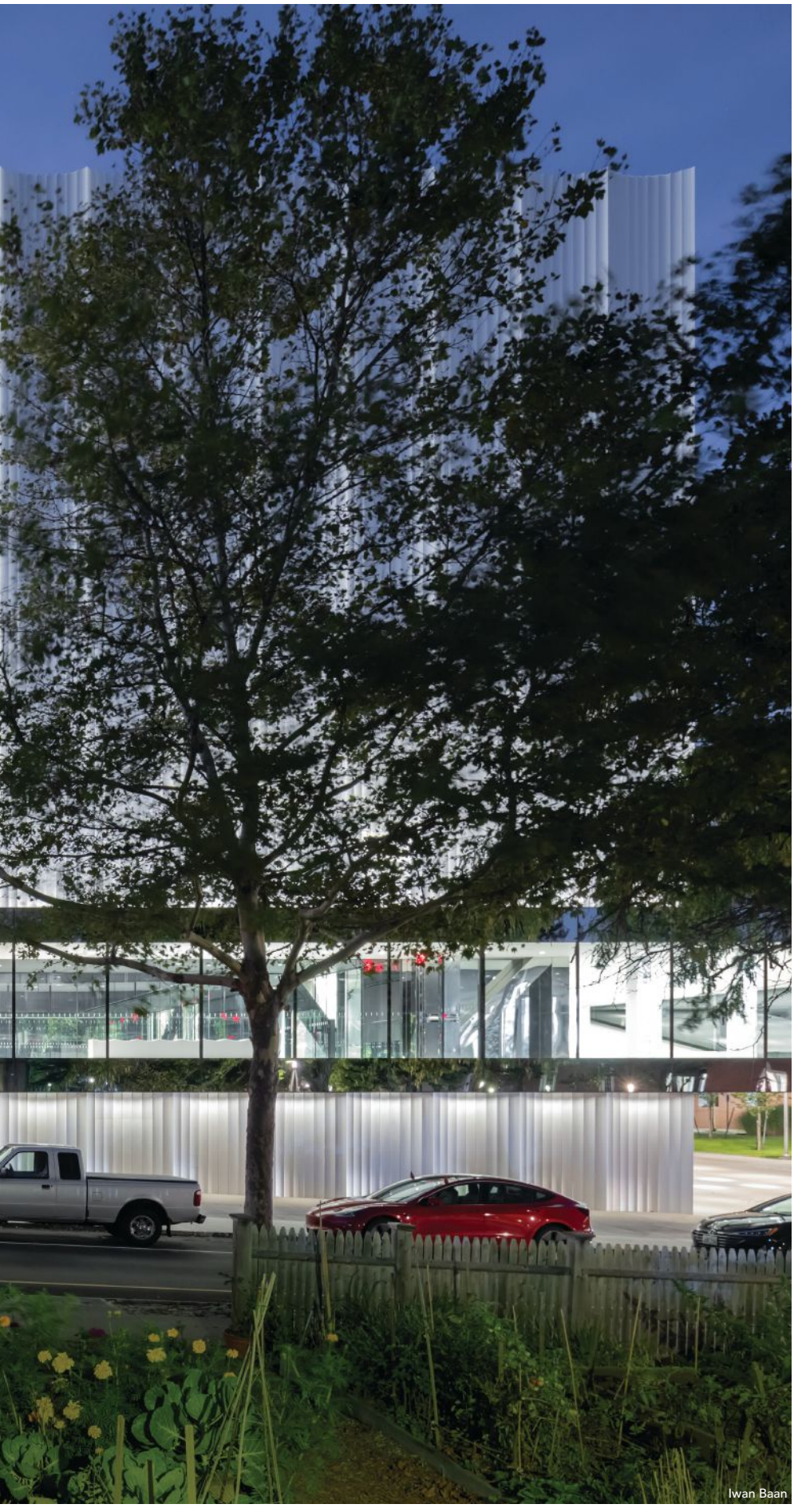
Mr. Terry Kubat
on behalf of IES, Inc.

iesweb.com

Brown University's Lindemann Center has a creative steel frame crafted for a versatile performing arts space.

Frame of Reference

BY DAVID J. ODEH, SE, PE, JAY TAYLOR, SE, PE, AND CARL GIEGOLD


Iwan Baan

BROWN UNIVERSITY sought more than just a new performing arts space at the center of its Providence, R.I., urban campus. It wanted something designed on the cutting edge. The school challenged potential project designers to create a dynamic space for artists and scholars to collaborate and push the boundaries of the performing arts.

Its chosen design team delivered.

The architect, REX, envisioned a bold new building with unprecedented ability to transform the shape and acoustics of the performance space on demand. The building would be transparent, unlike typical enclosed concert halls, hovering above the surrounding streets and walkways and engaging the community. The structural engineering and acoustics teams—a collaboration of Odeh Engineers (a member of WSP), Magnusson Klemencic Associates (MKA), and Threshold Acoustics—devised a creative steel frame system that gracefully achieves this vision, overcoming the many challenges of the site and program requirements.

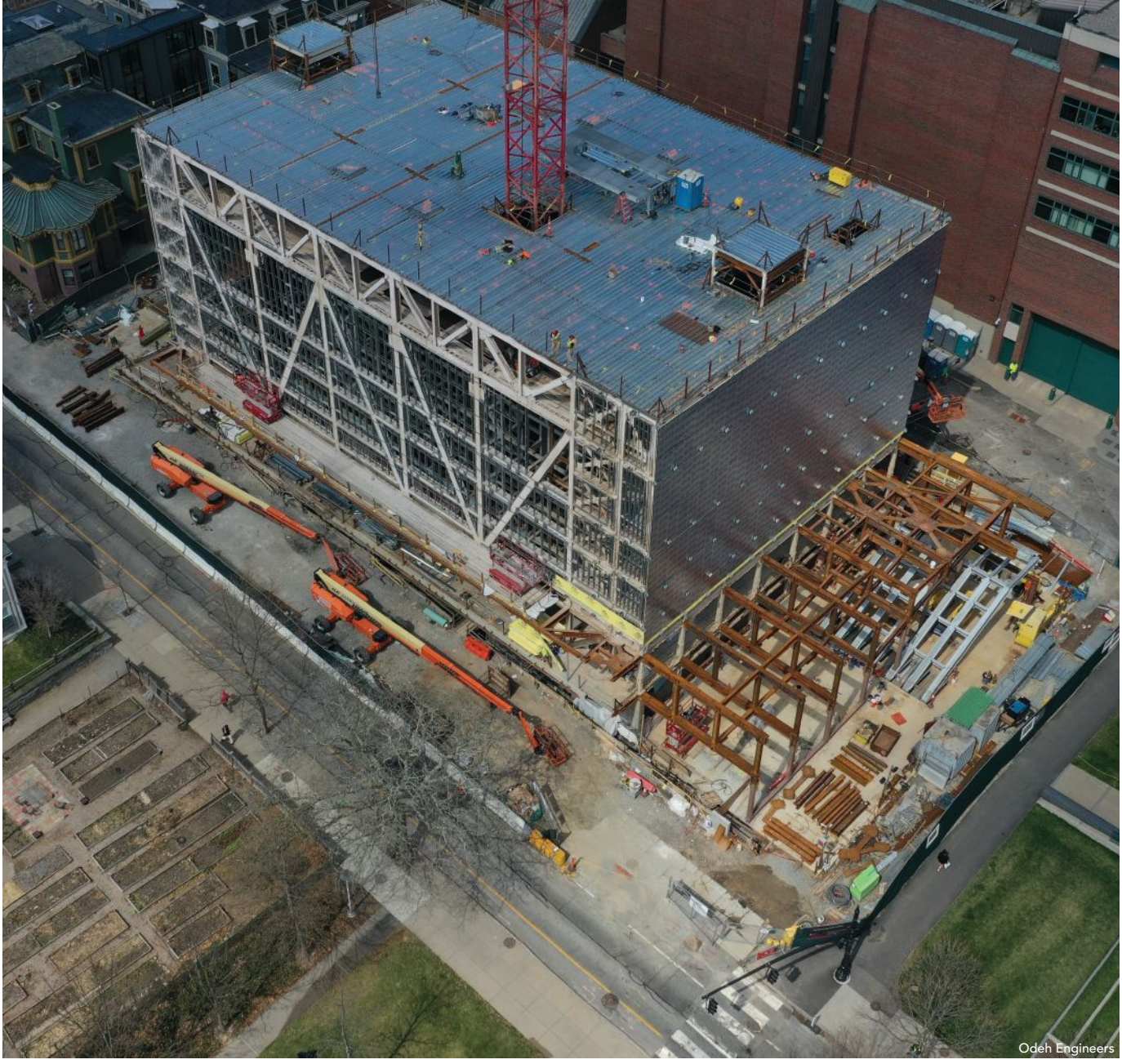
The result is the Lindemann Performing Arts Center, which opened in October 2023 and used 1,800 tons of structural steel.

The Lindemann site, located on the east side of Providence, is at the center of Brown's urban campus. A busy pedestrian walkway and a city street abut the site, making it a hub of campus activity. The location was an opportunity to engage the local community, but also a challenge to isolate the performance space acoustically from its surroundings.

The site had room for only one large concert space, meaning the main hall had to be versatile enough to accommodate performances from large orchestras to small recitals. Furthermore, the architect proposed a clear glass slice through the building, including the main hall, to let passers-by see the performance and lobby space inside. That architectural vision was essentially a "floating box" hovering over a transparent perimeter base, with moving walls and ceilings to transform between different types of concerts.

These challenges of the site and program drove a unique structural solution—a structure turned upside-down.

The Lindemann Performing Arts Center opened in late 2023.



The floating box under construction.

Upside Down Structure: The Floating Box

To achieve the floating box, Odeh Engineers and MKA designed a primary structural system consisting of deep perimeter belt trusses, with diagonal members located in the solid walls of the box above the glass, supported by steel columns at the corners of the main performance hall. The belt trusses support north-south roof trusses that clear span across the performance space, creating an 86-ft by 113-ft column-free interior with an 8½-ft-tall unobstructed transparent perimeter façade at its base. The belt trusses work with narrow braced frames at the east and west ends of the performance box to create the lateral force resisting system.

Instead of conventional, moveable seating towers bearing on the floor, the seating towers along each side and the rear of the Lindemann became four-level gantries suspended from the roof above—hovering 9 ft above the performance level floor. Glass walls with 1½-in. thickness are suspended from the gantries by their top edges and acoustically shape the room. These gantries retract in and out, acting as moveable walls and ceilings capable of reducing the physical and acoustical volume of the performance space.

The hanging gantries are four-level, 42-ft-tall by up to 59-ft-long steel framed structures configured to support two levels of balcony seating and two levels of technical balcony. They also hold solid acoustic wall shaping and soffits. The moveable gantries are suspended from wheeled 3 ton "bogies" that traverse a series of hollow structural section (HSS) members suspended from the roof truss bottom chords. The side gantries can move up to 10½ ft toward the center of the performance hall, and the rear gantries can move up to 44½ ft toward the stage end of the performance hall.

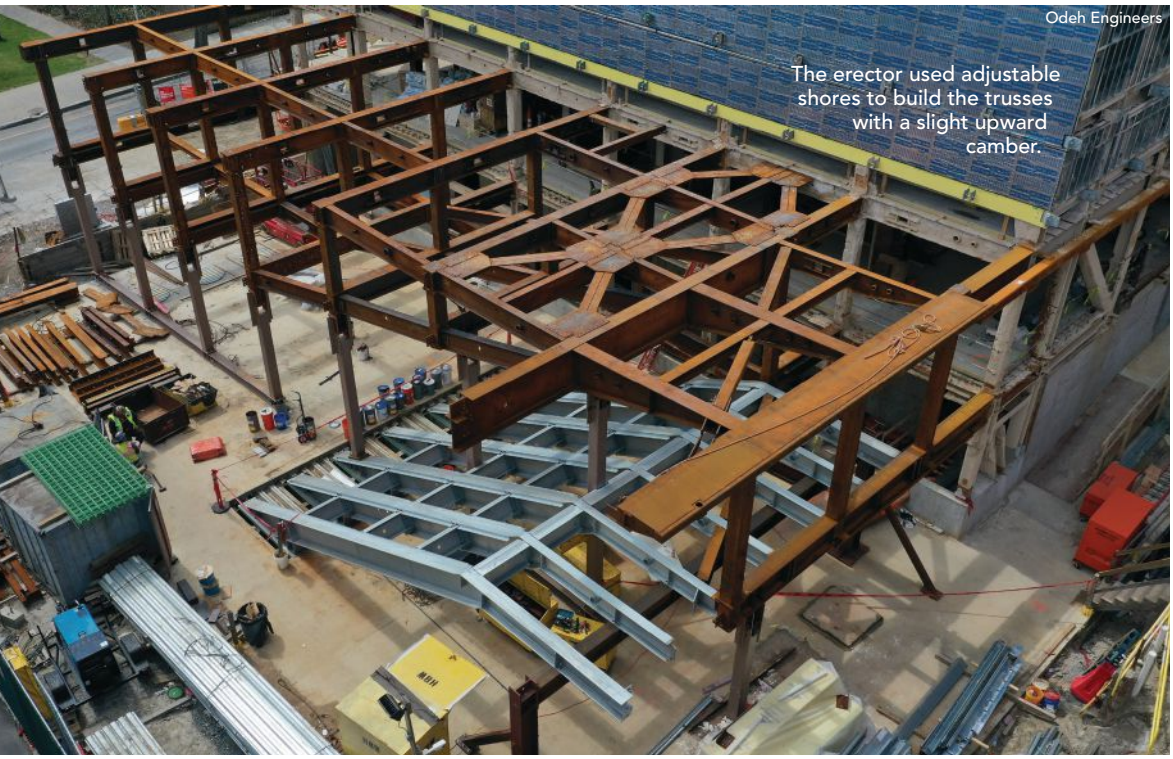
Given the high sensitivity to vibrations at the seating and technical balconies, the gantries and all supporting framing were designed to very strict performance and deflection criteria. Additionally, each level of the suspended gantries had to align perfectly with the adjacent ground-supported floor—requiring meticulous coordination between the design and contractor teams to account for every ⅛ in. of construction tolerance and deflection to set the gantries perfectly.

Odeh Engineers

above: The side gantries can move 10½ ft toward the center of the hall, and the rear gantries can move up to 44½ ft toward the stage.

below: The hanging gantries hover 9 ft above the performance floor.

Iwan Baan



Odeh Engineers

The erector used adjustable shores to build the trusses with a slight upward camber.

The center's exterior.

One Room, Four Venues

Lindemann's main hall could best be described as multi-form rather than multi-purpose. Most performance spaces that must accommodate multiple uses are built for the largest ensemble and audience—in this case an orchestra of 100 and chorus of 70 with an audience of about 550. These typical spaces accommodate the smaller performances as best they can by deploying absorption and an orchestra shell or perhaps moving an acoustic canopy over the stage. That approach can be acoustically successful, but it does not fully acknowledge that rooms for solo performers and their audiences are traditionally far more compact than those accommodating a full orchestra and their much larger audiences.

Audiences are closer to the performers in recital rooms and small theaters. The walls providing reflections critical to perception of space are closer together, and sound reflected from them does not have to travel as far to reach listeners. The shorter distances translate to shorter time delays and often distinctly more intimate acoustic and architectural experiences.

Lindemann's main hall is unique in that its width, height, and length—and thus its intimacy—are variable. The gantries essentially carry the acoustics with them, excluding the unwanted volume and placing the walls in the best location for the performance type. The acoustic volume can be further adjusted using retractable acoustic ceiling panels that are suspended from the roof trusses above the hall. Using these features, Threshold developed four different modes for the hall: a concert hall, a recital hall, a theater, and an immersive media cube.

The 62-ft concert hall mode width, required to accommodate the orchestra of 100, can be reduced by 20 ft when all four side gantries come in, right in the sweet spot of traditional recital hall and ballroom widths. In theater mode, the side gantries come in at the audience and stay out at the stage to create wing space and define a proscenium. With the stage narrowed and the audience widened, the east gantry can move 40 ft toward the stage to create the immersive media cube. The room is always exactly the right size, with audiences and performers as close together as possible.

Traditional music spaces have heavy concrete or masonry walls, because the mass of those materials is important to acoustic warmth; the containment of low-frequency sound from basses, bassoons, trombones, and low percussion are the foundation of an orchestra's sound. But heavy walls were not practical for the Lindemann due to its unusual structural framing. Instead, the walls were built of exceptionally stiff stud and drywall construction (*I*/720 at 9 psf uniform load—a criterion Threshold had used successfully in the past for organ pipe chambers).

Threshold's approach provides the required warmth inside, and combined with the somewhat lighter façade construction, it is equally effective at keeping street noise out of the hall. Walls carried by the gantries (which would also ideally be concrete or masonry) are modular, bowed, medium-density fiberboard stiffened by a grid of plywood ribs with the cells filled with mineral wool. They are much lighter than masonry, but the steel truss system still supports a significant weight.

