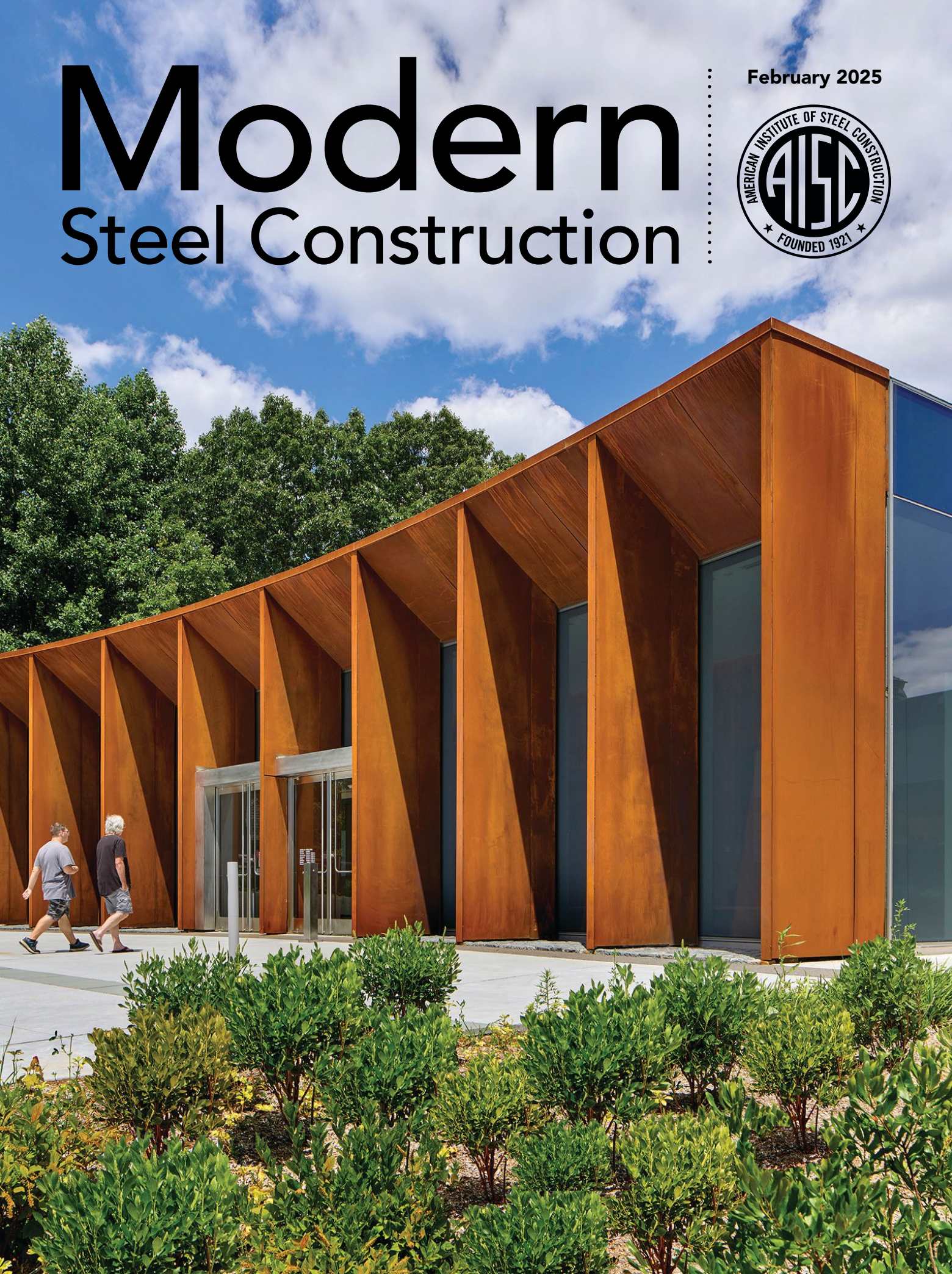
# Modern Steel Construction

February 2025



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February 2025

## in every issue




## features



## columns



**ON THE COVER:** Weathering steel panels greet visitors to the Purple Heart Hall of Honor in New Windsor, N.Y., p. 22. (Photo: Jeffrey Totaro)


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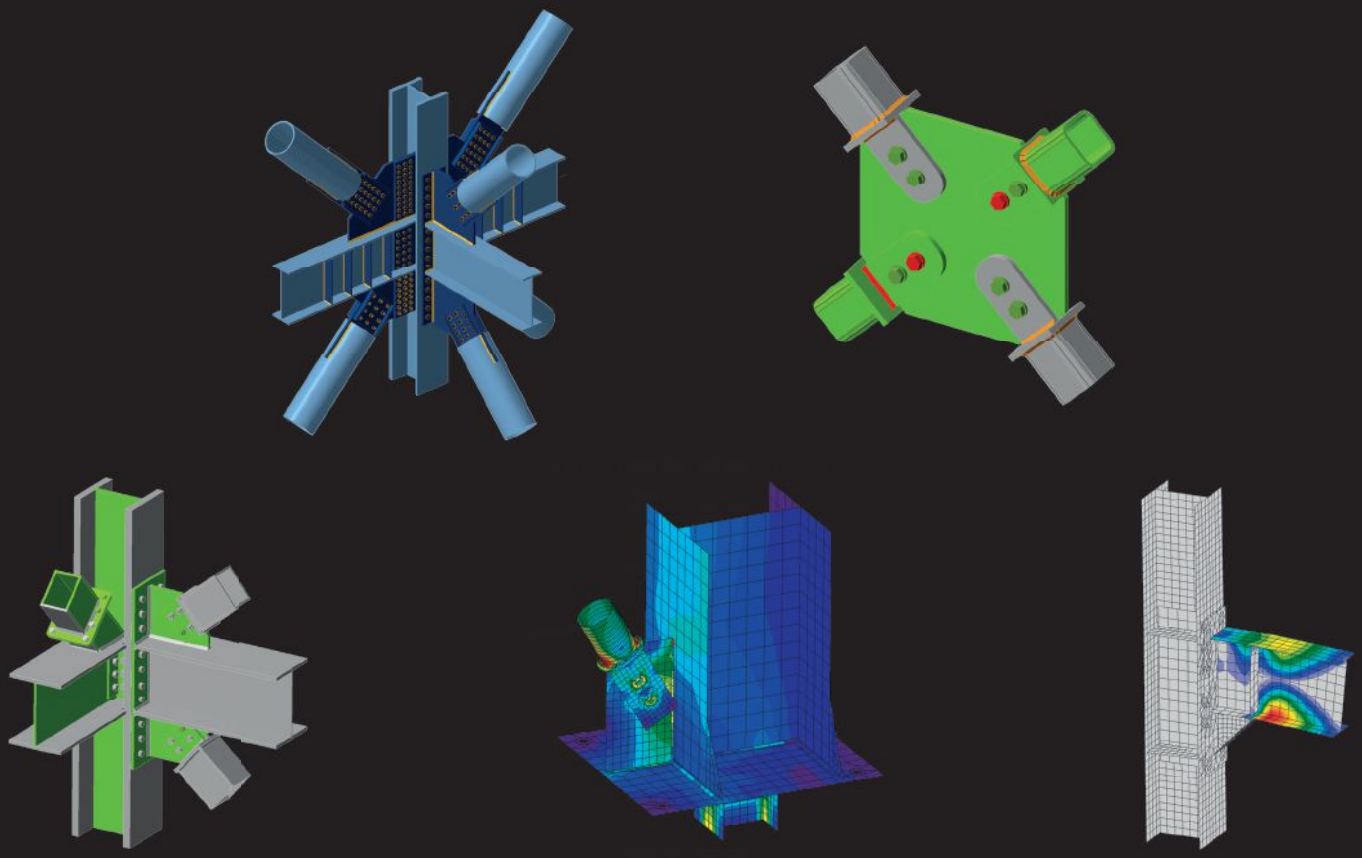