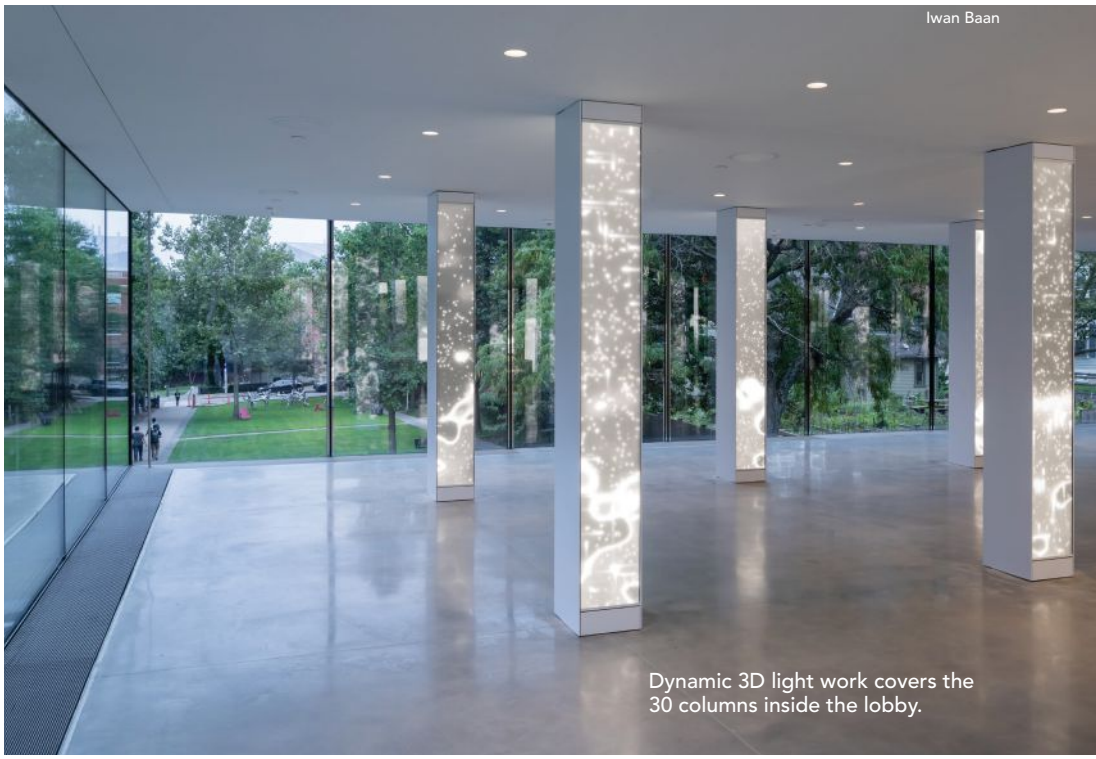
Cantilevered Lobby

To engage the adjacent pedestrian greenway and create an outdoor gathering space for students, the lobby cantilevers 36 ft from the east side of the building, with a stepped seating area leading to the building entrance above ground. The lobby is a dramatic extension of the transparent band of windows, and the team was challenged to create these spans with minimal roof and floor framing depths and no diagonal members.

The structural engineers explored numerous ideas for the cantilevered lobby, including post-tensioned concrete, but settled on a solution that incorporates seven steel Vierendeel trusses interconnected at the floor and roof levels by horizontal diagonal members that further stiffen the system. The columns, arranged in a 10 ft by 12 ft grid pattern within the lobby, consist of W12s with welded plates to form box sections, welded to W18 top and bottom chords.

The erector used adjustable shores to build the trusses with a slight upward camber, carefully calibrated to create a near level structure after the placement of the floor slab and curtain wall. The


Iwan Baan


Iwan Baan

Dynamic 3D light work covers the 30 columns inside the lobby.

cantilevered structure's outer corners have ¾-in. diameter steel rods that allow for field adjustment after erection and reduce deflections from floor live loads.

Brown commissioned a 3D dynamic light work called "Infinite Composition" by artist Leo Villareal that covers the 30 columns inside the lobby, transforming the steel frame into a beautiful work of public art.

A Creative Steel Solution

Through deeply collaborative work, the design and construction team successfully used steel to achieve the transparent yet structurally resilient forms of the architecture that meet the acoustic demands of this challenging project. The long span requirements, architectural vision, suspended seating and technical gantries and unique construction logistics made steel the only structural solution.

Beyond the architectural beauty and superlative performance spaces, the creative steel structure delivered multiple advantages to the project. The building is net-zero ready, and the electric arc furnace recycled steel structure provided a low embodied carbon system to help meet Brown's net-zero 2040 pledge for its campus.

Furthermore, the structure is truly adaptable, with future flexibility in the performance spaces and rehearsal rooms built into the structural systems. The structure's ability to float above the public outdoor spaces below has already created a new gathering place for the community to explore new ideas and experience the arts in a dynamic way. ■

Acknowledgements: The authors would like to acknowledge the project structural and acoustical design team members that included Brendan Mara, Jason Bacon, Michael Scancarello, Brian Monteith, Lydia Moog (Odeh Engineers); Jay Taylor (MKA); and Shane Kanter and Nicolaus Dulworth (Threshold Acoustics).

Owner
Brown University

Architect
REX

Structural Engineers
Odeh Engineers (member of WSP), Magnusson Klemencic Associates

General Contractor
Shawmut Design and Construction

David J. Odeh (**odehdj@odehengineers.com**) is a principal at Odeh Engineers (member of WSP). **Jay Taylor** is a retired Magnusson Klemencic Associates senior principal, and **Carl Giegold** is a partner at Threshold Acoustics.

A mall turned ice center in Tulsa redefines adaptive reuse.

Retail to Rinks

BY NICK ERECKSON, PE, AND SCOTT WERT, PE

EMPTY SHOPPING MALLS are piling up at an increasingly fast pace. And practical solutions for reusing them instead of demolishing them are limited.

One Oklahoma mall's second life, though, demonstrates a novel vision for transformation of a building designed for a no-longer-essential and less popular activity.

The Tulsa WeStreet Ice Center project renovated an empty mall's anchor department store into a versatile sports and entertainment facility that features twin ice rinks for community skating. Excitingly, it will also be the new home for the Tulsa Oilers minor league hockey team. The Twin-Ice Project showcases the possibilities that adaptive reuse offers in sports and commercial redevelopment.

Beyond achieving the owner's programmatic goals, adaptive reuse of a building delivers benefits in cost, sustainability, and schedule when compared to construction of a new facility for the same use. A condensed schedule allowed the facility to open roughly 18 months from project kickoff, with truss erection beginning just eight months after design work started. Adaptive reuse slashes labor time needed to install utilities and other building infrastructure.

Moreover, adaptive reuse offers significant reduction in material use by keeping in place the exterior façade, roofing membrane, and entire structural frame. When compared to a new-build facility, re-adapting the existing department store building for the new rinks provided a reduction in new construction concrete volume of 75% and steel tonnage of 60%—lowering cost and project embodied carbon. Total steel weight for the building renovations reached 510 tons.

The arena opened to the public in March 2024.

Perkins&Will

A look at existing steel column shoring during foundation replacement.

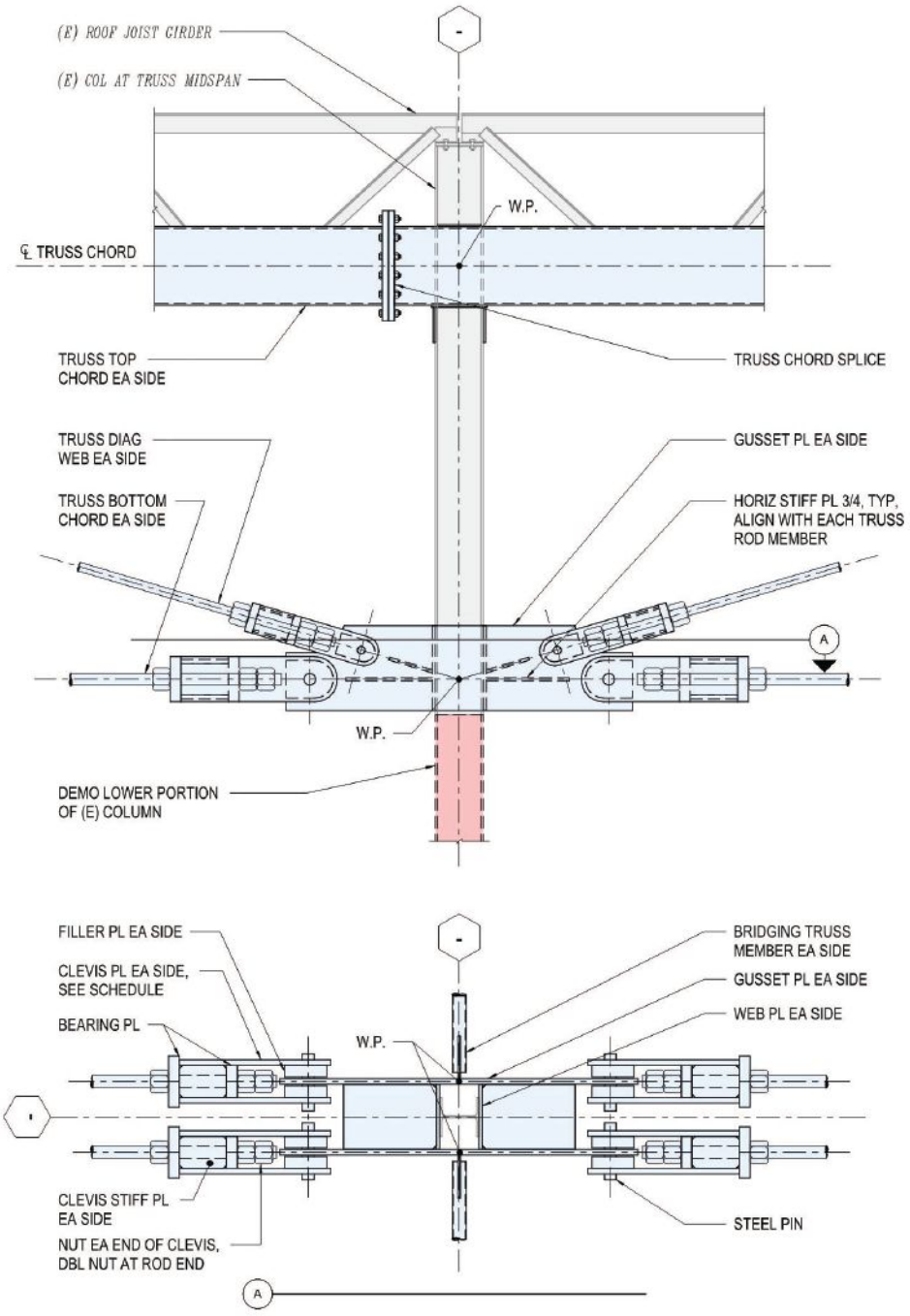

Martin/Martin, Inc.

Renovating the department store for its new function meant significantly altering the floor and roof structures, which entailed several complicated steps:

1. Convert the 28-ft by 56-ft bays into 28-ft by 112-ft bays over each ice rinks.
2. Remove large portions of the second floor.
3. Address wind uplift pressures imparted on the light-framed and now long-span roof.
4. Leave as much of the exterior façade and roof in place as possible while not affecting roof drainage at the new long-span elements.
5. Maintain structural stability throughout the construction process.
6. Ensure the renovated structure meets current building code requirements for a modified risk category.

Each rink required removal of 23,000 sq. ft of second-floor framing and composite slab, equating to more than half of the total floor area. Additionally, 36 columns that existed within the footprint of the rinks needed to be removed. Those columns supported the second floor, and 18 also supported the joist and joist-girder-framed roof. Six new steel trusses provide re-support for the roof framing and span 112 ft across each rink—designed to support the existing roof framing at the top of each existing column.

The new longer spans of the roof framing concentrates loads to a smaller number of building columns and spread footing foundations, which required replacement of 18 footings and reinforcement of two remaining wide-flange columns.



above: A rink truss connection detail.

below: The arena and former mall exterior.

The sequence of column demolition and truss erection was closely coordinated with general contractor Thompson Construction Inc. and steel erector Bennett Steel (also the fabricator) to ensure stability was maintained during the erection process and that roof elevations and slopes were not affected once the trusses carried roof dead loads. Expected jack loads and target jack heights were provided to aid the erector in developing a jacking and shoring plan and to identify issues during jacking should the columns begin carrying more load than anticipated.

Target jack heights ranging from 2 in. to 3½ in. represented effective truss camber at which the truss members were to be installed. Once the truss connections were completed and the jacks lowered, the trusses were intended to deflect, under the self-weight of the roof system, back to the original neutral position of the roof elevation. Bennett Steel provided feedback on truss jack loads and truss deflection allowing for adjustment of the target jack heights using more accurate information regarding the actual weight of the roof assembly supported by the new trusses.

The following construction sequence was undertaken to re-support the roof:

1. Jack and shore existing columns at truss ends and replace footings, where required.
2. Attach top chords and webs to existing columns, install bridging elements loose.
3. One truss at a time, jack midspan columns to target jack heights.
4. Install and tighten truss bottom chord and web rods.
5. Demolish lower section of midspan columns below jack point.
6. Lower jacks slowly and monitor truss deflections.
7. Repeat process and re-tighten truss rods for truss to deflect to neutral position.
8. Repeat process with next truss, weld bridging members between completed trusses to stabilize each completed truss.

Each new steel roof truss is effectively two trusses; one positioned on each side of the existing columns and joist girders—which remained in place—with new double top and bottom truss chords and double diagonal web members. By integrating the existing columns into the truss as vertical web members, the existing roof structure remained fully intact while erecting each truss.

Additionally, load was applied to the trusses directly at panel points without

Adam Murphy Photography

The completed steel roof trusses.

changing how the existing roof joists and joist girders function and carry roof loads. The inverted bowstring shape of the truss allowed for the flat top chord to be located as high as possible beneath the roof deck, and the curved bottom chord allowed for optimal sightlines from the side of each rink.

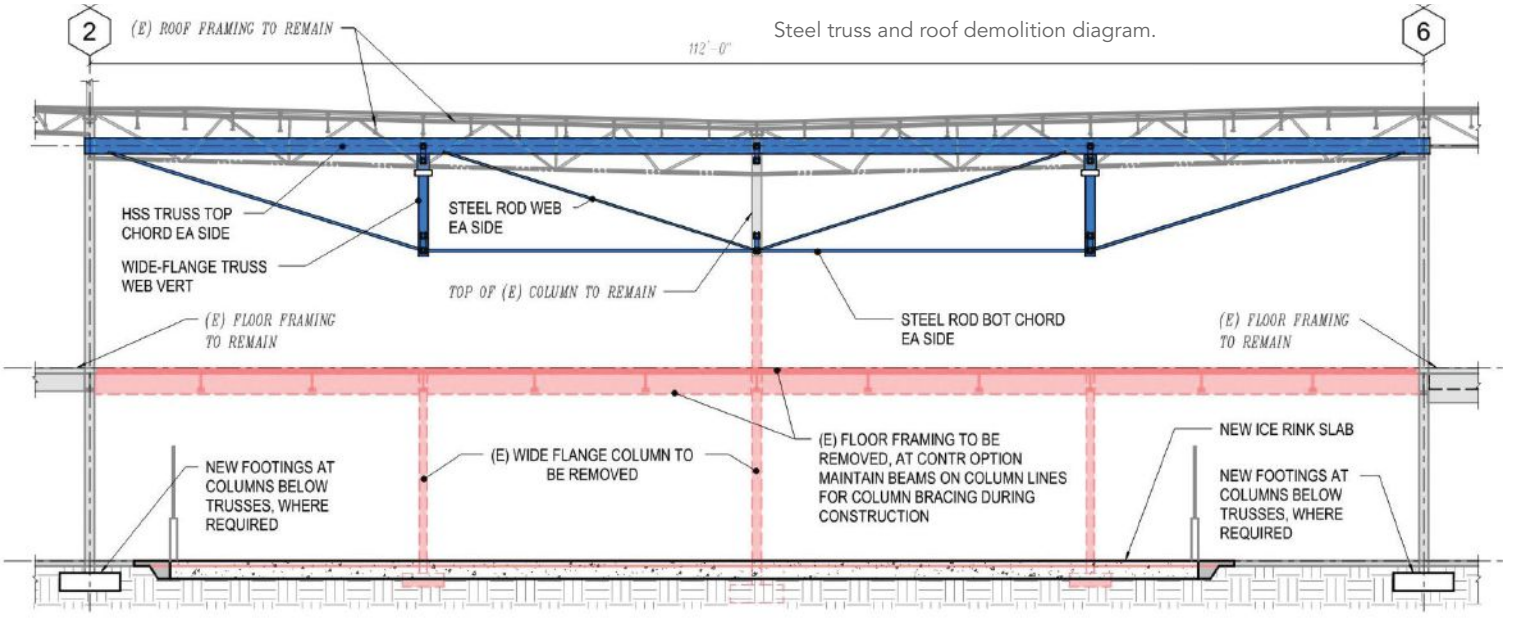
Rink truss design was fully customized to fit the unique conditions of the new ice facility, including the chord and web member shapes and truss connections. Top chords consist of deep hollow structural section (HSS) tube shapes filled with grout to help add weight and resist wind uplift pressures.

Meanwhile, bottom chords and diagonal web members use 2-in. to 3-in. diameter high-strength rod members. The high rod strength led to the bottom chord sizes being controlled by truss deflection, with roof deflections under environmental loads limited in design to ensure that roof slopes were maintained for effective roof drainage and to limit distress on the existing framing being re-supported.

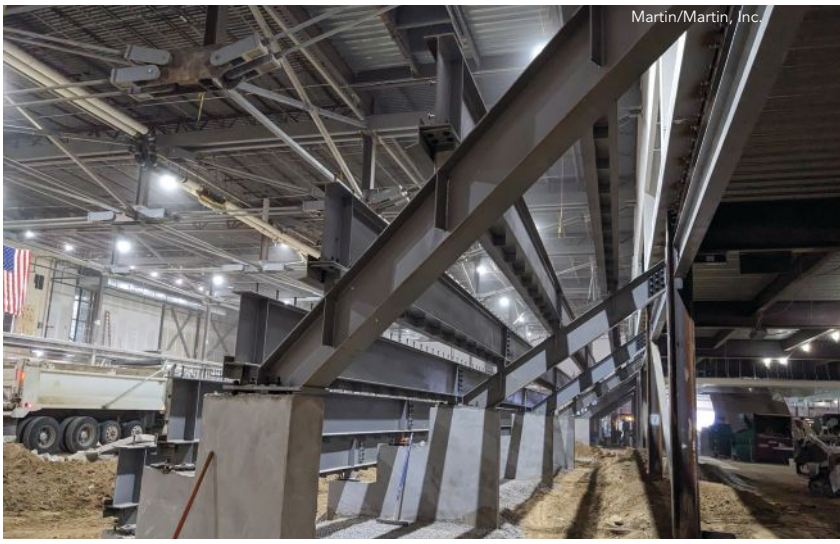
Connections for the rink trusses were customized for the Twin-Ice Project to provide the erector with maximum fit-up tolerance by utilizing built-up rod connections rather than specific hardware for connecting and tightening the large diameter rods. Each rod connects to a large gusset plate at truss panel points using nuts at the threaded ends seated against a bearing plate welded between side plates. This simple nut connection allowed the erector sufficient field tolerance to tighten the rods enough to carry load as soon as the jacks were released.

The connection side plates connect to the truss gusset using solid steel pins, and the gusset connection includes central web plates welded to the existing column as well as horizontal stiffeners to provide a simple and direct axial load path to the truss panel point. At the top chord, each HSS member is connected to the existing column segment using built-up seat brackets, which aided in erection of the chords prior to installation of the rest of the truss elements.

Steel truss and roof demolition diagram.




Martin/Martin, Inc.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above: The steel-framed raker and seating units.

left: Another look at the seating area framing.

below: The completed arena interior.

Adam Murphy Photography

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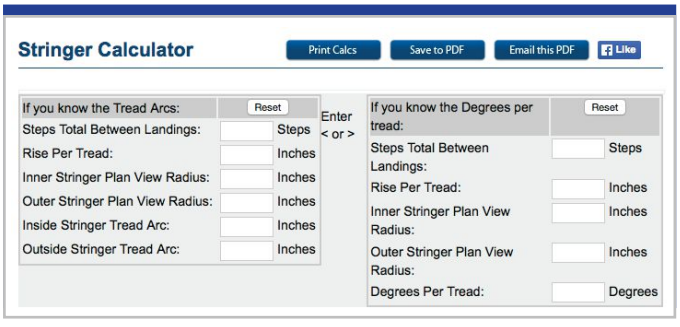

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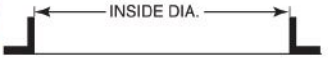
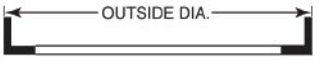


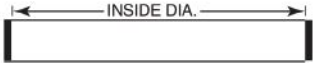
10" x 10" x 1" Angle

2 Angle Leg In


10" x 10" x 1" Angle

3 Flat Bar The Hard Way


24" x 12" Flat

4 Flat Bar The Easy Way


36" x 12" Flat

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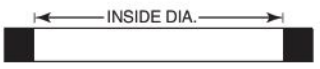
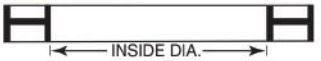


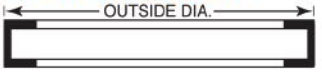
18" Square

6 Beam The Easy Way (Y-Y Axis)

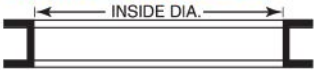

44" x 335#,
36" x 925#

7 Beam The Hard Way (X-X Axis)


44" x 285#

8 Channel Flanges In


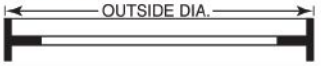
All Sizes

9 Channel Flanges Out


All Sizes

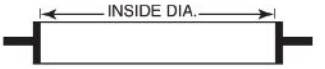
10 Channel The Hard Way (X-X Axis)


All Sizes

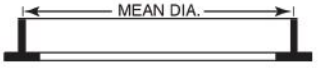
11 Tee Stem In


22" x 142½# Tee

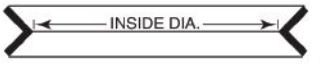
We bend ALL sizes up to:

12 Tee Stem Out


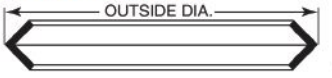
22" x 142½# Tee

13 Tee Stem Up


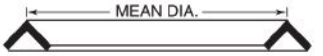
22" x 142½# Tee

14 Angle Heel In


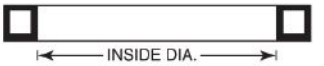
8" x 8" x 1" Angle

15 Angle Heel Out


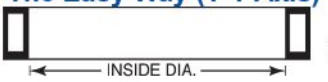
8" x 8" x 1" Angle

16 Angle Heel Up


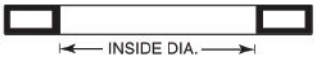
8" x 8"x1" Angle

17 Square Tube


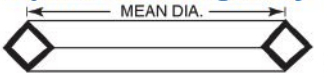
24" x ½" Tube

18 Rectangular Tube The Easy Way (Y-Y Axis)


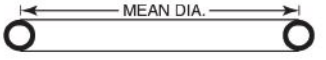
20" x 12" x ⅝" Tube

19 Rectangular Tube The Hard Way (X-X Axis)


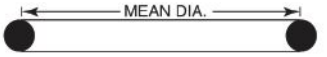
20" x 12" x ⅝" Tube

20 Square Tube Diagonally


12" x ⅝" Square Tube

21 Round Tube & Pipe


24" Sched. 80 Pipe

22 Round Bar


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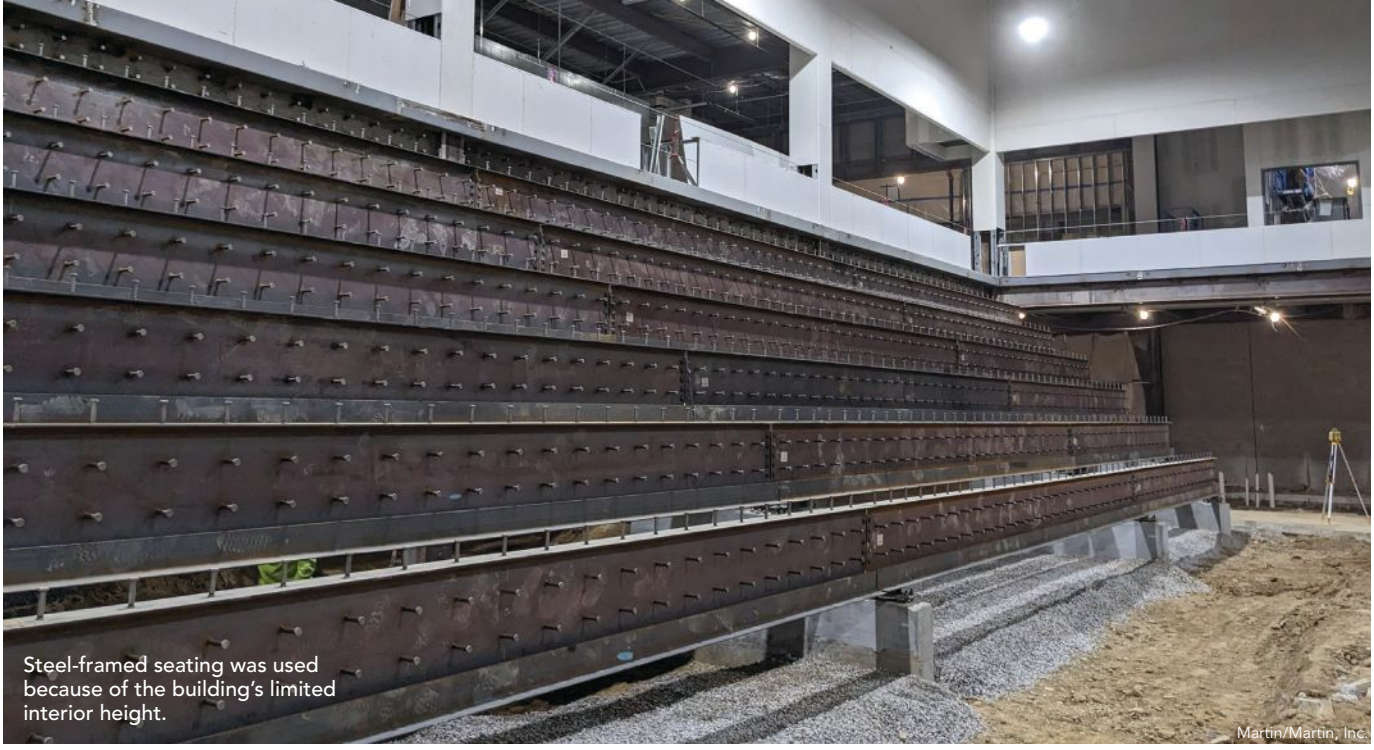


Steel-framed seating was used because of the building's limited interior height.

Martin/Martin, Inc.

Construction of the competition rink seating represents another departure from convention by using steel framing and slab-on-metal deck to create the stepped stadia. Conventional arena stadia construction use steel or precast concrete rakers supporting precast concrete stadia. The building's limited height, though, posed a challenge and caused issues with maneuvering large precast elements within building confines.

Constructing the stadia with smaller steel framing for the raker and each tread allowed the erector to work with smaller equipment and provided increased flexibility in forming the architect's desired stadia shape. Composite decking formed the tread of each seating level, with concrete riser walls placed between each level.

Another major upgrade and retrofit of the existing structure involved the building's lateral force resisting system. Removal of two large openings in the second-floor slab changed how lateral forces could be delivered from the second-floor diaphragm to the vertical lateral elements. Beam connections around the perimeter of each opening were retrofitted to create effective diaphragm chords and collector elements for lateral force transfer around the large openings.

Existing braced frames were also found to be deficient in resisting building wind and seismic forces formulated in accordance with current building codes. Multiple bays of HSS tube bracing were replaced and added, including modification to floor and roof framing connections.

Furthermore, column base connections for shears and uplift forces delivered by the frames were also modified. The existing building façade does not include windows or architectural features with which the braces would clash, meaning a high number of frames could be added to achieve a significant degree of redundancy and to spread lateral force effects out across multiple foundation elements. Adding those frames avoided costly foundation element upgrades and replacement at the building's perimeter.

Building reuse offers a variety of benefits to owners and developers and is a critical tool for engineers and builders to achieve sustainability goals. Redeveloping an existing building can help reduce a project's embodied carbon, cost and construction duration while still delivering an equivalent product for the owner. Thinking outside the box, developing creative engineering solutions, and leveraging the versatility of steel construction allowed the Tulsa Twin-Ice dream to be realized and a clunky unused space to find new life. ■

Owner and Owner's Representative
Andy Scurto, Tulsa Oilers
International Coliseums Company (ICC)

General Contractor
Thompson Construction, Inc.

Architect
Perkins & Will

Structural Engineer
Martin/Martin, Inc.

Steel Team

Fabricator and Erector
Bennett Steel Inc. AISC CERTIFIED FABRICATOR

Steel Detailer
Bennett Steel Inc.
CADeploy AISC DETAILER

Nick Ereckson (**nereckson@martinmartin.com**) is a principal and **Scott Wert** (**swert@martinmartin.com**) is a senior project engineer, both at Martin/Martin.

Heavy Lifting

BY ROGER HEERINGA, SE, PE, JESSICA MARTINEZ, PE, AND DENNIS PILARCZYK, PE

Steel was the essential piece of an innovative two-story distribution center that's reimagining the future of urban warehouses.

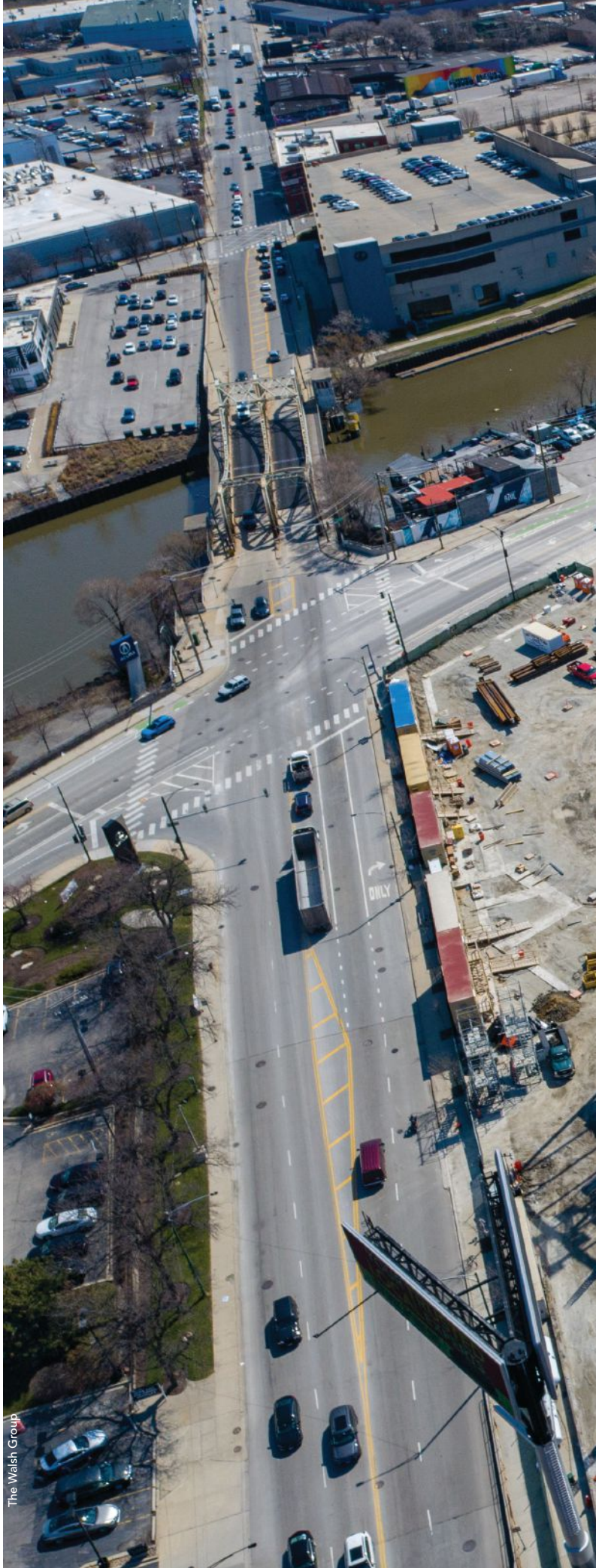
BUILDING A DISTRIBUTION CENTER just two miles from a city center has obvious appeal for an owner. The central location in a major city can offer unparalleled access to a large concentration of consumers and companies in a region. An urban location, though, means the available building footprint shrinks.

As with all buildings in a dense area, the solution to maximizing available space is building upward. But designing a vertical warehouse has little in common with an office or residential tower. One Midwest distribution center took on the challenge.

The owner, structural engineer DCI Engineers, general contractor The Walsh Group, project architect Ware Malcomb, structural steel fabricator Lyndon Steel, and Nucor's Construction Solutions team collaborated to bring a novel multi-story warehouse distribution center design to life. The warehouse is the first of its kind in the region and offers an innovative solution to future demand for new industrial facilities in more densely populated urban areas.

The building's multi-story design posed some significant design and construction challenges. One of its unique features is that trucks can load and unload goods on an elevated floor designed to maximize warehouse usage. The rack loading is typically on the grade level in distribution warehouses.

The elevated warehouse floor meant design considerations needed to include high loads and deflection criteria.



The Walsh Group

The warehouse's most distinct feature is its second-level loading and unloading zone.

above: The warehouse is 1.5 million sq. ft.

right: Aeos ASTM A913 reduced tonnage while meeting the required loading and turning radius conditions for having 18-wheelers on a second-floor loading area.

Accommodating a racking system to store shipments and the ability to operate forklifts meant the second-floor structure needed to handle the HS-20 (highway safety) loading requirements for 18-wheelers while also having enough space for a large turning radius. The roof-level parking also contributed to the challenges with its high loads and long spans.

The heavy loads imparted by the rooftop parking, elevated warehouse storage, and lateral system required the design and fabrication team to develop a unique solution to keep the framing system weight down. Nucor's Aeos™ ASTM A913 high-strength structural steel was the clear choice to reduce tonnage while supporting the required loading conditions.

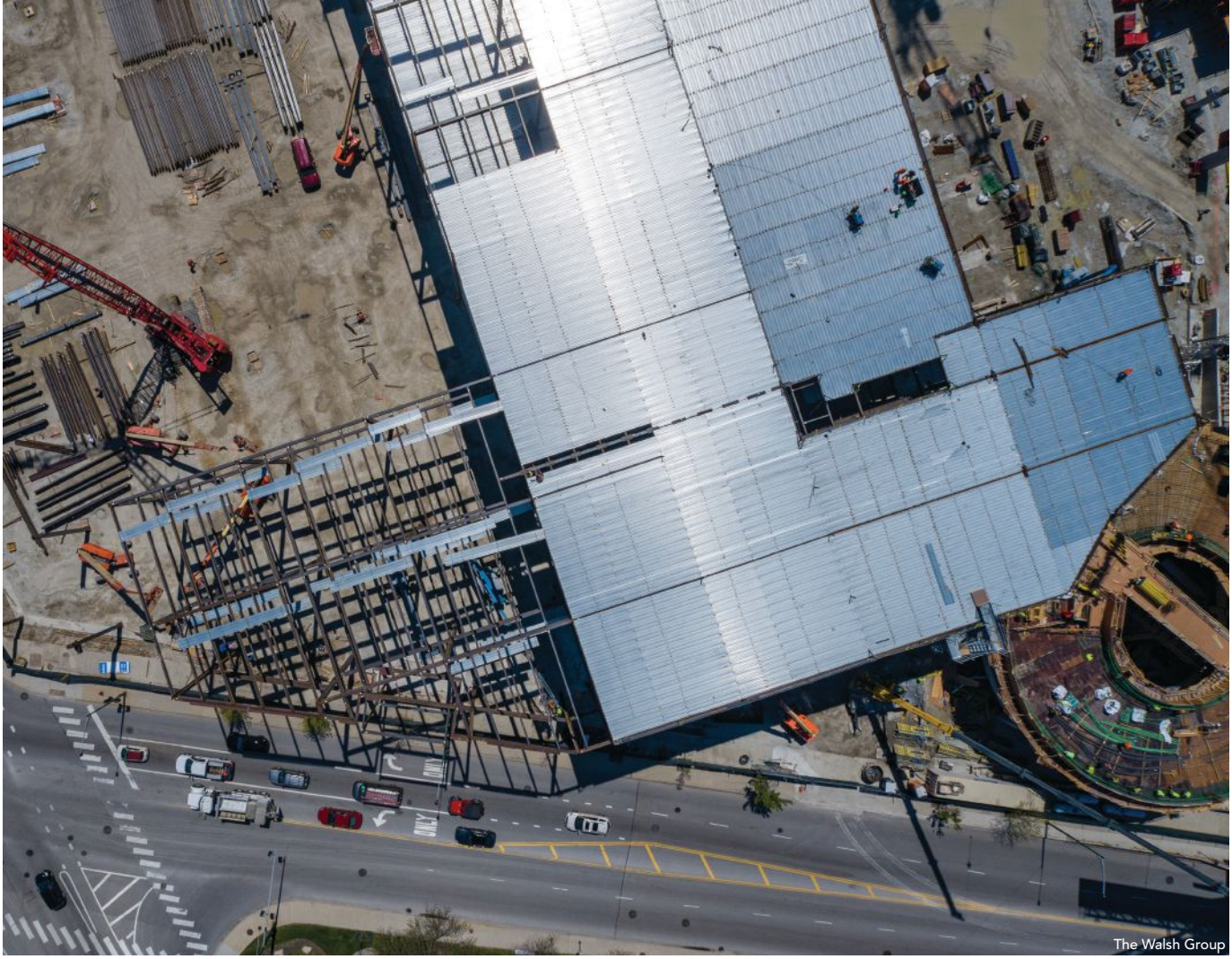
DCI's design team called Aeos A913 Grade 65 high-strength structural steel a cost-savings "no-brainer" because it meant cutting 15 to 20% of steel weight. Some of the warehouse's large girders were extremely heavy, so using structural steel with a higher strength-to-weight ratio compared to more common building and warehouse material ASTM A992 offered a cost savings advantage because fewer tons were required to support the same load. Nucor's steel provided a solution that addresses clear height and overall structure weight limits while also reducing costs and steel weight.