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# editor's note

## Happy February!

As I write this (in mid-December), I'm frantically thinking of all the things I need to get done before being away from work for the next two weeks.

This break will include a lot of football, both college and professional, as well as the annual trip west to Denver to visit family and friends. It's supposed to be in the 50s there, but the nice thing about Denver is that even when it's warm in December (which isn't uncommon), you can always drive to the mountains if you need a snow fix.

Anyway, my long list of items to be completed before the end of the year has now been split into two columns: things that have to get done by then and things that simply aren't going to and thus will be staring me in the face when I open up my laptop in early January (the list is heavily weighted toward the latter).

But as you read this, all of that is behind me now, I'm all caught up, and everything is hunky-dory (wow, I sure hope that's actually the case). By now, the first winner of the 12-team-format college football playoff has been crowned, the Super Bowl matchup has been decided, and registration has opened for NASCC: The Steel Conference (and if you haven't registered yet, go to **aisc.org/nascc**).

Something else that has come to pass? AISC's Need for Speed initiative. I mentioned it in last month's editor's note, but back in 2019—which feels like a lot further in the past than six years—we declared a goal of being able to demonstrate how we can increase the speed at which a steel building or bridge can be designed, fabricated, and erected by 50% by the end of 2025.

The need for speed initiative is continuing and ongoing (hence the large number of projects still in progress). We said we would increase the speed of steel design and construction by the end of 2025, but we're declaring that we met that goal early and are now working on making it even faster! We're taking a victory lap of sorts in the form of a list of testimonials from dozens of product and equipment manufacturers, software developers, and others who have done their part to reduce the time it takes to bring a structural steel project to fruition. You can read all of them starting on page 38. In addition, turn to page 36 where you'll see a rendering of a portion of a steel frame visualizing multiple speed-related technologies and practices that have resulted from AISC research projects.

Does this mean that we're done focusing on speed and steel? Hardly. There will always be opportunities to push for further efficiency at every link in the steel supply chain. And that phenomenon will be illustrated ad nauseam at The Steel Conference, which takes place April 2–4 in Louisville. The exhibit hall will feature more than 300 vendors, and all of them will have a story to tell regarding how they can help you do your part of a steel project faster. Ask them.

I hope that 2025 is off to a good start for you so far, and I also hope to see you in Louisville in a couple of months!

Geoff Weisenberger
Editor and Publisher


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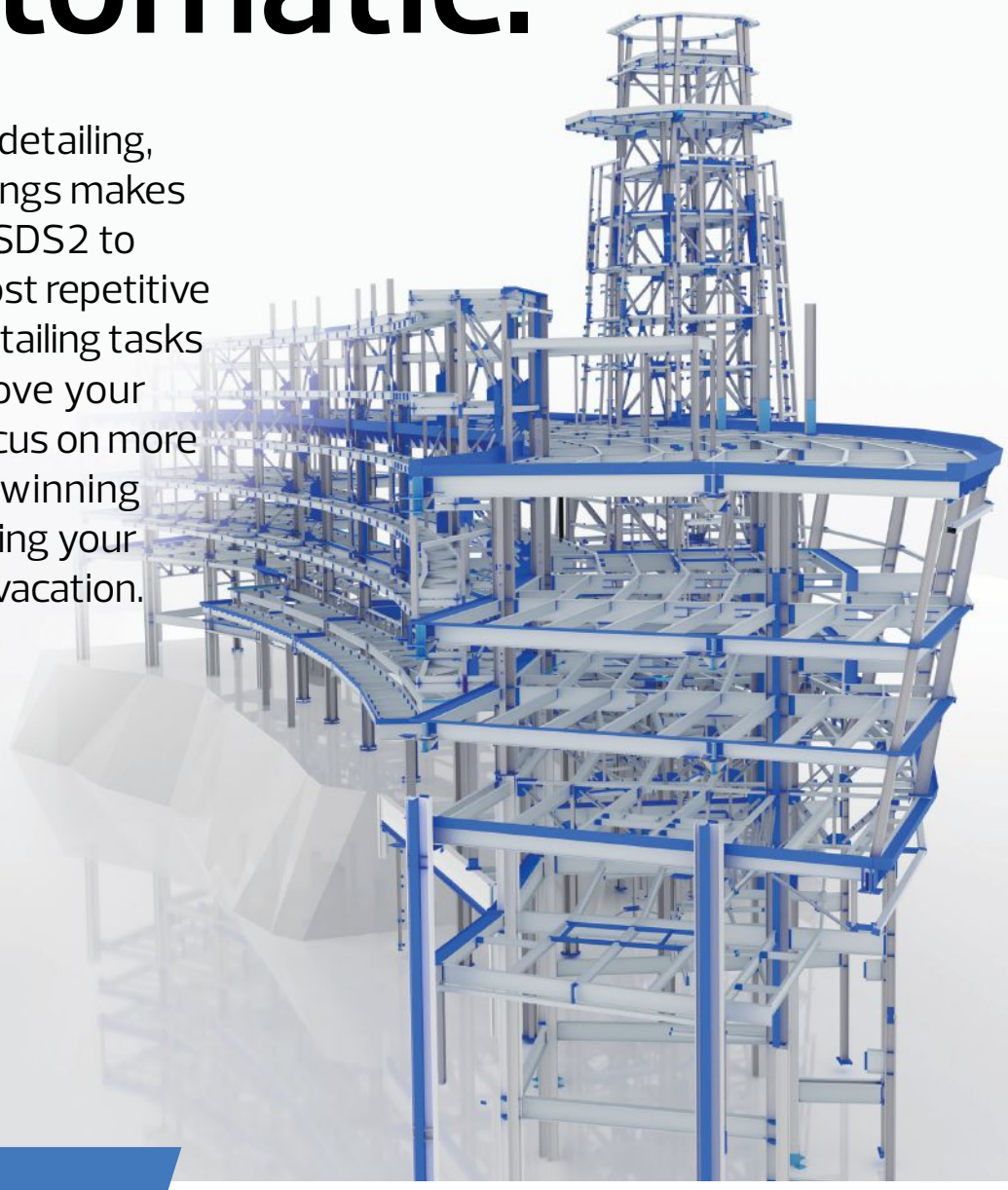