Aeos also provides substantially reduced preheat requirements, which can result in savings in fabrication, field-welded connections, and labor and energy costs compared to A992 without adding additional effort for a fabricator. Aeos' high strength-to-weight ratio means reduced tonnage and easier material handling at the fabrication shop and job site, reducing time, weight, and cost.

A Sustainability Win

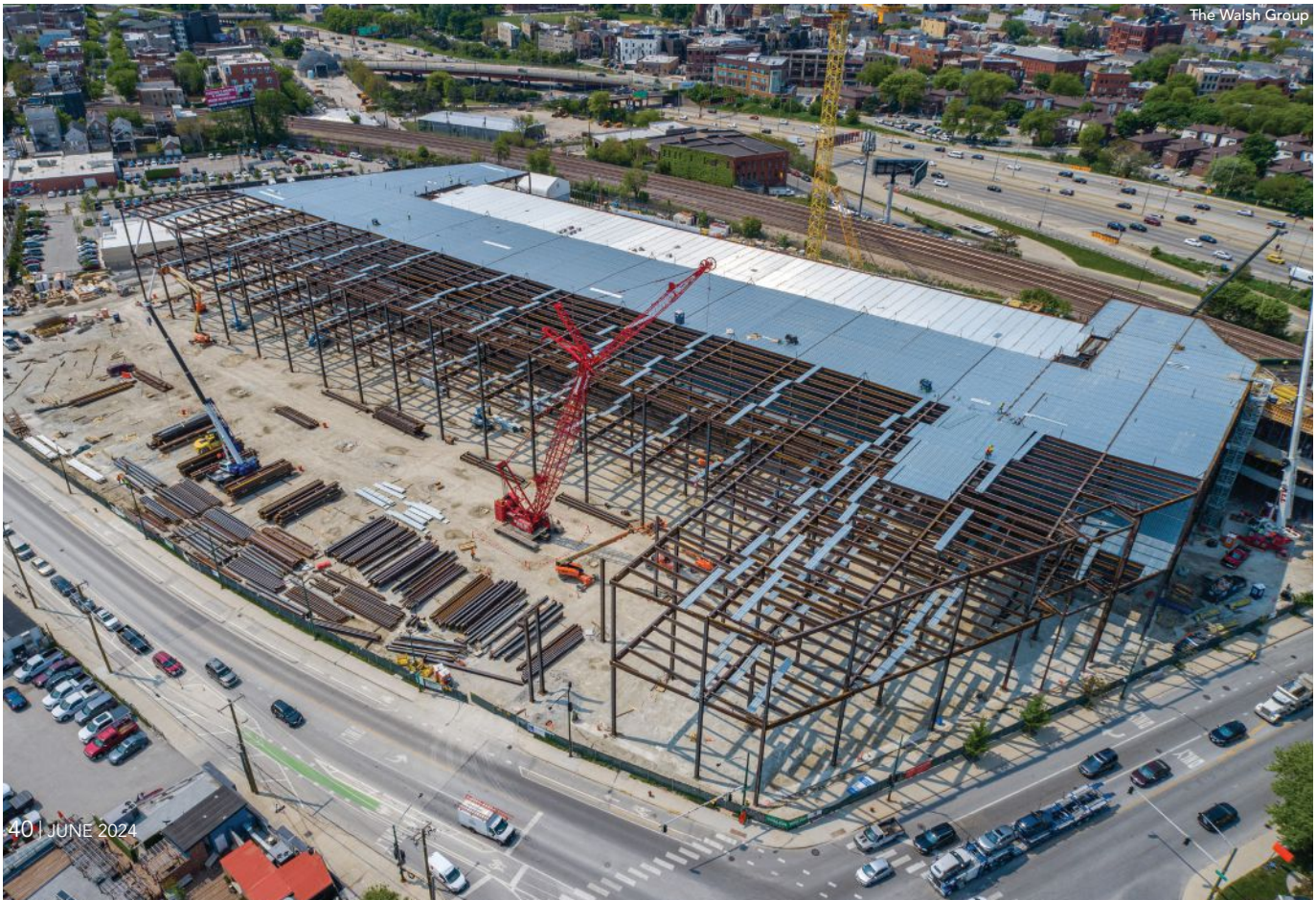
Using Aeos A913 resulted in 165 tons of material savings, helping DCI meet its commitment to reducing its projects' carbon footprints. One of the best ways to make a project more sustainable is to reduce material, because a project saves 100% of the global warming potential for that material it didn't use. Additionally,


The Walsh Group



above: The warehouse sits on an 11.5-acre parcel.

below: Aeos A913 Grade 65 reduced 15 to 20% of the steel weight.



The project found 1,063 metric tons of CO_2 equivalent savings.

The Walsh Group

much of the project's structural steel, including Aeos, was produced at Nucor-Yamato Steel Company in Arkansas, and the project team used that mill's facility-specific Global Warming Potential (GWP) values when it conducted a life cycle assessment.

Through efficient design practices and procurement strategies, DCI and Nucor's Construction Solutions team found 1,063 metric tons of CO_2 equivalent savings—the equivalent of taking 237 gasoline-powered vehicles off the road for one year, according to the Environmental Protection Agency's Greenhouse Gases Equivalencies Calculator.

Aeos is the only domestically produced A913 steel. It's sustainably made with more than 95% recycled content (scrap metal is the primary feedstock) using Nucor's circular electric arc furnace (EAF) steelmaking process, the cleanest steelmaking method commercially available today. That combination makes Aeos the lowest embodied carbon steel of its kind.

The multi-story distribution center is also pursuing a LEED Silver certification. To achieve LEED certification—a globally recognized symbol of sustainability achievement—points are collected based on carbon, energy, water, waste, transportation, materials, health, and indoor environmental quality.

A Model For The Future

Passersby will have difficulty missing the massive 1.2 million sq. ft, multi-story warehouse on 11.5 acres near a city center. The building design includes two warehouse levels where full-size trucks can enter to load and unload goods and two mezzanines. The roof will feature parking for cars and can also be used for van parking, a unique feature for this type of building. It will have a pedestrian bridge that connects to a separate parking garage.

This innovative warehouse will hopefully serve as an inspiration for other developers who want to use prime, central city space for distribution warehouses and other types of commercial projects that support the current and future waves of hybrid work, ecommerce, high-density urban living, and instant delivery. It underscores how steel can maximize limited space while helping meet sustainability goals.

The project team expects to see increasingly higher demand for low-impact designs with sustainability commitments and legislation becoming the standard for the built world. When coupled with the necessity for those sustainable designs to be durable and long-lasting, specifying steel products can help put architects, engineers, fabricators, and owners in a good position to meet a project's structural strength requirements and sustainability goals.

Architect
Ware Malcomb

General Contractor
The Walsh Group

Structural Engineer
DCI Engineers

Connection Design
Drucker Warner Associates

Steel Fabricator
Lyndon Steel

Roger Heeringa is a principal and **Jessica Martinez** is a structural sustainability specialist, both with DCI Engineers. **Dennis Pilarczyk** (**dennis.pilarczyk@nucor.com**) is a Construction Solutions manager at Nucor Corporation.

AI Arrival

BY DANIEL KAMAU, PEng,
AND
GRAYSON INGRAM, PhD

The steel industry is increasingly turning to AI as one way to help improve efficiency and tackle problems.

ARTIFICIAL INTELLIGENCE (AI) has taken the world by storm, revolutionizing the way machines and computer systems think, learn, and perform tasks that were previously the exclusive domain of human intelligence. While some industry sectors have been reluctant to use AI and are skeptical of its impact, the steel industry is increasingly pushing past its initial hesitation and tackling age-old challenges with AI.

The construction and trade industries are plagued with significant issues in labor shortage, low productivity, volatile costs, and manual and repetitive workflows ripe for AI technology innovation. AI systems today can perform tasks like understanding human language, recognizing patterns, learning from experience, and making predictions and decisions. There is no better time than now for innovations that can be used to reduce wasted time and material, alleviate worker stress, and help our industries work safer and faster. AI is already impacting construction speed and quality, efficient material use, and will continue to impact the planning, designing, fabrication, and construction phases of projects.

Historical Context

To understand why AI is poised to have a transformative impact across industries, start from the earliest mentions of AI and the breakthroughs that led us to where we are today. In 1950, computer scientist Alan Turing introduced the "Turing Test"—also called the "Imitation Game"—in his paper, *Computer and Machine Intelligence*. The Turing Test measures a machine's intelligence by having a human evaluator interact with a machine and a human, without knowing which is which, and judge the machine's success based on whether it can convincingly mimic human behavior.

Five years later, scientist and professor John McCarthy, known as the father of AI, held a conference at Dartmouth College and coined the phrase "Artificial Intelligence." Throughout the next two decades, scientists advanced AI technologies and some companies began using them to support human workers.

After decades of incremental research progress and exponential growth in available computing power, AI can now replicate human performance on a wide range of tasks. In recent examples, AI systems have passed the multiple choice and written portions of the bar exam and the highly competitive Fundamentals of Engineering Environmental Exam.

Since late 2021, public awareness of AI has exploded with advances in Generative AI, a subset of AI that can generate new content, such as images, text, audio, or video, similar to or indistinguishable from real examples. These systems use vast amounts of data collected from the Internet to allow the models to learn patterns. The most well-known generative AI tool today is ChatGPT, which can generate human-like responses to text prompts. Generative AI tools can paint pictures, write poetry, develop architectural designs, and establish proposals independently.

Common Types of AI and Their Applications

A single AI system has yet to match or exceed human-level intelligence across a wide range of cognitive tasks, a benchmark referred to as artificial general intelligence (AGI). Instead, existing AI applications are limited to narrowly defined ones that mimic human performance on specific tasks—referred to as narrow AI.

Today's most popular AI systems leverage vast amounts of data using neural networks, a mathematical structure inspired by the biological neural networks found in the brain, to uncover patterns, learn, and make predictions from available data. These neural networks and the architectures developed around them have led to significant advancements in computer vision and natural language processing—two subsets of narrow AI—as well as other areas. Project owners, engineers, architects, fabricators, and contractors have leveraged the advancements to work faster and more accurately.

Computer vision is a powerful technology used to interpret and understand the visual world. Within construction, computer vision algorithms are used to monitor construction progress and identify safety risks faster and often more accurately than a human can. One exciting application of computer vision allows fabricators to scan construction bidding plans and output material takeoffs.

For example, King Steel, an AISC member fabricator in Lawrenceville, Ga., is one of many fabricators using SketchDeck.ai's program "LIFT" to cut their material takeoff times by 50%, giving them two extra days per week to focus on higher-value tasks.

Natural language processing (NLP) is an AI technique embedded in popular applications like virtual assistants or chatbots. It allows computers to understand, interpret, and generate text and speech in a way that is understandable to humans. The steel industry and other construction contractors can use custom built NLP models and tools to scan contracts to identify risks, scope, and missing components ahead of time.

Many NLP applications function as virtual assistants, researchers, and consultants to help ensure consistent quality and considerations within contracts. When thinking about where NLP might be useful in your organization, consider where you could use an assistant to read documents and answer questions or write reports based on their reading.

In addition to working with images and text, AI can analyze a wide range of structured and unstructured data sources that can be used at all stages of a construction project.

In the design and planning processes, AI systems could analyze enormous amounts of data from past projects, material properties, and environmental factors to support the design of efficient and cost-effective steel structures. Some engineers and designers are using these systems to create internal search engines for their technical data sets, and others have attempted to use these tools to provide a cold start during design, proposal writing, contract creation, and review that saves valuable time.

Predictive maintenance and quality control are other vital areas where AI can impact the construction industry by monitoring steel structures and collecting data in real time from various cameras, sensors, and devices. AI algorithms can take the data and detect potential issues, such as corrosion, fatigue, and structural weakness, before they cause damage or harm. Proactive and predictive maintenance reduces downtime and ensures the safety and durability of steel structures.

Similar technologies to those that monitor structures can also predict equipment failures before they happen. By monitoring machinery and equipment operational conditions, typically with sensors and data analytics software, AI can identify patterns that could indicate a potential breakdown or significant wear, providing consistent quality during production and increasing safety.

Work previously done by an individual can now be completed with AI's help and reduce the time and effort required in design, planning, and construction phases. Streamlined processes will benefit owners, designers, fabricators, and contractors when dealing with changing information during design and construction and while processing numerous data points in complicated projects.

Considerations for AI Implementation

AI's opportunities are endless, but it is not yet infallible. Creativity and speed can at times come at the cost of accuracy. In some cases, AI systems can hallucinate, making connections in the data where none exist. A generative AI tool used to describe an image or summarize a document may add details that aren't present in the image or in the document itself.

Those glitches have made companies and workers ask if they can trust AI. Will it be accurate enough? Is company data private and safe? Are teams and staff prepared for the impact it will have? How and where should companies start implementation?

In high-stakes applications where errors could have severe financial, societal, or safety consequences, using systems and designing workflows that incorporate human oversight and intervention can mitigate risks and ensure safety. While AI can often outperform humans in narrow tasks with great accuracy, the more complicated a decision-making process becomes, the higher the likelihood for AI errors. A human-in-the-loop approach is essential to building trust within an organization and mitigating the impact of errors that are inherent in probabilistic systems.

Successful AI implementation often requires identifying individuals within an organization who are enthusiastic about AI and willing to champion its adoption. They should be advocates, educators, and role models for others, helping to promote a culture of innovation and learning. Companies should empower these AI champions or specialists to lead AI initiatives, share knowledge, and drive organizational change.

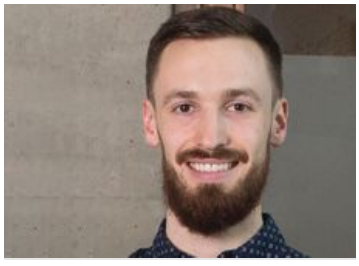
It's also important to invest in skills development and upskilling for your teams to gain the knowledge and expertise required to work effectively with AI. Many AI tools and educational options are available for free to the public.

For those not sure where to start, think about your organization's most pressing challenges. Are your teams overwhelmed by the amount of work they process? Are you having difficulty managing your schedules, completing your designs promptly, or responding to customers? Using AI to tackle your most significant challenges will often lead to the highest impact on your organization. Despite a keen focus on your biggest problems, starting small and re-investing in technologies that show great promise is a sure way to win with AI.

Future Outlook

Many fabricators across the country using AI software are already seeing its benefits. SteelFab, Inc. vice president of preconstruction Jonathan Mertz and senior estimator Garrett Gallagher each attest to AI creating time savings that help the company minimize errors, bid on more work, focus on proposals, respond to customers faster, and improve the overall quality of bids. A novelty tool for them and others not long ago has quickly become an essential part of their work.

Similar stories are being told across multiple industries. As AI continues to revolutionize industries, its transformative power is clear: by harnessing its potential, companies can overcome labor shortages, reduce costs, and drive growth, ultimately gaining a competitive edge in a rapidly evolving landscape. ■



Daniel Kamau (**daniel@sketchdeck.ai**) is the founder and CEO, and **Grayson Ingram** (**Grayson@sketchdeck.ai**) is a product manager, both at SketchDeck.ai.

Steel's Slam Dunk

BY KATE DUBY, PATRICK ENGEL, AND MEGAN ERICKSON

NASCC: The Steel Conference smashed attendance records for a third straight year and united all corners of the industry.

THE STEEL INDUSTRY'S BIGGEST STAGE coincided with college basketball's shining moment to deliver three days of optimal madness in San Antonio this March.

Nearly 7,000 attendees from all areas of the steel industry gathered in Texas' second-largest city from March 20–22 to network, see the latest innovations and products in the business, attend sessions that covered all areas of steel construction, and catch some of the March Madness action at AISC's basketball-themed booth.

Rethinking Sustainability

Northeastern University's Jerome F. Hajjar, PE, PhD was one of several keynote speakers at The Steel Conference, and he challenged all engineers in attendance. The industry is in an optimal position to be a guiding force for resilience and sustainability, but industry leaders must reframe how they think about both.

"This is a time when new materials, new design strategies, and new systems have the potential to revolutionize the way we think about our designs, our processes, and our profession," Hajjar said to a crowd of about 1,700.

Hajjar, the 2024 SSRC Beedle Award recipient, dove into the role of structural engineers in mitigating the inevitable impacts of climate change by challenging existing mindsets around sustainability and resilience.

When engineers design for resilience, arming the built environment against damage from natural disasters and other impacts of climate change, they are already designing sustainably—the two go hand in hand. Hajjar shared findings from more than a decade of research on resilience, explaining how engineers can apply fuse-based design to protect our buildings and bridges well into the future.

Hajjar discussed controlled rocking structural systems as one example of using easily replaceable inelastic fuses that prevent collapse but also enable quick reoccupancy after extreme seismic and wind events. That method stands in contrast to traditional collapse prevention approaches that focus exclusively on occupant safety.

Similarly, employing energy-dissipating elastomeric bearings in bridge design limits force transfer from the foundation and protects bridges from collapse in a seismic event, Hajjar said. Over time, replacing these small fuses in a building or bridge's substructure is more sustainable, adaptable, and cost-effective than replacing the entire building or bridge.

And often, cost scares clients away from choosing a sustainable project—they hear "sustainability" and see a big dollar sign.

Throughout his career, Hajjar has seen firsthand that when architects propose aesthetically beautiful designs, clients accept with little hesitation. Sustainability, though, brings out their trepidation.

"When [designers] propose something that is sustainable, the client calculator comes out, and we start talking cost, technical innovation and leadership alone may not do the trick."

The solution, Hajjar said, is an industry-wide mindset shift whereby if a structure is not resilient, it feels unsafe, and if it's not sustainable, it feels ugly.

"Let's put a positive spin on it," Hajjar said. "Let's lead a culture shift in our mindset so that if our structure is resilient, it feels safe; if it is sustainable, it feels beautiful. There's hope for the future."