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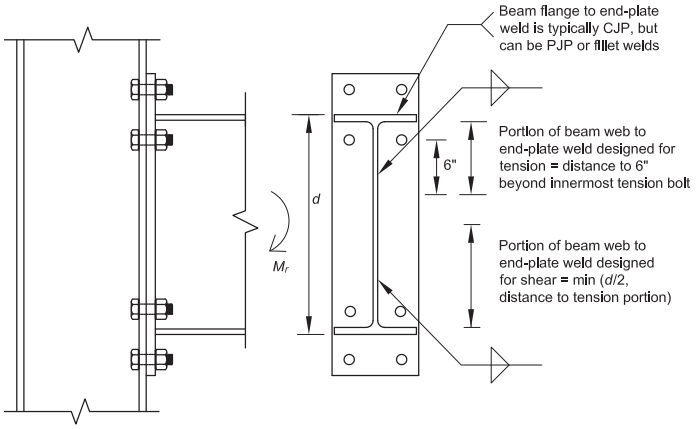
## End-Plate Moment Connection—Web Weld Design

**AISC Design Guide 39: *End-Plate Moment Connections* states, "The beam web to end-plate welds are separately checked for (1) tension rupture in the region around the tension bolt holes (extending 6 in. beyond the tension bolt holes), and (2) the rest of the web to end-plate weld is checked for shear." For the portion of the web in the region around the tension bolts, why is demand based on $M_u/d–t_f$ when the flange has already been designed for $M_u/d–t_f$. Isn't this double-counting the load and too conservative?**




Virginia Tech professor and Raymond G. & Madelyn Ann Curry fellow Matthew Eatherton stated in his presentation, Design of End-Plate Moment Connections Using Design Guide 39, that these checks are "not conservative; they are necessary because the stress distributions are so non-linear." (Download Design Guide 39 for free at **aisc.org/dg**).

The beam web-to-end-plate weld is divided and designed independently in two regions (see the figure provided). The focus here is on the tension region, which refers to the weld "in the vicinity" of the tension bolts adjacent to the web. The web tension region extends 6 in. beyond the last tension bolt. This weld is designed for the calculated flange force mentioned above, adjusted by the load distribution to the bolts directly adjacent to the web, but not less than 60% (LRFD) of the web tension strength in the web tension region. This procedure assumes that all the load in the bolts nearest the web is transferred through this portion of the weld, from the web to the end plate.

The "Design Guide attempts to summarize and simplify the design concepts and limit state checks into coherent design procedures. The design procedures for the 15 end-plate moment connection configurations presented herein have been validated by testing." The design procedure for the beam-to-end-plate weld is the same for both thick and thin end-plate conditions. The beam flange-to-end-plate weld is designed based on a calculated flange force derived from the required flexural moment, but it is never taken as less than 60% (LRFD) of the flange tension strength.

*Melissa Gradecki, SE, PE*

## 2016 vs. 2022 AESS Surface Preparation Requirements

**Table 10.1 (top) in the 2016 AISC *Code of Standard Practice* (ANSI/AISC 303) states "Surface preparation to SSPC-SP6" for all AESS categories. Does this mean we can use any one up to SP6 (for example, SP2, SP3, or SP6) or should we use SSPC-SP6 only?**

**TABLE 10.1**
**AESS Category Matrix**
2016

| Category | | AESS C | AESS 4 | AESS 3 | AESS 2 | AESS 1 | SSS |
|---|---|---|---|---|---|---|---|
| Id | Characteristics | Custom Elements | Showcase Elements | Feature Elements in close view | Feature Elements not in close view | Basic Elements | Standard Structural Steel |
| 1.1 | Surface preparation to SSPC-SP 6 | | • | • | • | • | |
| 1.2 | Sharp edges ground smooth | | • | • | • | • | |
| 1.3 | Continuous weld apprearance | | • | • | • | • | |
| 1.4 | Standard structural bolts | | • | • | • | • | |
| 1.5 | Weld spatters removed | | • | • | • | • | |

**TABLE 10.1**
**AESS Category Matrix**
2022

| ID | Characteristics | Reference Section | Category | | | |
|---|---|---|---|---|---|---|
| | | | AESS 4 Showcase Elements | AESS 3 Feature Elements in Close View | AESS 2 Feature Elements not in Close View | AESS 1 Basic Elements |
| 1.1 | Butt and plug weld reinforcement limited to 1/16 in. (2 mm) | 10.4.9 | | | • | • |
| 1.2 | Surface preparation to meet paint specification | 10.4.11 | • | • | • | • |
| 1.3 | Sharp edges eased | 10.4.7 | • | • | • | • |
| 1.4 | Continuous weld appearance | 10.4.8 | • | • | • | • |
| 1.5 | Consistent bolt appearance | 10.4.1(g) | • | • | • | • |
| 1.6 | Weld spatters removed | 10.4.8 | • | • | • | • |

While the question asked specifically mentions the 2016 *Code*, these requirements have changed in the 2022 *Code* (download for free at **aisc.org/specifications**).

For the 2016 *Code* the intention of "Surface preparation to SSPC-SP6" in Table 10.1 is to indicate that for AESS Categories 1 through 4, the surface preparation meets the requirements of SSPC-SP 6. A higher SSPC standard number does not necessarily mean a better finish; rather, they are different specifications to describe different finishing processes.

Section 10.4.11 states,

"AESS shall be prepared to meet the requirement of SSPC-SP 6. Prior to blast cleaning:

(a) Grease or oil, if any is present, shall be removed by solvent cleaning to meet the requirements of SSPC-SP 1.

(b) Weld spatter, slivers and similar surface discontinuities shall be removed.

(c) Sharp corners resulting from shearing, flame cutting or grinding shall be eased."

Table 10.1, however, includes another column for AESS C. AESS C provides some flexibility for "custom elements with characteristics described in the contract documents". The "AESS Answers" article from the September 2020 Steel Interchange (read at **modernsteel.com/archives**) discusses this category in relation to the default SSPC SP-6 surface preparation. The article states:

"Proper surface preparation is necessary for painting and coating systems to achieve their optimal performance and longevity. The default surface preparation for AESS 1 through 4, SSPC SP-6 Commercial Blast Cleaning, may create a surface that is too smooth or too rough for proper adhesion of certain systems. Design teams should verify the required surface preparation by reviewing the painting or coating manufacturer's specifications. If a surface preparation other than SSPC-SP 6 is needed, then design teams can use AESS C or clearly state within the contract documents the optimal surface preparation."

Table 10.1 and Section 10.4.11 were revised in the 2022 *Code* to instead indicate that "AESS surfaces shall be prepared to meet the requirements of the contract documents and the specified paint or coating system (see Section 3.1)" as opposed to defaulting to SSPC SP-6. This would avoid the need to use AESS C when a different surface preparation is required. The contract documents should specify which version of the *Code* is applicable for your project. If concerns exist regarding the surface preparation required, one should notify the specifier.

*Heather Gathman*

**Melissa Gradecki** (**gradecki@aisc.org**) is a senior engineer, innovation, and **Heather Gathman** (**gathman@aisc.org**) is a staff engineer, both in AISC's Steel Solutions Center.

## steel quiz

This month's steel quiz is all about the newly released AISC *Seismic Design Manual*, 4th Edition. Get your copy and download the digital edition at **aisc.org/publications**.

1 **True or False:** The AISC *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341-22, download at **aisc.org/publications**) requires columns that are shared between intersecting seismic force-resisting frames use a required axial force considering simultaneous inelasticity from all intersecting frames.

2 **True or False:** There are different member ductility requirements depending on the type of seismic force-resisting system the member is used in.

3 **Select all that apply:** The shear stresses in a diaphragm and the distribution of the lateral load to the vertical frame is complex and difficult to predict due to which of the following reasons?
- **a.** A diaphragm is highly indeterminate.
- **b.** Portions of the structure providing lateral resistance are often neglected in structural analysis.
- **c.** Diaphragms can transfer lateral load from one frame to another as deformation compatibility between frames is enforced.
- **d.** The change in how forces are distributed once vertical frames or shear connections between diaphragms and beams becomes inelastic.
- **e.** Different geometric features causing complex shear stress patterns.
- **f.** Earthquake inertial forces may not be uniform.

4 **True or False:** The approximate second-order analysis amplifier to account for $P$-$\Delta$, $B_2$, can be determined from allowable drift limits.

5 **True or False:** A column splice in a special moment frame cannot be achieved using a partial joint penetration (PJP) weld.

6 **True or False:** In a buckling-restrained braced frame, the core achieves the same or greater strength in compression as it does in tension.

TURN TO PAGE 12 FOR ANSWERS

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Answers reference the newly published AISC *Seismic Design Manual*, 4th Edition (available at **aisc.org/publications**).

1 **True.** *Seismic Provisions* Section D1.4a requires columns that are shared between intersecting frames use a required axial force considering simultaneous inelasticity from all intersecting frames. Example 5.3.13 has been added and illustrates how to determine the required strength in a column that is shared between a special moment frame and an orthogonal special concentrically braced frame.

2 **True.** There are different member ductility requirements depending on the type of seismic force-resisting system (SFRS), since each SFRS is expected to behave with a certain level of ductility. Tables 1-3 through 1-7 help the designer verify if a selected member meets the requirements for moderately or highly ductile members. Table 1-3, which lists W-shapes that satisfy the ductility requirements, is now split into two tables, Table 1-3a for moderately ductile and Table 1-3b for highly ductile. For more information, see Section 1.5 entitled "Design Table Discussion."

3 **a.**, **b.**, **c.**, **d.**, **e.**, **f.** All of these reasons can contribute to the complexity of shear stresses in the diaphragm and the distribution of lateral load to the vertical frames. There is updated discussion of diaphragms in Part 8 regarding load path, challenges in analysis, and common assumptions along with guidance on diaphragm modeling.

4 **True.** Section 2.3 discusses analysis procedures and has been expanded in the fourth edition to include second-order analysis. One method of second-order analysis consists of using amplifiers per Appendix 8 in the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22). A method for using the drift limit to bound the second-order effect is summarized, permitting determination of second-order amplification prior to design and analysis. A new Table 2-1 provides values for the second-order amplifier, $B_2$, for use with the approximate second-order analysis procedure.