Buckle Up

A presentation from the T.R. Higgins Lectureship Award winner is a Steel Conference staple, and Johns Hopkins University professor Benjamin Schafer, PE, PhD, delivered this year's.

Schafer won the 2024 Higgins Award for his research on local buckling limits. On the surface, local buckling sounds like a problem—and a presentation titled "Think Global, Buckle Local: Exploring Local Buckling in Structural Steel" sounds like a thorough examination of that problem.

Schafer views it differently, though. Local buckling can be more of an asset than a burden with the right understanding.

Observed as far back as the mid-19th century, local buckling is a phenomenon that causes wrinkles, puckers, and as Scottish civil engineer William Fairbairn described in his 1846 bending tests, "hummocks" in plates. These tests and other early observations of steel's behavior under various conditions of stress paved the way for industry-wide code that has helped engineers predict and control local buckling.

Schafer, who has centered much of his research on local buckling, admits that engineers aren't necessarily keen on embracing the phenomenon. In fact, they often take the route of eliminating local buckling because it simplifies material behavior, avoids deformation, and increases durability for the structures in question.

He asked engineers to take a new look at local buckling as a means to minimize member size while allowing for controlled deformation, even if it means there is more complex behavior involved.

Left: Jerome F. Hajjar speaks during his keynote address.

Center: Benjamin Schafer receives his T.R. Higgins plaque.

Right: Attendees play Pop-A-Shot at the AISC booth.

"Was it too complicated when I looked at that plate," he urged engineers to ask themselves, "or can I use that to my advantage?"

Schafer discussed the mathematics and mechanics of local buckling by examining the evolution of width-to-thickness ratios published in editions of the *Specification for Structural Steel Buildings* throughout the past century, pointing out that the ratios have gotten more and more complex with new research. Despite the complexity involved in predicting sites of local buckling, Schafer pointed out a key factor that can simplify the calculations: slenderness.

"Getting local slenderness right is a huge 'unlock,'" Schafer said. "Instead of having huge tables, we can look at two values."

Two separate paths—eliminating or embracing local buckling—are a historic precedent, but Schafer believes that modern tools and design methods enable engineers to find a middle ground.

"There's no real reason why anyone shouldn't be allowed to use all the tools," he said. "With this unlock of local buckling and modern design methods, you get to use both paths."

This knowledge is vital for the understanding it imparts on the industry, but Schafer discussed the global goals it will also help the industry accomplish. Citing former Princeton University professor David Billington, who studied structural excellence, he pointed to society's modern structural needs as perhaps the greatest benefactor of local buckling understanding.

"We're not in a situation where we can afford to keep putting 'more' into the world," Schafer said. "As we look to the future, where advanced high-strength structural steels are more common and every designer is pressed to maximize sustainability and minimize the thickness of the steel they employ, the importance of mastering local buckling is only growing."

Local buckling as a social solution rather than a structural problem is a new perspective to take, but one that can shape the future of structural engineering. Schafer discussed how engineers' technical depth is a strength, but they must not be afraid of applying that strength to issues of increasing breadth, including sustainability and resiliency in structures.

"I challenge each of you to take your technical depth—for me, that's local buckling—and apply it widely to see what you can make better," Schafer said. "Our modern social needs and our scientific knowledge provide an opportunity for a new era of structural engineering excellence."

Working on the Future

The Steel Conference had a forward-thinking aspect as well. The Be Pro Be Proud virtual workshop trailer returned this year as the centerpiece of AISC's Workforce Zone, a steel-building playground that introduces conference participants to every piece of a fabricator's job and showcases engagement ideas for recruiting in architecture, engineering, and construction, specifically in the skilled trades.

"Bringing something physical to the conference this year was important," said AISC director of workforce development Jennie Traut-Todaro. "Programs, services, activities, and industry partnerships came together to highlight different experiential ways to engage and attract new talent. Real life and virtual engagement tools served as discussion starters, and that is where a lot of the steel industry is right now."

The most enthusiastic Workforce Zone visitors were about 100 San Antonio-area Career and Technical Education (CTE) students who stopped by as part of an exhibit hall tour. They had a chance to connect with every corner of the structural steel industry and consider it when planning their career path.

That connection appeared to be strong. Students were frequently heard comparing their scores on the virtual welding machine, gathering around a classmate operating a crane simulator, and laughing through their trial-and-error attempts on the machines. They also learned how to measure steel members and talked with Nucor representatives about the industry.

The students left having experienced all pieces of the Workforce Zone, one small but significant step to help correct a growing supply and demand problem. The construction industry will need to surpass its average hiring pace by 501,000 additional workers to

AISC's Newest Program

The Fabricator Education Training Program is designed to provide AISC members with an easy way to introduce basic concepts to new employees at their fabrication shops. As a robust supplement to in-person training, the program intends to help new hires acquire necessary skills as quickly as possible to feel more involved and supported in their new roles, which will help them progress into more specialized career paths that become available with experience.

"New employees can get overwhelmed with all the things they don't know about steel fabrication," said Joel Landsverk, AISC's Fabricator Education Program manager. "This new training will introduce them to the tools, language, and environment of a real fab shop, helping them to get comfortable and productive, faster than ever."

The first 14 courses of the program include about five hours of training content.

One standout quality of these courses is their training approach. Presented mostly in video segments, they are centered around mentor/employee scenarios, with an expert fabricator standing in as the mentor. New hires who take the training will be introduced to essential skills, such as how to properly read and use a tape measure, how to use a grinder, and even how to torch cut. The scenarios depicted in the courses play out just as they would in a real fabrication shop, and all content is created in fully active fabrication shops to deliver maximum authenticity and effectiveness.

Through firsthand experience working with new hires, Kenny Hicks, a structural steel training specialist with Able Steel Fabricators, Inc. in Mesa, Ariz., can attest to the benefits the program will bring to fabricators across the country.

"Every steel employer in America is looking for talent right now. We can get employees, but can we get talent?" Hicks said. "The industry is starving for talent, so the only way we're going to fix it is through training. The industry needs what [AISC is] doing. We needed it 20 years ago [so that] we wouldn't have gone through this slump that we're coming out of now."

The Fabricator Education Training Program is already growing and will go live in early summer 2024. Throughout 2024, it will add fitter training courses to its library focusing on drawing reading, construction math, and basic layout and fit-up strategies. Visit **aisc.org/fabricatortraining** to sign up for updates.

meet the demand for labor, according to Associated Builders and Contractors.

Attracting a younger workforce to offset a growing number of retiring tradespeople is crucial in combatting the shortage. Those efforts start with challenging perceptions attached to working in construction and the trade industry so the next wave of workforce entrants sees it as a promising path rather than a fallback option.

"Be Pro Be Proud's mission is to change the view students, parents, and teachers have of skilled professions, manufacturing, transportation, construction, and utility sectors," said Andrew Parker, Be Pro Be Proud's executive director. "We hope a student will come on board the truck, explore the simulations, hear the message, look at the content, see what opportunities look like, and pay attention."

The student tours and trailer visits involve more than just a virtual step into a skilled trade job. The students learned about the salary potential and path to management in the trades, two essential pieces of a successful pitch. Both have previously left students pleasantly surprised and knocked down their perception, Parker said.

Steel-related, hands-on engagement stations staffed by AISC and other exhibitors who make steel components surrounded the trailer. Attendees could try bolt installation, snap in magnetic welds, and learn how to identify a member's size through measurement and some simple math. They could compete against other attendees in a virtual welding competition and take a virtual reality tour of a steel mill. The trailer had virtual-reality simulators where participants could practice welding, drive a truck, operate a robotic arm, drive an excavator, and more.

"We're always looking for ways to train and bring kids into the trades and see what other people are doing," said Kevin Traynor, President and COO of JGM Fabricators and Constructors, following a stop at the Workforce Zone. "The best way to learn is by getting all the smart people together and figuring out what everybody is doing to get people into the trades.

"If you can get simulators into high schools and grade schools and let kids see how to be a welder, equipment operator, or a driver—that's great and where we all have to start as an industry."

All conference participants could learn something from the Workforce Zone—even steel fabricators. The hands-on activities and engagement can serve as an educational springboard for local talent outreach efforts and integrate into fabricators' own workforce development programs. They capitalized on the benefits of experiential learning, putting the architecture, engineering, and construction industries at a distinct advantage over other careers.

Providing immersive introductory experiences to a fabricator's local Career and Technical Education (CTE) students can build and strengthen community partnerships. A workforce development program has a limited reach if it doesn't effectively connect with and educate the future workforce. Many fabricators have partnerships with local trade schools, but they can effectively reach beyond them to a more general audience with the right approach. And successful outreach and recruitment of new labor goes beyond convincing the potential worker that the trade industry is a viable career path.

"[Perception challenges] are usually not with the kids, but with their parents," Traynor said. "We try to do outreach to the parents as well. If we interview a high school kid or take one on a tour, we ask them to bring a parent and see how they can build a career."

Meanwhile, engineers in attendance could witness and appreciate the process of fabricating the steel members and connections they select when designing buildings—and the skill level required.

The Workforce Zone also included a sign-up station for BlueRecruit, a job platform that can help steel industry employers find the right talent by connecting tradespeople with their next step or first step into the industry. Those employers are actively seeking help and looking everywhere for it.

"The skilled trade gap has been identified by our industry and beyond," Traut-Todaro said. "The activities we featured are the seeds of ideas of how our members can teach their local community about the sustainable and rewarding careers found in steel."

Floor Finds

Keynotes drew the highest attendance of all sessions, but they were just a few of the 300-plus presentations during the conference. Sessions ranged from technical talks geared toward structural engineers to fabricator-specific topics to business acumen relevant to any attendee in a leadership position.

Anyone who missed a session of interest can watch a replay of it online at **aisc.org/learning**. Engineers can earn up to 16 PDHs by watching sessions online. If you didn't explore the exhibit hall floor, turn to page 48 for *Modern Steel Construction*'s annual Hot Products section. This year, it highlights more than 35 exhibitors' latest and best offerings that were on display during the conference. The hall's 250,000 sq. ft of floor space had 355 exhibitors showcasing some of their best offerings.

The heavy machinery area was, as usual, a must-see for fabricators. At EMI's booth, visitors could grab a face shield and watch sparks fly from EMI's Angle-Channel Processing Center that can cut through a steel pipe in seconds.

"The plasma doesn't melt the steel—it literally vaporizes it," said manager Mark Ferrance.

The machine can heat metal up to 20,000 degrees—twice as hot as the surface of the sun.

Nearby, Peddinghaus had several machines displayed on its booth's patented orange carpet. The company ran the PeddiSubX 1120 beam drill line every 30 minutes. Peddinghaus and Lincoln Electric could not demo their robotic welding offerings inside the exhibit hall, but visitors to their booths could examine the machines up close and grab a Guinness poured from a tap attached to the welding arm.

Elsewhere, exhibit hall explorers could use augmented reality to check if steel beams are up to standard at FabStation's booth. FabStation allows fabricators to get quick, precise measurements and seamless 3D model visualizations of complex steel assembly structures and integrates with several detailing softwares.

Engineered Supply had ongoing demonstrations of its portable rope hoist system for easy use with roof and wall anchor points. AISC President Charles J. Carter was a special guest on the rope hoist system, taking a ride to the ceiling during the opening reception.

The Steel Conference and all its events—from familiar staples to new faces and features—will return April 2–4, 2025, in Louisville, Ky. ■

Kate Duby (**duby@aisc.org**) is AISC's communications content specialist, **Patrick Engel** (**engel@aisc.org**) is the associate editor of *Modern Steel Construction*, and **Megan Erickson** (**erickson@aisc.org**) is AISC's digital communications specialist.

Every year, the exhibit hall at NASCC: The Steel Conference features the latest offerings for creating and building successful structural steel projects.

2024 Hot Products

This year's NASCC: The Steel Conference once again shattered attendance and exhibitor records. Nearly 7,000 industry professionals gathered in San Antonio in late March, eclipsing the 2023 conference's record crowd by nearly 1,000. All attendees could visit 355 exhibitor booths—also a record—that featured a wide range of products, services, equipment, and machines targeting at least one link in the steel supply chain. *Modern Steel Construction* gathered nearly 40 new and compelling offerings that were on display in the exhibit hall.

All product, software, and service information was submitted by the manufacturers, developers, and providers. This list does not constitute endorsement by *Modern Steel Construction* or AISC.

Lindapter Hollo-Bolt

Hollo-Bolt is the original expansion bolt designed and manufactured by Lindapter since 1985. Its latest version is the only blind fastener for structural steel approved by the ICC Evaluation Service for combined loads in high-seismic regions. Lindapter is the only blind bolt manufacturer to have ICC-ES approvals for its entire range, including every size (diameter and length), every finish, corrosion protection and material, every head type (hexagonal, countersunk, and flush fit), and every seismic design category A through F.

With Lindapter Hollo-Bolts, steel sections can be connected quickly to pre-drilled hollow structural sections (HSS) with no proprietary tools and access from only one side. This faster alternative to welding or through-bolting enables contractors to reduce construction time and labor costs. Other features and benefits of Hollo-Bolt include:

- Design for fatigue resistance now included in ESR 3330
- LABC and LARC supplements for Los Angeles now included in ESR 3330
- CBC and CRC supplements for California included in ESR 3330
- ICC-ES approved for all seismic design categories (A through F)
- Carbon Steel variants independently fire tested per ASTM E-119
- Fast cost saving installation from one side
- Suitable for square, rectangular and circular hollow sections
- High resistance to shear and tension
- Unique high clamping force design
- Recognized in the AISC *Steel Construction Manual*
- Carbon steel variants tested to -50°F

For more information, visit **www.lindapter.com/us**.

Allfasteners NexGen2 Oneside Bolt

The Allfasteners NexGen2 Oneside Bolt is a fastening solution designed to streamline installation processes and enhance structural integrity. With a unique design that allows for one-sided installation, this bolt eliminates the need for access to both sides of the connection, making it ideal for applications where space or accessibility is limited. It's a versatile and reliable fastening solution that offers superior performance and ease of installation.

The NexGen2 Oneside Bolt features high-strength steel construction, ensuring reliable performance in demanding environments such as concrete, steel, and timber. Its innovative design includes a self-tapping thread that enables quick and easy installation without needing pre-drilling, reducing labor costs and project timelines. The bolt's large diameter and deep thread provide exceptional pull-out resistance, making it suitable for heavy-duty applications. Additionally, the bolt's corrosion-resistant coating ensures long-lasting durability, making it ideal for indoor and outdoor use. Visit **www.allfasteners.com** to learn more.

Canam Elocone Elongated Nuts

Elocone by Canam is the ultimate solution for unforeseen construction challenges. As an erector, have you ever learned on a jobsite that your anchor rods were too short? Have you ever poured concrete foundation but realized there's not enough projection to erect and connect the building's columns? This is where Elocone nuts can help.

These specially designed elongated nuts are crafted from high-strength steel through precision machining, offering two distinct forms. By securely fastening Elocone nuts to anchor rods, you can effectively address issues arising from inadequate projection above the concrete foundation. Elocone nuts should be fastened to a length equivalent to the diameter of the rod, ensuring optimal tension capacity for anchor rods made of steel boasting a tensile strength of 1,035 MPa (150 ksi). Don't let unexpected setbacks halt your progress. Visit **www.shopus.canam.com** to learn more.

Canam Steel Corporation (CSC) Anbo-X Nut

You're on the job site and come across a little problem with big implications. An anchor bolt is too short to engage the nut, delaying your progress and forcing you to find solutions. The U.S.-made Anbo-X Nut is your answer.

Anbo-X Nuts, CSC's newest product, are elongated nuts to help when an anchor rod doesn't project high enough above its concrete foundation to attach a regular nut. By machining a piece of high-strength steel into two different sections, this special nut can attach to a shortened anchor rod, minimizing additional project costs, reducing installation time, and keeping your project on schedule.

The upper section resembles a standard nut that attaches to the column base or washer plate, while the lower section has a smaller diameter and fits the oversized hole of the base plate to screw on enough threads of the anchor rod. Visit **www.cscsteelusa.com** to learn more.

Ray Fu Self-Drilling Screw

Ray Fu's 8 Tek Self-Drilling Screw features point reinforcement that can drill iron plates up to .79 in. thick without requiring pre-drilling—making the hassle of stitch welding moot and saving time and labor for contractors. With the self-drilling screw, customers can secure a large façade, piping, exterior appliances, and a lighting system right onto steel beams.

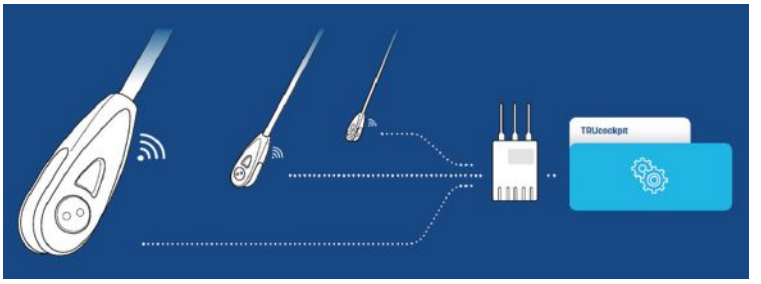
Ray Fu also produces a Bi-Metal screw made of stainless steel and alloy steel welded with carbon steel, which gives the screw great weather-resistant ability while drilling into a ¼-in. steel plate. These Bi-Metal screws can secure appliances on roofs, concrete, and various metal plates. They're specifically designed for solar panels, providing easy drilling and effective rust prevention. Visit **www.ray-fu.com** to learn more.

P2 Programs STSX Software

P2 Programs' newest product, STSX, provides fabricators, painters, galvanizers, and erectors with extreme mobility in barcoding using phones, tablets, and other devices. It aims to increase the speed at which a steel project can be fabricated and erected.

STSX is a web-based application that brings real-time tracking information to your fingertips to reduce decision-making time significantly. Barcoding with STSX increases the speed of your existing processes and negates inefficiencies long accepted as standard operating procedures. STSX will improve production by reducing decision-making time and errors while also cutting needed manpower and manhours. All the above leads to a decrease in hours and an increase in productivity.