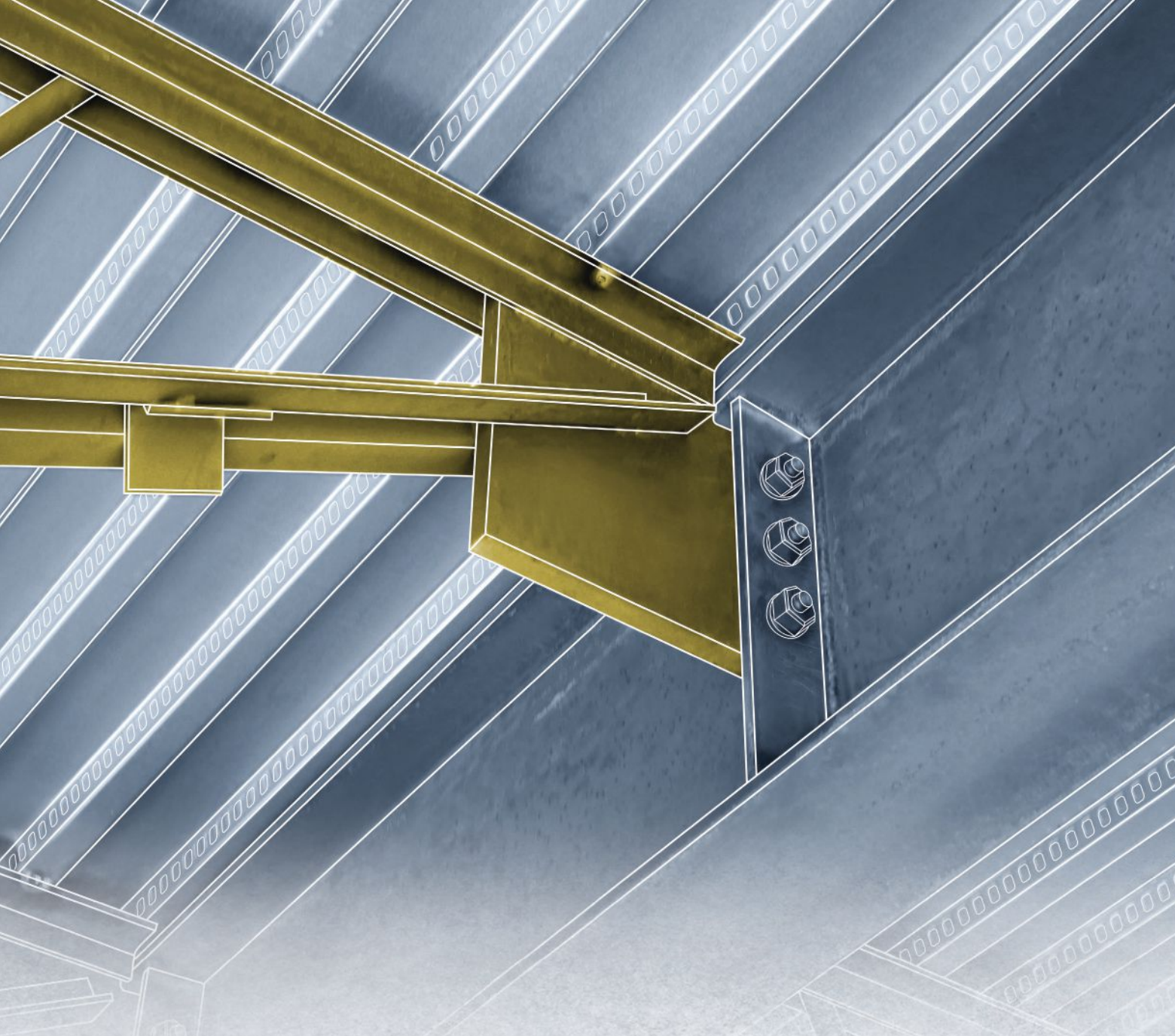
5 **False.** Part 4 addresses different types of moment frames and summarizes *Seismic Provisions* and other design considerations for these systems. PJP groove welds may be used for column splices in special moment frames (SMF) in accordance with *Seismic Provisions* Section E3.6g. Example 4.5.2 for a SMF column splice design has been updated to show a PJP weld option.

6 **True.** In a buckling-restrained brace frame, the buckling of the core is restrained to very small amplitudes and therefore, the core achieves the same or greater strength in compression as in tension. Head to Part 5 for more discussion on buckling-restrained braced frames (BRBF), which now includes new examples of multi-tiered BRBF.



**STEEL SOLUTIONS CENTER**

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**.



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# Scanner Solutions

BY THOMAS VACHON, DEREK JOHNSON, PE, AND CHRISTOPHER HEWITT, SE, PE

Placing MRI scanners on elevated steel floors adds several vibration and other design considerations. Here's how to address them.


An MRI scanner set to be installed in a medical building.

All photos courtesy of SGH

**IT'S NO SECRET** that steel framing's inherent flexibility makes it desirable in healthcare facility designs and their ever-evolving layout preferences.

One recent and growing layout trend is positioning specialized hospital equipment on elevated floors, which brings many unique challenges. MRI scanners are among the most challenging equipment types to install above a ground floor, and success requires collaboration between structural engineers, architects, shielding consultants, and equipment suppliers.

MRI scanners are highly sensitive and generate powerful magnetic fields that produce precise medical imaging. They typically weigh several tons, and the supporting floor design must provide proper structural support within the building while adhering to stringent standards for optimal MRI functionality and accommodating patient accessibility requirements. The supporting structure must be designed for the weight of the scanner and its supporting equipment, vibration requirements, shielding requirements, magnetic fields, acoustic considerations, floor trenching or elevation changes, penetrations, installation and maintenance access, and other manufacturer-specified design criteria.

## Vibration Evaluation

Vibration criteria typically used for office areas and patient rooms are constrained by the limits of human perception. However, MRI scanners and other specialized equipment demand stricter acceptance criteria due to their heightened sensitivity, making the floor system's vibration response a critical design consideration for MRI room floors. Vibrations exceeding the manufacturer's specified limitations will compromise the equipment's precision and image quality. While vibration control is commonly achieved by supporting the equipment on dedicated foundations at grade, successful

designs on elevated floors are possible with appropriate attention and care.

The vibrations of concern are those transmitted from external sources to the machine. A forcing vibration may arise from external transient sources, including hospital equipment operation, elevator equipment, human activity (such as walking at various speeds), HVAC system equipment, or related vibration transmitted through piping, ductwork, and mounts. Vibration from equipment and HVAC systems can be isolated and effectively mitigated at their mounts, but the floor system must mitigate the transient vibrations resulting from human activity. Enter Chapter 6 of AISC Design Guide 11: *Floor Vibration due to Human Activity*, Second Edition (download for free at **aisc.org/dg**), which provides general recommendations for designing floors supporting specialized equipment for human-induced walking vibration.

## Vibration Criteria

Floor design criteria may be required before the specific MRI scanner and its manufacturer are known. Section 6.1.4 of Design Guide 11 provides a general method for preliminary assessment, and Table 6-2 of Design Guide 11 suggests a generic vibration tolerance of 500 mips (micro inches per second) as measured using one-third octave bands. This general method is similar to that used for sensitive occupants, but with higher calibration factors for predicted velocity, reflecting the stringent vibration limits required by sensitive equipment.

Once the MRI scanner is selected, the manufacturer-provided technical data sheets for MRI scanners should include vibration velocity or acceleration tolerance limits as measured using either peak-to-peak, narrowband, or one-third octave. An MRI shield room floor evaluation can then be conducted for the selected equipment using the appropriate method from Section 6.1.5 of Design Guide 11.

There are several parameters required to design floor systems for MRI vibration criteria, and they are also required when re-evaluating or retrofitting existing floor structures. When evaluating an existing structure for a new MRI scanner installation, it may be beneficial to engage a vibration consultant to measure the existing floor vibrations and natural frequency for a more accurate assessment of the floor system.

**Forcing functions.** The typical structural evaluation of new or existing floors supporting MRI scanners focuses on transient loads from human activity. Design Guide 11 describes four walking speeds: very slow, slow, moderate, and fast. Designing a floor to limit vibration induced by fast walking speed near the MRI scanner may be difficult. However, it is reasonable to assume that fast walking speeds only apply in nearby hallways and that walking speeds in the MRI shield and control room are limited to slow and very slow during operation.

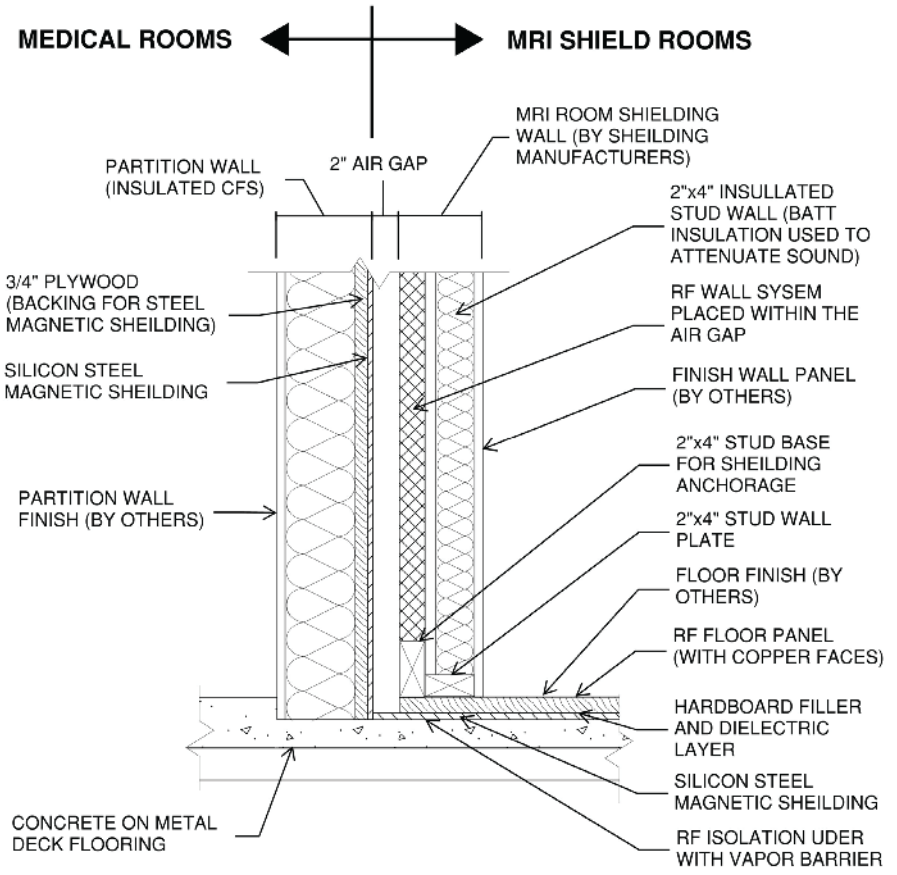



Fig. 1.

**Mass.** The natural frequency of the floor system is inversely proportional to its mass. Larger masses like an MRI scanner's weight can decrease vibration response. While dead loads are relatively easy to predict, the live load applicable to a frequency calculation is less clear and should not equate to the design live load. Table 3-1 in Design Guide 11 recommends superimposed live loads for vibration analysis for typical flooring occupancies. A live load between 5 and 10 lb per sq. ft is appropriate for a sparsely populated MRI shield room.

**Stiffness.** The applied load due to human walking frequencies is relatively small compared to the structure's stiffness, resulting in very small deflections. Therefore, most connections and boundaries will behave as fixed conditions for transient vibration analysis. Per Section 3 of Design Guide 11, the concrete modulus of elasticity for vibration can be taken as 1.35 times the elastic modulus for concrete specified in ACI 318. The equations recommended in Design Guide 11 are calibrated based on this increased modulus.

**Natural frequency.** A floor system's mass and stiffness determine its natural frequency, which is crucial for evaluating the vibration response. For manual calculations, the natural frequency is defined in Chapter 6 of Design Guide 11 as the lower natural frequency resulting from the beam or girder rather than the combined effect considered in vibration evaluations for human comfort. The most economical design typically occurs when the beams and girders have comparable natural frequencies. However, using similar-sized framing may not be feasible for irregular bays or existing structures, and modeling per Chapter 7 of Design Guide 11 is advisable to take advantage of the combined mode shapes.