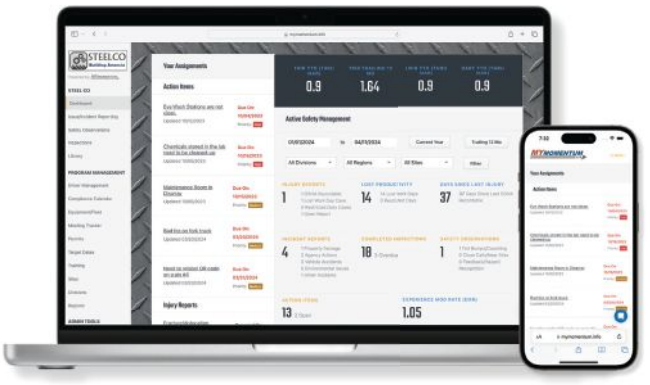
Using STSX barcoded steel provides a virtually error-free data collection environment while saving money and employee time with a return on investment of approximately one year. For more information, visit **www.p2programs.com**.



Fatzer TRUpin

Fatzer's TRUpin system continuously monitors cable assembly loads and ensures that each assembly is properly tensioned. Regardless of cable diameter or end connection, this always-on technology allows maintenance personnel to detect changes in cable force immediately. With that knowledge, preventive maintenance can be scheduled and performed before minor problems become costly repairs. An intelligent load pin reads each assembly's tension and allows the data to be examined locally, transmitted continuously, or uploaded daily using an autonomous battery-powered modem.

TRUpin and all associated software monitoring solutions are supplied and maintained by Fatzer's subsidiary TRUcompany. At the heart of Fatzer's condition monitoring and reporting process is TRUcockpit. This web app, accessible via laptop, tablet, or phone, receives data from each sensor and aggregates the information for analysis in the customer-configured user interface. Or, the data can be sent to the building's supervisory control and data acquisition (SCADA) system. For more information, visit **www.fatzer.com/en/monitoring/trupin**.



EHSMomentum MyMomentum

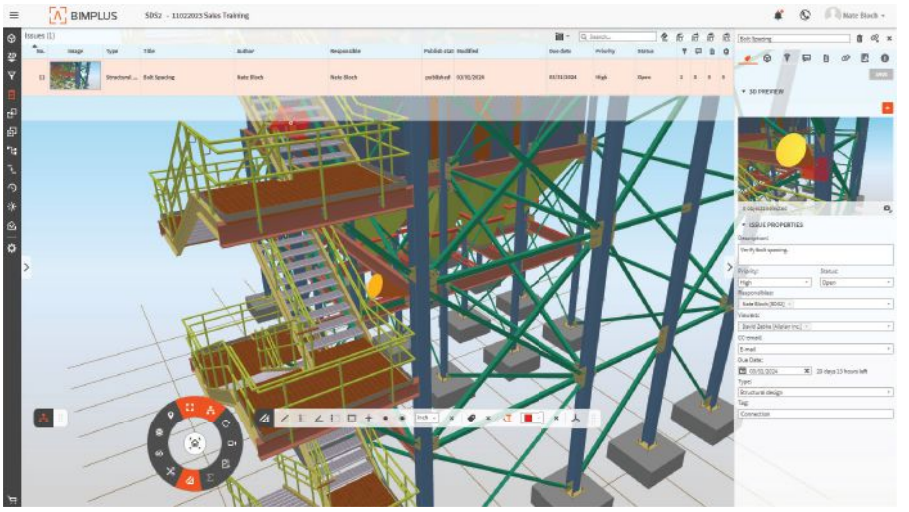
MyMomentum by EHSMomentum is the first fully integrated safety management system built for small and mid-size fabricators and erectors. Cloud-based, mobile, and easy to deploy, this system is an accountability machine. Manage training, injuries, audit items, inspections, and maintenance issues on any device and get a new level of visibility into the effectiveness of a well-run safety program. Scannable codes make for easy equipment inspections.

MyMomentum also automates safety program administration so your team can engage on the shop floor instead of being buried in paperwork. Designed to integrate safety requirements into production, MyMomentum is built help under-resourced staff do it right. For companies that want an easy way to improve shop safety and stay in compliance, MyMomentum could be a great fit. Visit **www.ehsmomentum.com** for more information.

Bimplus by ALLPLAN

With Bimplus by ALLPLAN, detailers and fabricators can seamlessly share model information with all project stakeholders through advanced visualization tools and other features.

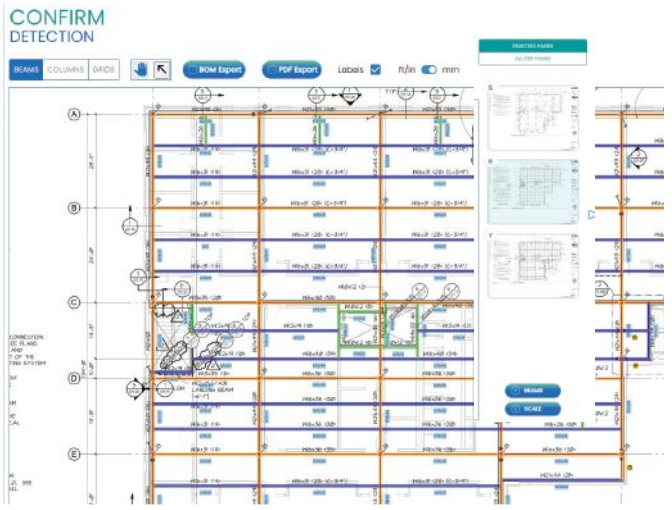
As a cloud-based platform, Bimplus allows you to access project data anytime from any device and easily integrate data from other stakeholders to manage, merge, and review designs in a centralized platform. Its advanced features, including version control, model coordination, clash detection, and task management, empower you to coordinate seamlessly with your teams and other stakeholders throughout the project life cycle. Visit **www.allplan.com** to learn more.



Pathways AI

Despite steel manufacturers facing more pressure than ever to reduce their emissions today, merely understanding emissions is costly, labor intensive, and prohibitively slow. It's typically completed via one-off manual analyses by consultants.

Pathways' AI-powered platform simplifies and accelerates the emissions reduction process by transforming unstructured, operational data into automated, real-time reporting on a manufacturer's emissions. With rapid deployments of life cycle analyses (LCAs) and environmental product declarations (EPDs), Pathways' technology allows manufacturers to understand, evaluate, and improve upon their current state of emissions at scale. For more information, visit **www.pathwaysai.co**.



SketchDeck.ai LIFT

Fabricators and Erectors all over North America are now automating their material takeoffs using LIFT, a software built by SketchDeck.ai for the steel industry. LIFT is the first solution for structural steel takeoffs that uses artificial intelligence and machine learning technology to automatically detect structural steel members from 2D engineering drawings.

Within seconds, LIFT can detect beams and columns on plan as well as headers, girts, and braces on elevation drawings. Estimators can quickly add multiple attributes to members and export a bill of materials. LIFT also integrates into most common estimating software through a customizable bill of material export.

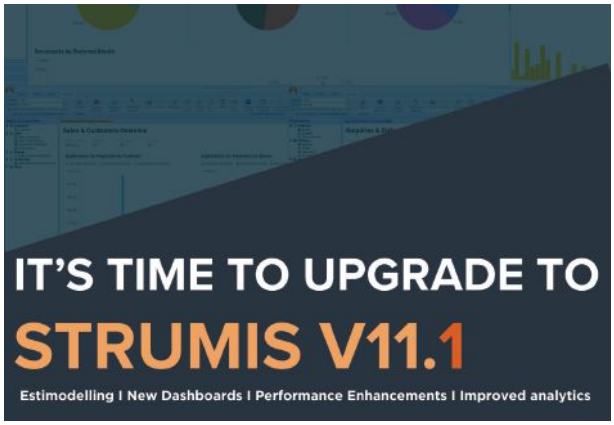
Clients using LIFT are saving hours on every bid, allowing them to bid more work with greater accuracy and confidence. To learn more, visit **www.sketchdeck.ai**.

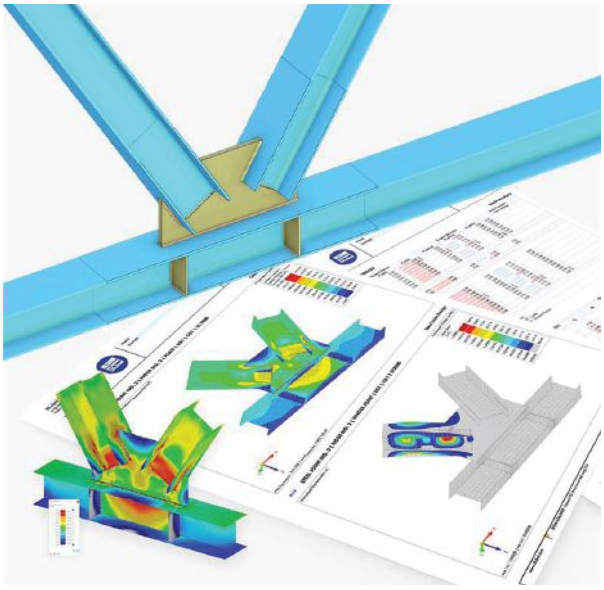
STRUMIS V11.1

STRUMIS V11.1 features an Estimodelling function and new dashboards designed to increase your members' efficiency and boost their profitability. It promises to deliver unprecedented speed and accuracy in steel structure project estimates.

The software's standout feature is the game-changing STRUMIS Estimodelling, which revolutionizes the speed and precision of steel structure project estimates. STRUMIS V11.1 is an innovative combination of 3D CAD and STRUMIS Estimodelling that delivers unparalleled benefits. It imports SDS2 and Tekla models in seconds for exceptional speed, achieves flawless costing of the entire model for unmatched accuracy, and generates comprehensive costs encompassing main members and fittings.

STRUMIS Estimodelling aligns seamlessly with existing benefits, demonstrating the company's continuous commitment to the steel fabrication industry. Visit **www.strumis.com** to learn more.





Dlubal Enhanced RFEM

Dlubal Software has enhanced its RFEM 6 FEA structural analysis and design software to incorporate the latest *Specification for Structural Steel Buildings* (ANSI/AISC 360-22) for member and connection design. Additional seismic member checks according to the *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341-22) are also available.

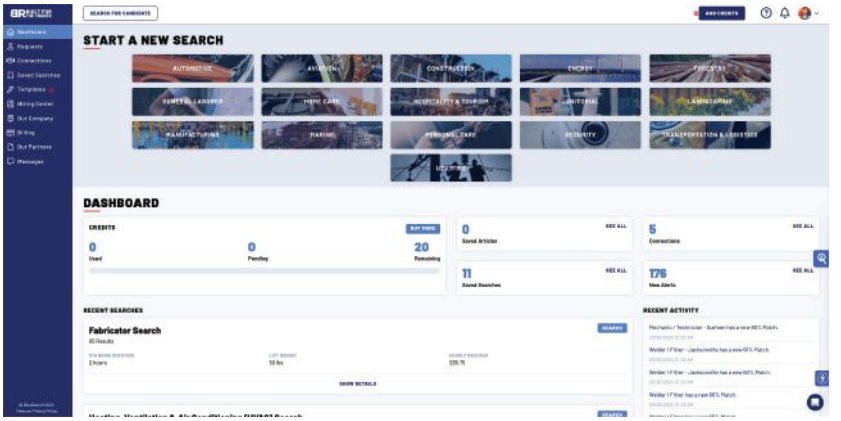
RFEM's unique connection design surpasses conventional analytical models by internally generating an FEA model, creating unique or non-standard connections. Users can select from a diverse library of predefined steel connection templates or create their own. They will find complete bolt, weld, and plate checks with AISC design formulas and equations. Additionally, a buckling sub-model is automatically generated to identify plate element buckling failure mode shapes.

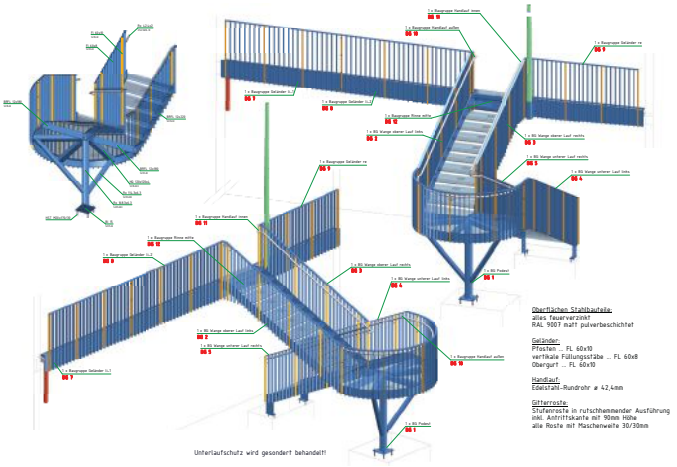
The program includes a comprehensive design of the global structure where all member end forces are incorporated directly into the steel connection design within a single model. Eliminate data loss during the transfer of member end forces when switching between external programs and experience RFEM's all-in-one design solution. For more information, visit **www.dlubal.com**.

BlueRecruit Talent Acquisition

BlueRecruit is a talent acquisition software platform built for the skilled trades that allows employers to find and connect with the exact talent they need. Rather than writing time-consuming job posts and waiting for candidates to find them, companies can use BlueRecruit to connect with talent based on the exact skillsets, certifications, and licenses their roles demand.

Whether you're hiring a fabricator, welder, erector, detailer, or any other skilled trade professional, BlueRecruit is an access point to talent across North America. Take advantage of an exclusive 10% discount for AISC members and visit **www.bluerecruit.us**.





ISD Group Software

The ISD Group is a specialist in CAD and PDM software. Its HiCAD and HELiOS products offer a coordinated overall solution with integrated special functions, profile libraries, and configurators for all industries, including steel engineering and the construction of stairs and railings.

Small manufacturing companies, medium-sized companies with their own product development, or large international corporations will find the right combination of all required functions in just one system thanks to HiCAD's modular structure. With HiCAD, you can use 2D and 3D in single interface, in addition to the field-proven, industry-relevant functions. Furthermore, drawings can be transferred directly to NC machines at the push of a button.

With all these automated processes, HiCAD can meet the high demands of complex engineering projects. The integrated PDM software HELiOS manages a wide range of data that comes together during the design process of 3D models. Visit **www.isdgroup.us** for more information.

SteelSUB

How often do you have open capacity in your fabrication shop or the field? How often do you find yourself in need of a quality partner to subcontract work to or from? What do you do when your current partners have no work to subcontract or no open capacity in their shop? What if there was a better way?

SteelSUB is a collaborative online platform where fabricators and erectors can connect transparently, fostering open communication and problem-solving. Say goodbye to outdated methods of subcontracting—SteelSUB's Open Capacity Marketplace allows instant sharing of production gaps and facilitates connections with industry peers. Additionally, its two-sided SUB fabrication and erection marketplaces offer seamless project management, enabling users to post, find matches, and communicate effortlessly. Explore the marketplace, connect with SteelSUB's network, and experience the benefits at **www.steelsub.com**.

SDC Verifier

SDC Verifier is a powerful simulation and standard checking software that works independently and within popular FEA interfaces. It seamlessly integrates structural design, analysis, optimization, and verification processes. With its modern and intuitive graphical interface, engineers can effortlessly import existing models from various sources or create new designs from scratch.

SDC Verifier automates the verification of the FEA model against industry standards, design codes, rules and regulations, and custom criteria. Its library includes more than 40 standards, among them the *Specification for Structural Steel Buildings* (ANSI/AISC 360-22), Eurocode 3, AIJ-2017, AS4100, FKM, ISO19902 and others. Structural items such as beam members, plates, welds, stiffeners, panels, and connections are detected on the model to be directly verified with the unique recognition tools. The optimization module allows the best design decision to be made for the structure by calculating different combinations of design inputs. For more information, visit **www.sdcverifier.com**.

Scotchman FI 8510-20M

The Scotchman FI 8510-20M Ironworker has an 85-ton punch capacity that can put a $1\frac{1}{16}$-in. hole through 1-in. material. The FI8510-20M is made in America with built-in tooling stations. Some standard features include a 6-in. by 6-in. by ½-in. angle shear and rod shear that will shear 1½-in. round and 1¼-in. square rod, and a rectangular notcher that can notch 3 in. by 5 in. by ½ in.

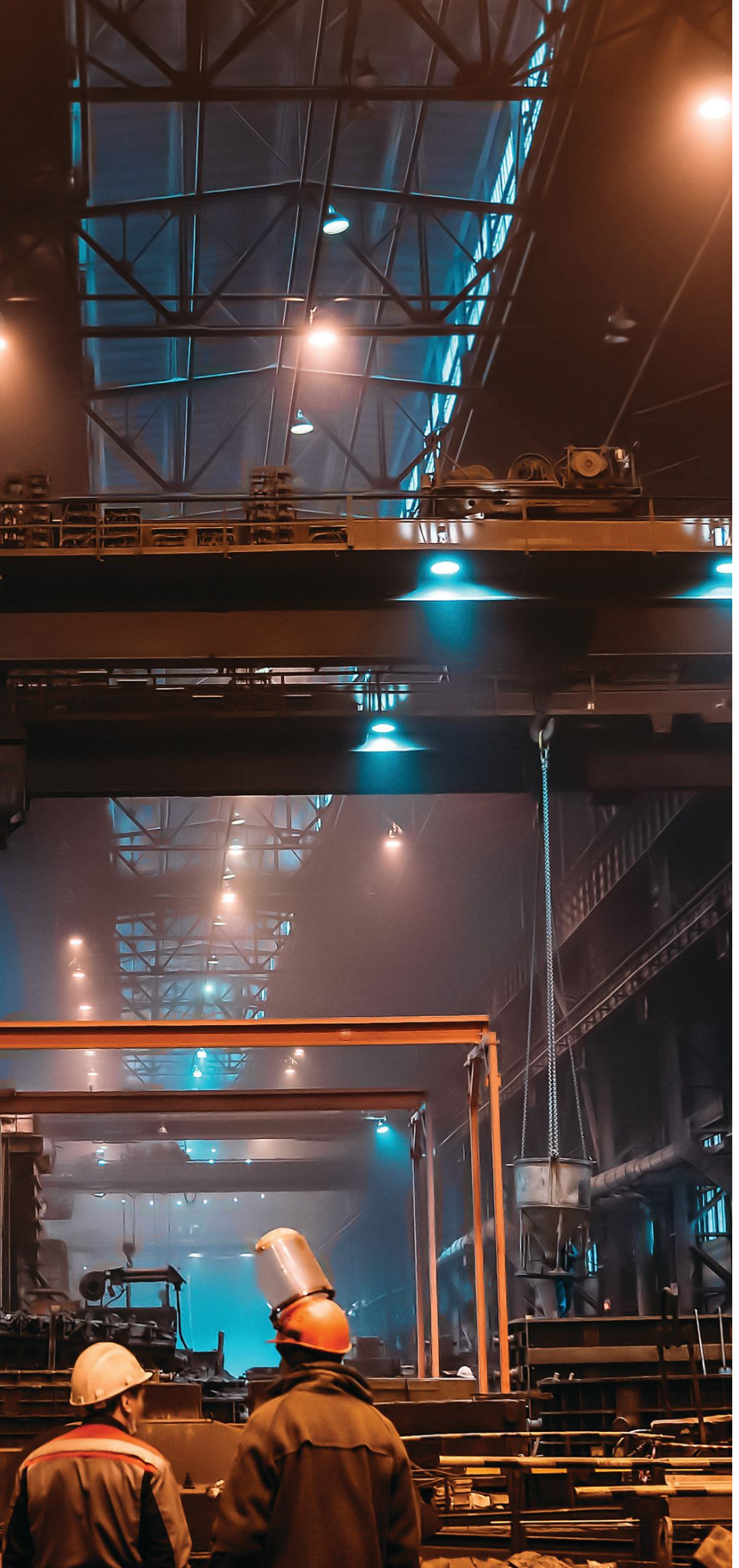
The 20-in. flat bar shear features a low-rake angle that can shear up to 1 in. by 12 in. and ¾ in. by 20 in. material. The machine also has an electric remote foot pedal, jog control, keyed punch ram, punch gauging table with fence and scale, shear table, miter fence, notcher table with guide and scale, and a three-year warranty. For more information, visit **www.scotchman.com**.