**Damping.** Damping is often expressed as a ratio of actual to critical viscous damping, and a floor system's predicted vibration response is typically inversely proportional to the damping ratio. Accurately defining modal damping is challenging without testing. Table 4-2 of Design Guide 11 provides guidance on typical critical damping values for various systems and occupancies, recommending 1% for the structural system, 1% for ceiling and ductwork, 1% for paper office fit-out (assumed to be comparable to medical space fit-outs), and 2% to 5% damping for spaces with full-height partitions (dependent on the number and location relative to the center of the bay).

In MRI shield rooms without interior partitions within the bay, a damping ratio of 2% to 3% is reasonable. However, a damping ratio of 5% or higher may be appropriate where full-height partitions are present within the bay. Engineering judgment based on project-specific room layouts should be used to determine the design damping ratio and whether it's reasonable to include the effect of full-height partitions.

**Mode shapes.** Designers can choose the procedure outlined in Chapter 6 of Design Guide 11 or develop a finite element model to obtain a floor system's mode shapes. The generic spectral velocity Equations 6-3a and 6-3b in Design Guide 11 represent the vibration excitation and response at the center of the bay for the first mode shape, assuming the MRI and the excitation source are at the center.

Since the unit and the excitation source will not both occupy the center of a bay, the response may be reduced by multiplying by the unit normalized mode shape of the equipment location, $\phi_E$, and walking excitation location, $\phi_W$, using the equations provided in Equation 6-2a and 6-2b of Design Guide 11. This procedure is only recommended for simple bays; otherwise, finite element analysis is advised.

**Shielding requirements.** MRI scanners require a shielding enclosure to isolate the equipment from radio frequency and magnetic field interference. Copper, stainless steel, or aluminum shielding materials are common, but other materials are possible and should be selected by a specialist. Shielding typically lines the ceilings, walls, and floors, increasing their thickness. Given the inconvenience of ramps in hospital settings, a recessed floor system may be required to achieve a consistent finished floor elevation with the thicker subfloor shielding assembly. The additional weight of the shield room walls and floors must also be considered in the design.

Figure 1 shows an example detail of a modern wall and floor shielding for an MRI shield room. The weight of the shielding in

this example increases the wall weight and must be accounted for. This wall assembly is similar and more compact than older shielding wall assemblies (See Figure 2).

**Installation considerations.** MRI scanners typically cannot be disassembled and are shipped and installed as a single unit. Because of their considerable cost, they will likely be installed after the building is enclosed. Their service life is about 15 years, so designers should consider a viable method of installing a replacement after the building is enclosed. That method could involve evaluating the floor system to support the weight of the equipment along the installation path and ensuring adequate space to create an opening in the shield room large enough to install the equipment.

## Other Special Considerations

Manufacturer-provided technical data sheets for MRI scanners outline design criteria to ensure reliable equipment performance. One important parameter is the limit imposed on surrounding ferromagnetic objects, such as steel beams and rebar. These criteria are intended to minimize interference with the MRI scanner's magnetic field. Manufacturers often specify minimum distances between structural elements and the MRI scanner's isocenter, which can include the minimum depth and maximum density of concrete reinforcement below the finished floor, the minimum distance to steel beams within the isocenter's footprint, and the distance of steel beams from the isocenter. (Figure 3).

Restrictions on steel framing locations can negatively impact floor system performance, necessitating creative solutions such as using nonferrous low-carbon stainless steel alloys or replacing steel reinforcement in concrete with fiber-reinforced polymer (FRP) or carbon fibers. Limitations in steel density at the slab level (Z2) can also influence the decision between formed concrete floors and concrete on metal deck.

Depending on the scanner type and manufacturer, further considerations might involve designing anchorage for the patient table and scanner's floor pads, accounting for prescribed horizontal and uplift forces, and providing steel support for ceiling-mounted equipment such as overhead monitors or lights. Electrical and MEP routing might require trenching in the elevated slab, which could impact the floor system's fire rating or require slab and beam penetrations.

Careful consideration of all topics discussed will achieve effective installation of MRI equipment on elevated steel floors. ■

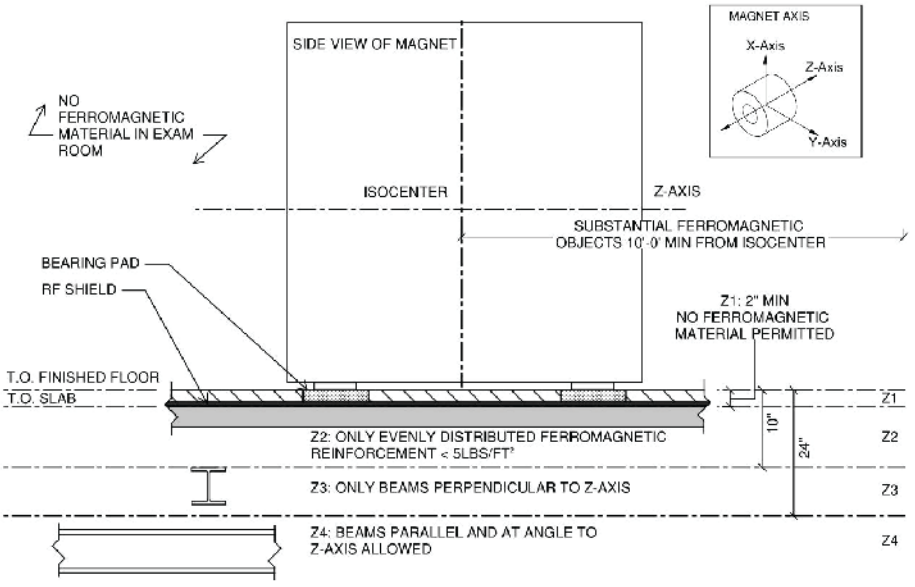



Fig. 3. Requirements for ferromagnetic material square area of 10 ft ×10 ft around magnet isocenter.


Fig. 2.

**Thomas Vachon** (**tchvachon@sgh.com**) is a project consultant, **Derek Johnson** (**dmjohnson@sgh.com**) is a consulting engineer, and **Christopher Hewitt** (**cmhewitt@sgh.com**) is an associate principal, all at Simpson Gumpertz & Heger.