Miller Electric Welders

Miller Electric has released two new welding machines, the Bobcat 265 Air Pak and Trailblazer 330 Air Pak. In addition to Air Pak options, the Bobcat 265 is available in gas and LP models, while the Trailblazer 330 comes in gas and diesel.

Both offer all the legendary benefits with the added advantage of an integrated industrial rotary-screw air compressor that eliminates the need for a separate compressor. These powerful all-in-one machines are lighter and smaller than previous models, offering multiprocess weld quality, auxiliary power, battery charge/crank assist and, now, an air compressor—delivering all-in-one capabilities for maintenance, repair operations, and field fabrication.

Both Air Pak machines allow operators to run air impact wrenches and give 100% deliverable air. The compressor produces 30 cfm of air at a 100% duty cycle and delivers 80 to 160 psi of air with an optional storage tank for consistent airflow performance. Visit **www.millerwelds.com** to learn more.



QMC

Quality Management Company, LLC (QMC) is seeking qualified

INDEPENDENT CONTRACT AUDITORS

to conduct site audits for the American Institute of Steel Construction (AISC) Certified Fabricators and Certified Erector Programs.

This contract requires travel throughout North America and limited International travel. This is not a regionally based contract and a minimum of 75% travel should be expected.

Contract auditors must have knowledge of quality management systems, audit principles and techniques. Knowledge of the structural steel construction industry quality management systems is preferred but not required as is certifications for CWI, CQA, or NDT. Prior or current auditing experience or auditing certifications are preferred but not required.

Interested contractors should submit a statement of interest and resume to **contractor@qmcauditing.com**.

Faccin Group Plate Roller

Plate rollers have experienced significant technological advancement in recent years, aligning with the overall industry trend towards electrification.

Faccin Group has developed a 4-roll Direct Electric-Drive Plate Roll 4HEP-MPE series that seamlessly integrates lower bending rolls' hydraulic movement with the electric rotation of the top roll. The rolling speeds reach a staggering 32.8 ft per minute. It accommodates a maximum plate thickness of up to 1⅜ in. while also providing a maximum plate length of 10 ft. Moreover, the high-efficiency electric design reduces energy consumption costs by up to 35%.

In addition, the plate roller provides ergonomic benefits for operators, as its reduced working height allows for easier operation and handling of steel plates. It achieves a silent operation by significantly reducing the noise levels by almost 15 decibels. To learn more, contact **usa@faccingroup.com**.

Peddinghaus PeddiSubX-1120

The PeddiSubX-1120 takes on efficiency challenges by utilizing independent Sub-X axis spindle movement and powerful carbide technology to maintain speed and accuracy throughout the processing of each piece of material. Each axis operates independently, meaning drilling and milling functions can be performed simultaneously at triple the speed of average drill lines. By rapidly decreasing the time to process profiles, steel fabricators can keep production timetables far ahead of schedule. Expedite project deadlines and take back the market share with this superior technology.

Next to accuracy, speed is one of the most important conditions in the steel industry. The sheer speed of the PeddiSubX-1120 has rewritten the book on innovation. Imagine processing a beam with milled block copes on both flanges in just 90 seconds without any rework or touching a grinder. By eliminating the need for grinding or any other post-processing, manhours are restored, and profits are maximized. Fabricators have never seen such a sharp spike in savings. Visit **www.peddinghaus.com/videos** to watch the PeddiSubX-1120 in action.

Steelmax Plate Beveling Machine

Steelmax's BM25 is a dynamic portable heavy duty plate beveling machine that can effortlessly craft precise bevels from 0 to 90 degrees, with a 1 in. maximum width. Equipped with a high-speed rotary milling head featuring five replaceable carbide cutting inserts, it delivers unparalleled performance. The BM25 can consistently produce flawless bevel geometry that ensures superior fit-up and top-notch welding results, slashing costs and minimizing rework.

Forget about grinding or secondary work—the BM25's milled finish leaves plates weld-ready, saving you time and effort. Its robust 2,200-watt variable speed motor, coupled with an ergonomic design tailored for maximum comfort, means this beveler isn't just a tool; it's an indispensable asset. For more information, visit **www.steelmax.com**.

Kobelco ARCMAN Structural Steel Welding Robot System

The Kobelco ARCMAN Structural Steel Welding Robot System is a fully automated complete joint penetration-capable robot. It can realize unobserved operation for extended periods, applies to a wide variety of work, will increase plant operation rate, produces high-quality welding to match human effort, has a simple operation with an easy-to-understand input screen, and its existing delivered systems can be upgraded to two arc robots.

ARCMAN's positioner load capacity is 33,000 lb. It can be used in core welding, where it eliminates measurement time for corner radius sensing, increasing quality. It does connection welding, and depending on the matching of the back plate, welding parameters are automatically adjusted to prevent burn through.

ARCMAN can perform inner diaphragm welding to a depth of 11.81 in. from the core's upper surface to the diaphragm's lower surface. Lastly, it can do SRC shaft welding; the interface between the robot and flange is automatically avoided based on the shape of the work entered and sensing. For more information, visit **www.kobelco.co.jp/english/welding/system**.

Daito DCM1000

Daito's drilling coping machine, DCM1000, is a multi-tasking machine combining a CNC drill with three spindles, a CNC robotic coper for standard or complicated plasma cuts, and a marking machine for part number marking and welding/layout marking. Each drill has an automatic tool changer to cover tapping, milling, chamfering holes, and boring blind holes.

A wide range of functions makes the DCM1000 the most versatile machine for non-repetitive structural steel processing: monitoring cameras, a feeding system with a pinch roller, shuttle vise, a push bar, a hybrid workfeed system, angle processing, and extra strong clamping. Go to **www.daitousa.com** to learn more.

Soitaab OMNIAtech

Market trends now demand multi-purpose machines that integrate many technologies on a single platform, and the new Soitaab OMNIAtech perfectly meets that all-in-one philosophy. By seamlessly integrating all fabrication processes into a single unified system, OMNIAtech delivers the ability to cut, drill, thread, surface and hole mill, countersink. It offers a wide range of marking options in a single machine.

OMNIAtech meets the highest industry standards for quality, precision, productivity, reliability, and ease of use. With the most sophisticated, user-friendly CNC controls and software, Soitaab delivers on the promise of an operator-friendly, multi-process, all-in-one fabrication system. More pictures, information, and videos of the system can be viewed on the OMNIAtech product page at **www.soitaabusa.com**.

Engineered Rigging Climbing Cylinders

Engineered Rigging has expanded its rental fleet with the addition of Holmatro Ring Climbing Cylinders, which provide incremental lifting height up to 23.6 in.—much more than a traditional hydraulic cylinder. Starting at under 12 in. when retracted, each portable, ergonomic cylinder has a lifting capacity of 100 tons but weighs only 50 lb and features a compact footprint. Its innovative design eliminates the need for stacking wood or filler blocks and expedites lifting. With a stroke of 4.7 in., the solution can safely lift and mechanically secure a load.

The ring climbing cylinders are ideal for challenging locations with limited access, including low-height bridge lift operations, bridge bearing replacement, and lifting large or heavy industrial components, such as transformers and other machines equipped with low clearance lifting pockets.

One set has four double-acting aluminum cylinders, stacking rings, insert blocks, and a fork accessory to place the stacking rings safely. With the addition of a split flow pump, the operator can safely and accurately lift or lower the component into place with all points synchronized. Visit **www.engineeredrigging.com** for more information.

Columbia Safety and Supply Gearcor

Columbia Safety and Supply has introduced its revolutionary workwear and boot platform, Gearcor, a one-stop destination for customizable workwear solutions. Backed by world-class technology, Gearcor puts you in complete control of your workwear program. Seamlessly tailor your work gear to match your team's unique needs and brand identity. Equip your team from head to toe, from durable jackets and rugged pants to rain gear and boots. Gearcor's extensive selection ensures that every team member feels comfortable and confident on the job.

With a wide variety of brands trusted by professionals worldwide, Gearcor has what you need to stay safe and productive from sunrise to sunset. Step into reliability and performance with industry-leading brands like Ariat, Thorogood, Danner, Muck Boots, LaCrosse, Keen, Wolverine, and Timberland. With superior craftsmanship, advanced technology, and unmatched durability, you can provide your crew with the ultimate protection and comfort in any work environment with Columbia Safety as a partner. For more information, visit **www.gearcor.com**.

ASC Steel Deck Smooth Series

Smooth Series is an architecturally exposed riveted cellular deck that provides clean beam-to-pan connections by replacing traditional welded attachments with aesthetically pleasing riveted attachments.

Smooth Series is a highly desirable product for all project stakeholders. It guarantees architects a clean, finished look. Engineers don't have to compromise on the structural capacity to deliver an aesthetically pleasing project. It helps general contractors and painting contractors reduce labor and time by skipping the need to prep and touch up the spot welds on the traditional welded cellular deck.

Smooth Series is offered in roof, floor, and acoustic profiles. Its standard finish offer is galvanized. Smooth Series is also offered in gray or white factory-applied bottom side prime paint when specified. ASC Steel Deck's welded cellular deck and Smooth Series may be specified interchangeably. Learn more by visiting **www.ascsd.com/products**.

Nuwave Laser Cleaning

Nuwave Laser is at the cutting edge of Category 4 laser cleaning technologies. With the newest models of pulse laser machines, continuous wave laser machines, and the three-in-one welding, cutting, and cleaning machines, Nuwave has the most effective and reliable options available.

Nuwave's technology can degrease and eradicate erosion, wear marks, and grime build-up from equipment, helping keep machinery in top condition. Its portable laser cleaning technology allows you to move efficiently between machines without affecting workflow. It can prepare surfaces for welding and clean old weld joints, making it easier to identify cracks and re-weld without manual sanding.

Whether you need to remove rust, paint, or other coatings from metal surfaces, clean engine parts, or restore historical artifacts, our laser cleaning technology provides a fast, effective, and non-damaging solution, trust Nuwave Laser machines for all your laser cleaning needs, and experience the benefits of our advanced technology in action. Visit **www.nuwavelaser.com** to learn more.

New Millennium RED Rolling Electric Deck

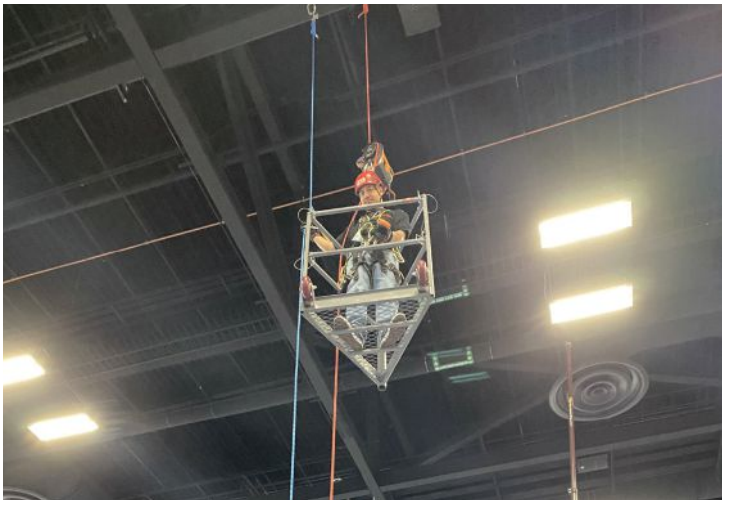
Create the strongest ever side-lap connections on interlocking B deck and stop tripping over cords and hoses with New Millennium's RED, the industry's first and only battery-powered deck tool on wheels. Eliminating the need for air compressors on the roof and hoses crisscrossing the deck, RED enables users to effortlessly, consistently clinch side-laps that have been tested and proven to be stronger and stiffer than those of competing tools.

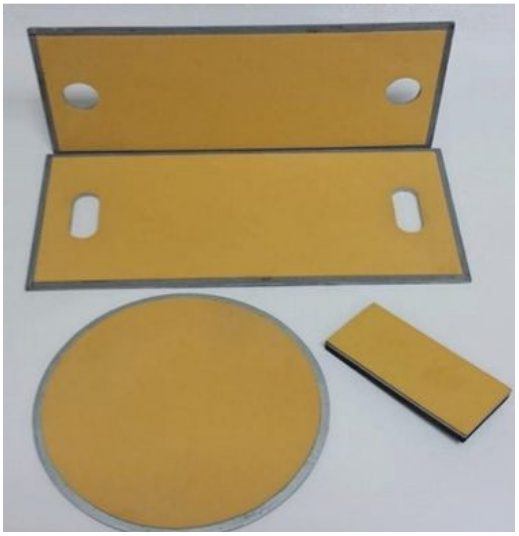
Since RED sits in the side-lap by default instead of requiring manual alignment with the seam, you'll create reliable connections every time. You'll know you've completed a connection when the green light shines and the tool emits an audible tone. Its ease of use means you'll do less work to achieve superior connections, while its design will improve the efficiency and performance of your personnel. For more information, visit **www.newmill.com**.

Engineered Supply Single-Man Basket System

Engineered Supply's single-man basket system makes accessing tall building façades. The system includes a single-man basket, traction chair, harness, battery-powered rope hoist with rigging, and a throw line with a rigging pole. Lightweight and easy-to-use, the basket system operates without power cords. It can access hard-to-reach places on tall buildings for building construction, welding, bolting, and other maintenance such as cleaning façades and windows.

The single-man basket system is part of Engineered Supply's suspended maintenance product suite that makes servicing the roof, windows, and façades of multi-story buildings safe and efficient, including anchorage connectors, davit arms, rigging sleeves, and monorails. Visit **www.engineeredsupply.com** to learn more.





GRM Custom Products FLUOROGOLD Slide Plates

Any design needing movement, isolation, or stress relief can benefit from the addition of GRM slide plates. FLUOROGOLD is a premium formulation of PTFE combined with special reinforcing agents to offer a high compressive strength and is widely considered the gold standard for quality and consistency. This premium blend yields a structural material that offers significantly higher mechanical properties than PTFE itself. Compressive creep is virtually eliminated, wear is substantially reduced, and deformation is decreased.

A standard FLUOROGOLD slide plate assembly has two $^{3}/_{32}$-in. plates, which work together (bottom and larger top) to provide a durable and low-friction surface for smooth sliding motion in various applications. It can also include a lip for tack welding. It works to absorb the displacement of machinery and structures due to thermal expansion, wind, or seismic vibrations, making it an excellent selection for bridges, highways, buildings, retractable roof stadiums, and pipelines. Visit **www.grmcp.com/fluorogold-slide-plates** to learn more.

ArcelorMittal Jumbo Sections

ArcelorMittal, a longtime innovator in rolled jumbo shapes, has unveiled its latest creation in structural steel: the W14×930 and W14×1000 sections. These shapes are the heaviest rolled sections produced globally and are incorporated into the ASTM A6 specification.

These jumbo sections offer project teams excellent alternatives to cover plating and constructing built-up box columns, traditionally labor-intensive solutions that add significant costs to projects. They will be an important resource for designers working on projects with major column demands, such as high-rise buildings, stadiums and arenas, or seismic force resisting system elements.

Available in A992 and A913 Grade 65, W14×930 and W14×1000 sections are a testament to why steel should be the material of choice. For inquiries, contact **sections.northamerica@arcelormittal.com**.

Infasco INF3013 Coating System

Infasco has developed the INF3013 corrosion-resistant coating system, specifically designed for tension control and heavy Hex bolts. The hydrogen-embrittlement-free coating is approved for ASTM F3125 Grade A325 and is the only system approved for ASTM F3125 Grade A490 bolts. It offers superior corrosion resistance—providing 1,000 hours of salt spray protection—and the thin coating covers the nuts' threads and completely protects the fastening system.

The lubricant embedded in the system produces repeatable performance regardless of environmental conditions. Wet, dry, hot, or cold, the parts tension properly. The thin film coating allows for a standard socket to be used for installation, meaning no special socket is needed. In addition, it readily accepts paint, providing an enhanced finished project. Visit **www.infasco.com** for more information.

BURKE Antimicrobial Coating

With over 50 years of expertise in high-performance coatings, BURKE's Silver Bullet Antimicrobial Coating stands at the forefront of industrial innovation. Featuring Agion antimicrobial smart technology, our water-based, VOC-compliant, and EPA-2 registered epoxy coating is 99.9% effective against Staphylococcus (Staph), Escherichia Coli (E Coli), Legionella, and Salmonella, as confirmed by an independent study at the University of Arizona.

Agion combats microbes through sterilization, suffocation, and starvation by releasing silver and copper only in their presence, halting cell reproduction, disrupting nutrient transmittance, and ceasing energy production to keep surfaces germ-free.

The Silver Bullet line—available in clear, white, and black—enhances cleanliness and ease of maintenance across multiple industries, including food processing, healthcare, government, education, transportation, hospitality, and metal manufacturing.

BURKE's coatings ensure a germ-free environment, contributing significantly to public health and safety standards in heavily utilized spaces. For more information, go to **www.burkeindustrialcoatings.com**.

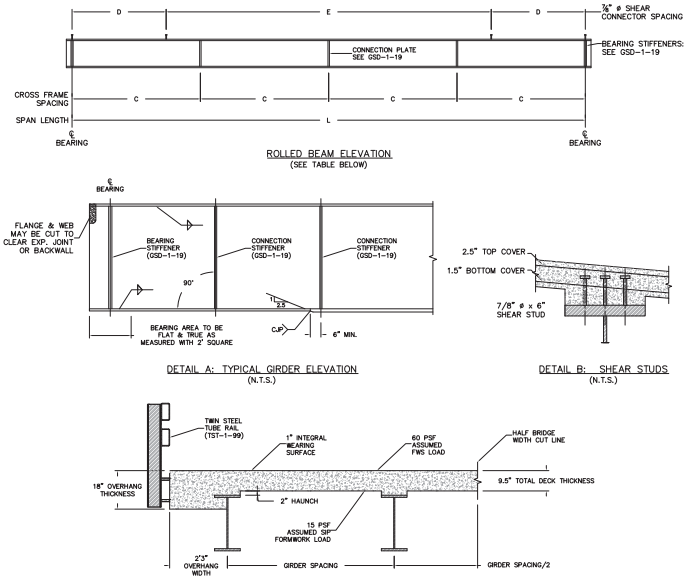
SSSBA Highway Bridge Designs

The Short Span Steel Bridge Alliance (SSSBA) offers a complimentary service to state departments of transportation that allows producing of standard rolled beam and plate girder designs for highway bridge applications. The designs conform to AASHTO and owner-specified criteria. They are individually compared against external software programs to ensure their compliance with owner preferences and pertinent limit states.

The service has broad implications for improved infrastructure quality and efficiency and allows:

- Owners to have a real-time understanding of cost.
- The bridge inspection community to be better equipped to perform inspections on industry-vetted and known details.
- Fabricators to have readily available approved design and detailing files to expedite project delivery.
- Contractors to perform jobs with minimal problems related to design flaws or complicated piece installation.
- Transportation system users to experience a more cost-effective and efficient infrastructure system.

To learn more, visit **www.shortspansteelbridges.org**.



Indiana Group Bar Gratings

The Indiana Group is rapidly expanding its footprint in the United States by offering bar gratings from warehouses in Savannah, Ga., New Jersey, and Long Beach, Calif., in addition to its longtime warehouse in Houston. Indiana Group, which has been selling bar gratings in the United States since 2004, is now also offering fabricated gratings and stair treads. Going forward, it also plans to offer other products such diamond-grip strut, expanded metal, wire mesh, and perforated metal. Visit **www.indianagroup.com** to learn more. ■

STANDARDS

AISC Releases New Version of Certification Standard

The latest version of AISC's *Standard for Certification Programs* (AISC 207-23) is now available for free download. It can be found at **aisc.org/cert-updates**.

The latest edition will continue to serve as the go-to reference for the AISC Certification program, setting the quality level for structural steel fabricators and erectors. It has been approved by the Certification Standards Committee and AISC's Board of Directors. It will take effect for current program participants and applicants for audits on or after June 1, 2024, superseding the 2020 version.

"AISC's Certification program is designed to help specifiers choose fabricators and erectors who have the personnel, organization, experience, procedures, equipment, and commitment to build quality at the start of a project by preventing errors, instead of correcting them," said AISC Vice President of Membership and Certification Todd A. Alwood. "It's one thing that makes structural steel such a reliable choice. This update ensures that certified fabricators and erectors are adhering to the latest best practices to provide high-quality work."

Changes include updates to the glossary, welding, inspection, testing procedure requirements, clarifications on subcontracting work, and record retention requirements. AISC Certification has also made the document easier to use by revising names of references, updating commentary, and aligning it more clearly with the *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303-22).

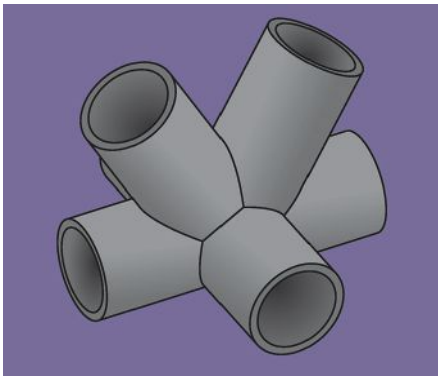
REFERENCES

Second Edition of AISC Design Guide for HSS Connections Now Available

Design professionals now have a vastly improved resource for the design of hollow structural section (HSS) connections in the new second edition of AISC Design Guide 24, *Hollow Structural Section Connections*, authored by Jeffrey Packer, PEng, PhD, DSc, professor in the University of Toronto's Department of Civil and Mineral Engineering, and Kimberley Olson, PE, director of Nucor's Construction Solutions Group.

Design Guide 24, 2nd Ed. is available for download at **aisc.org/dg**. Like all digital design guides, it is free for AISC members.

This latest update to the AISC design guide series greatly expands upon the background and commentary for each HSS connection. These thorough explanations of the relevant limit states and the experimental results for each connection provide invaluable insight into the rationale behind each connection design procedure.



The design guide has been expanded to include guidance and design procedures for many new connection types, and a dozen new design examples bring the total to 33. This new edition has also brought the discussions, guidance, and procedures for HSS connection design into conformance with the provisions of the current *Specification for Structural Steel Buildings* (ANSI/AISC 360-22) as well as the new 16th Ed. *Steel Construction Manual*.

The second edition includes extensive background for each of the various limit states relevant to HSS connections, including welded joints and mechanically fastened/bolted joints. It also discusses design procedures for numerous shear connections, moment connections, tension/compression connections, line load/concentrated force connections, HSS-to-HSS truss connections, and HSS-to-HSS moment connections.

People & Companies

Hatfield Group Engineering managing partner **Erleen Hatfield** has been elevated to The College of Fellows of The American Institute of Architects (AIA), a recognition of her career-long commitment and notable contributions to the advancement of the profession of architecture. With degrees in both architecture and engineering, she has an appreciation for the value of creative approaches to design. Only 3% of the 98,000-plus AIA members are part of the College of Fellows.

Lexicon, Inc., project administrator **Magen Schlesier** has been named Woman of the Year for the Greater Little Rock chapter of the National Association of Women in Construction (NAWIC). As project administrator at Lexicon, Schlesier provides administrative and logistical support to the construction project management team, and she advises on the most effective and efficient use of resources. Before joining Lexicon in 2023, Schlesier served as director of research and development at ACE Glass Construction Corp.

Walter P Moore promoted **Brent Bolerjack, PE,** to Managing Director of the Oklahoma Civil Engineering team. Bolerjack brings over 20 years of experience to his new position. Throughout his career, he has successfully managed and designed more than 40 bridge replacement and bridge rehabilitation projects, establishing himself as a trusted industry leader in this field.

Simpson Gumpertz & Heger (SGH) has hired **Colleen Stuber-Zukanovic** as a project director, bolstering its building enclosure consulting practice. She joins SGH's Building Technology Division in Chicago and brings nearly 15 years of design and construction experience as an architect, specializing in building enclosure design consulting for new and existing buildings.

IN MEMORIAM

AISC Remembers SEI Founder Jim Rossberg

Jim Rossberg, ASCE's former managing director for engineering programs, died unexpectedly in late March. He was 65.

Rossberg significantly impacted ASCE and the engineering profession in his 30 years with the society. He joined ASCE as a full-time staff member in 1993 and remained with the organization until his retirement in October 2022. In 1997, he was instrumental in the creation of the Structural Engineering Institute (SEI), one of ASCE's first two institutes. He initially joined ASCE as part of the Civil Engineering Research Foundation and was the marketing manager for the Highway Innovative Technology Evaluation Center.

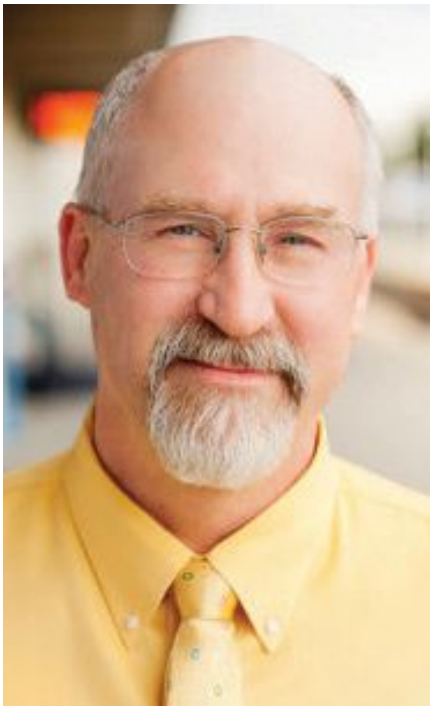
Later, ASCE named Rossberg its director of codes and standards. He grew ASCE's standards program from 10 standards when he began the job to more than 50 when he shifted titles.

Rossberg also envisioned and staffed ASCE's post-9/11 building performance teams for the World Trade Center and Pentagon. His work in that role earned him a Top 25 Newsmaker Award from Engineering News-Record in 2002. He was part of several other ASCE disaster response teams, including after the Murrah Building bombing, Hurricane Katrina, and the Chilean earthquake.

"Jim was a good friend who worked closely with AISC on several initiatives, including co-locating the Structures Congress with our conference in 2010," AISC senior vice president Scott Melnick said.

Rossberg shifted titles to managing director of engineering programs in 2011 and held that role until he retired. Forming the Utility, Engineering, and Surveying Institute was among his accomplishments in that role. In 2022, he received the William H. Wisely Award from ASCE.

Rossberg is survived by his wife, Jan, and two children: daughter, Jenny, and son, Chris.



AWARDS

Nominate Someone Remarkable for an AISC Award

AISC is accepting nominations for its award programs that honor people who make a difference in the world of design and construction.

"Steel is a special material—and the people in our industry are responsible for its impact on how people live, work, and play," said AISC President Charles J. Carter, SE, PE, PhD. "AISC is honored to provide a well-deserved spotlight for their achievements."

Each year, AISC recognizes exceptional industry professionals, designers, and educators with Lifetime and Special Achievement Awards. AISC also presents the Terry Peshia Early Career Faculty Awards to tenure-track faculty who demonstrate exceptional promise in the areas of structural steel research, teaching, and other contributions to the structural steel industry.

Nominations are due July 15, 2024. The 2025 winners will receive special recognition at NASCC: The Steel Conference in Louisville, Ky., April 2–4, 2025.

To learn more or submit a nomination, please visit **aisc.org/individual-awards**.

Lifetime Achievement Awards honor individuals whose long-term, dedicated service to AISC and the industry have made a difference to drive innovation forward. Special Achievement Awards recognize singular achievements in design, construction, education, and research.

In truly remarkable cases, AISC will also present its most prestigious awards.

The Geerhard Haaijer Award for Excellence in Education recognizes those who, through research and teaching, have had a profound and lasting impact on advancing the use of structural steel framing in the construction industry. Only nine individuals have won the Haaijer Award since 1999; they include Theodore V. Galambos of the University of Minnesota (1999), Lynn S. Beedle (2003) and John W. Fisher (2006) of Lehigh University, and Bruce R. Ellingwood of Colorado State University (2018). The award was most recently presented in 2023 to Michael Engelhardt, PE, PhD, of the University of Texas at Austin.

The J. Lloyd Kimbrough Award honors living engineers and architects who are universally recognized as the preeminent steel designers of their era. Past winners of the Kimbrough Award include Ludwig Mies van der Rohe (1961), Othmar A. Ammann (1964), Fazlur R. Khan (1973), and Leslie E. Robertson (2001). The award was most recently presented at the Steel Conference this March to Michael A. Grubb, PE, of M.A. Grubb & Assoc., LLC.

The Robert P. Stupp Award for Leadership Excellence is a special honor for those who have demonstrated unparalleled leadership in the steel construction industry. AISC has presented it to only 10 individuals since 1998, including David Zalesne of Owen Steel Company (2023), Duane K. Miller of The Lincoln Electric Company (2016), Daniel R. DiMicco of Nucor Corporation (2012), and Robert D. Freeland of Havens Steel Company (2002).

GRANTS

AISC Presents Inaugural Design-Build Grants to Three Universities

Today's architecture students are community-minded and forward-thinking—and their work deserves to come to life.

The AISC Education Foundation has awarded three grants from its inaugural Design-Build Grant Program, which promotes the use of structural steel in student-designed projects that will benefit the local community—followed by the construction of those designs by the students in hands-on activities or in partnership with a fabricator.

The grants support projects across the country. In Columbus, Ind., a city that has celebrated architectural design for decades, a project led by Lucas Brown and Daniel Luis Martinez of Indiana University was awarded a 2024 grant of $15,000 for a creative bus stop. An outdoor classroom in Houston led by Patrick Peters of the University of Houston's designLAB also earned a $15,000 grant for 2024. University of Texas at Arlington's Julia Lindgren will receive $30,000 in 2025 for a project to build a rest stop for cyclists and pedestrians in Dallas.

Peters spoke about architecture design-build at 2024 NASCC: The Steel Conference in a session titled "Rooted Ligaments: 35 Years of the University of Houston Graduate Design/Build Studio." His presentation, as well as all other sessions from the conference, will be available at **aisc.org/learning** by June. One of Peters's previous University of Houston classes designed and helped build an outdoor classroom on campus.

The Design-Build Grant Program is sponsored by the AISC Education Foundation, a registered 501(c)(3) dedicated to supporting students, educators, and educational programming that builds a better future with steel. Learn more about what the AISC Education Foundation does at **aisc.org/giving**.

CARBON EMISSIONS

U.S. Steel Implements Innovative New Carbon Emission Capturing Technology

U.S. Steel and CarbonFree, a leader in carbon capture technology, announced an agreement to harness carbon emissions generated from U.S. Steel's Gary Works blast furnaces using CarbonFree's SkyCycle technology.

The first-of-its-kind project will capture and mineralize up to 50,000 metric tons of carbon dioxide per year—equivalent to emissions produced by nearly 12,000 cars annually—and could be expanded in the coming years.

"Innovating to capture carbon at an integrated mill is the latest example of how steel is enabling a more sustainable future," said Scott Buckiso, U.S. Steel Senior Vice President & Chief Manufacturing Officer. "Moreover, U.S. Steel has a history of 'firsts' that we're confidently building on. Using SkyCycle technology for the first project of its kind in North America should benefit the community for generations to come."

U.S. Steel's involvement aligns with the company's goal of reducing greenhouse gas emission intensity 20% by 2030 and achieving net zero emissions by 2050. In addition, the initial SkyCycle project responds to the increasing demand for low-emissions products. The project is the first step in exploring SkyCycle's scalability for future implementation across the enterprise.

Construction on the SkyCycle plant in the U.S. Steel Gary Works facility is expected to commence as early as summer 2024 with operations projected to begin in 2026. The agreement is for a 20-year term following its in-service date.

CarbonFree's patented SkyCycle solution captures carbon emissions before they enter the atmosphere and converts them into a carbon-neutral version of calcium carbonate, which is essential to the creation of paper and plastics, as well as personal care, paint, and building products. CarbonFree-produced calcium carbonate made from captured carbon dioxide can help decarbonize global supply chains by enabling manufacturers to reduce Scope 3 emissions, or it can be stored in an environmentally conscious way without the need for pipelines or disposal wells. In addition to capturing carbon dioxide, CarbonFree will use slag produced by the blast furnace operation as part of the calcium carbonate production process.

"U.S. Steel is setting a precedent for how manufacturers can and must proactively manage their carbon emissions, and CarbonFree is honored to play a role in this legacy," CarbonFree CEO Martin Keighley said. "As carbon capture continues to be recognized as an indispensable solution on the path to carbon neutrality for carbon-intensive industries, we look forward to helping U.S. Steel achieve its decarbonization goals while providing economic and environmental benefits to Gary and Indiana."

The partnership will likely enable U.S. Steel to offer steel used in the automotive, appliance, and packaging industries with a significantly reduced carbon footprint.

U.S. Steel employs more than 4,300 people at Gary Works. The plant creates an economic multiplier effect, supporting thousands of additional steel plant, chemical, energy, transportation, and supplier jobs throughout Lake and Porter counties and the greater United States.

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Riveting River Crossing

A NEW ROADWAY over the Anacostia River in Washington, D.C., is the 2024 NSBA Bridge of the Year.

The Frederick Douglass Memorial Bridge earned the award, voted on by attendees of the 2024 World Steel Bridge Symposium, held annually during NASCC: The Steel Conference. It's the second Bridge of the Year recipient, following an Interstate 91 exit ramp flyover in Hartford, Conn., that earned the inaugural honor in 2022. It opened in 2021 and replaced a 71-year-old bridge.

BEAM Architects and AECOM designed the 1,444-ft-long through-arch bridge, which carries South Capitol Street across the river. It has two 452-ft spans, a 540-ft center span, and three arches. The middle arch rises 30 ft higher than the side arches, and the arch cross-section is hexagonal, casting shadows that decrease the arches' visual mass. AISC member Veritas Steel, LLC, was the fabricator, and AISC member Walsh Construction was part of the joint venture that did steel erection. The design team chose Grade 70 steel to provide extra strength between the arches while maintaining a consistent structure depth.

The bridge's tight tolerances and precise fabrication are only possible with steel, and the team capitalized on both by designing arch visually clean splices that require fewer bolts than a normal splice connection.

The bridge also earned a 2024 Prize Bridge Award in the major span category. All told, eight structures were honored with Prize Bridge Awards, which AISC presents every other year.

You can read more about the Frederick Douglass Memorial Bridge and the rest of the 2024 Prize Bridge Award winners in the July issue.

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CONNECTING A CITY THROUGH

EFFICIENT CONNECTIONS

The city of Houston needed a 600-foot pedestrian bridge constructed over one the busiest highways in America. Collaboration with Atlas Tube resulted in an efficient and successful outcome—all with little interruption to traffic.

The combination of Atlas Tube Jumbo HSS and Shuriken connection technology was key to the effort's success. Made and melted in the U.S., the thicker-walled Jumbo HSS let designers keep the stringer size at 16x16 to give the bridge a slimmer, aesthetically pleasing look. And using Shuriken meant splices for the three 200' sections could be bolted with standard hardware, no field welding required, to reduce cost and the time required to finish the project.

With innovation from Atlas Tube, the people of Houston now have a beautiful new piece of infrastructure connecting them to a crucial transit center.

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