# A Grip on Galvanizing

INTERVIEW BY GEOFF WEISENBERGER

A recent project has made University of Kansas professor Caroline Bennett a well-known voice on the behavior of hot-dip galvanized steel.

**THE RESEARCH PROJECT** that earned Caroline Bennett a 2024 AISC Special Achievement Award relied on a device she likened to a "really big crockpot."

Bennett, the Charles E. and Mary Jane Spahr professor at University of Kansas School of Engineering, recently studied steel member cracking issues during galvanizing. The project sought to test several steel specimens to failure while submerged in zinc, and conducting the research in an on-campus lab meant building a small-scale galvanizing facility. With some galvanizers' help, Bennett's research team built a small galvanizing setup for conducting tests, including an electric crucible furnace that resembles a crockpot.

Bennett has participated in many research projects during her 19 years on Kansas' faculty, and this one is among her most notable. She earned the special achievement award for advancing knowledge about the behavior of hot-dip galvanized steel structures. She spoke with *Modern Steel* about her research, career path, and more.


Bennett (center) with AISC president Charles J. Carter (left) and AISC board chair Hugh McCaffrey.

**Where are you from and where did you grow up?**

I grew up in Cincinnati. A lot of my family is still back there. I went to high school there and stayed for college and graduate school at the University of Cincinnati. It's a great town and a great place to be from.

**What made you want to get into structural engineering?**

I didn't get into the field because of one specific amazing experience. It was a combination of many little things. Growing up, I explored all sorts of things I might want to do as an adult. I was super interested in history. I've always been interested in art.

Toward the end of high school, I got involved with a group called U.S. FIRST—now called FIRST Robotics Competition—that's basically a robot-building club where students get together and work with a company. My team worked with Procter & Gamble, which is headquartered in Cincinnati. It was awesome. Every day after school for a year, we would go to Procter & Gamble's headquarters and work with their engineers on designing and building a robot for this competition. We took it to competition, regionally and nationally.

It was an incredible window into what different engineers were doing. Even though a lot of them were mechanical or chemical engineers, I liked the process of designing things. That led me to explore engineering. I started learning more about the different disciplines and thought civil was unique. Civil engineers, regardless of the path, are focused on building the world around them and helping other people. That really appealed to me. I started as a freshman in civil engineering and never really looked back.

Still, I kept an open mind when I was an undergrad. Cincinnati's undergrad engineering program is a five-year program and requires a co-op. I did a co-op for about five quarters with CSX Transportation in the design and construction group in Fort Wright, Ky. I loved it. I was doing surveying, learning about track layout, and doing a little bit of construction management. But during the quarter that I took structural analysis, I knew I was supposed to be a structural engineer, and that was my calling in civil engineering.

I figured I needed to do a different co-op, so I told CSX I wanted to be a structural

engineer and should find something else. They countered and said they had a lot of bridges and would put me in a role working with them. I did the co-op with their bridge group out of Jacksonville, Fla., for a couple of years, and that cemented things for me.

**How did that structural engineering passion lead you to become a professor?**

That decision came late in my undergraduate studies. I was exploring different career paths. I was considering an offer in private practice. I was also thinking about graduate school. I applied to some graduate schools and was weighing my options. Cincinnati had a unique fellowship program and offered me a position. It was called the GAANN Fellowship, which is Graduate Assistance in Areas of National Need. It was a doctoral fellowship through the U.S. Department of Education and focused on preparing students as future faculty.

That was a great opportunity. I had gone through five years of an undergraduate program and had some wonderful professors. I thought that could be an awesome career. Those things came together right at the same time. I signed up for a fast-track PhD program going from undergraduate studies to the doctoral program. At that point, I decided academia would be my career path.

**Have you been at Kansas the whole time since earning your PhD?**

I have. I started at KU in 2006 and have made my whole career here. It's a fantastic university. It has an exceptional balance of talented faculty, great resources, and great facilities. You feel like you can really build a career and be successful. It's a terrific place with wonderful students.

**I always like to ask professors this: What was your first day in front of a lecture hall like?**

Oh, I was terrified. It's hard to even remember how terrified I was during the first few courses I taught. Now, teaching is something that I get such joy from, and I got over that hump quickly. But that first year was intimidating. There is much to figure out with your style and the right way to interact with people so you don't become a doormat or a super rigid person. It takes time to figure out who you are as a teacher. But I figured it out, and when I did, I fell in love with teaching.

**What got you onto that track to specializing in hot-dip galvanizing?**

I have always been interested in materials-level work. This hot-dip galvanizing project came to fruition from a request for proposals that the National Cooperative Highway Research Program advertised. They were looking for a solution to cracking issues that occurred during galvanizing. I threw myself into it. I had the opportunity to work with an amazing team of people, and that was extraordinarily fun.

I was familiar with several aspects of cracking issues during galvanizing, but with others, I was learning on the job. My collaborators and I dug into the topic and worked with experts who have been embedded in different areas of the problem for a long time to bring it together.

We put together an interesting plan to attack this problem. (AISC senior director of engineering) Tom Schlafly refers to this project as a bold adventure, and that's a good set of words for it. It really was a bold plan. We tested hundreds of tension specimens to failure while they were submerged in liquid zinc. There are many logistical things to work through around thermodynamics and safety when taking on a project like that. It paid off and was the most interesting data set that I've ever worked with in my career.

**Was a local galvanizer involved in the project?**

We had support from some galvanizers across the Midwest, which was terrific. They helped us think through some details. They helped us get the right materials for flexing and different pieces of equipment.

We built a galvanizing facility in the structural testing lab. We purchased an electric crucible furnace and installed it in the lab. It was about 3 ft tall and 3 ft in diameter. It's not huge—it's like this really big crockpot. Once you turn it on, you leave it on. It takes a little while to get everything melted down and ready to go. We have this big lid on it, and every time we do a test, we crane the lid off, crane a test fixture over the electric crucible furnace, lower it down, and pull the specimen to failure.

I had students working on this project. It was an active galvanizing facility, so there were a lot of safety considerations and training associated with that. The melting point of zinc is around 820 °F to 830 °F, and the crucible stays around 835 °F. It was a super interesting process. We had some nice support from Valmont Industries and AZZ Galvanizing. The crucible furnace is an impressive piece of equipment.

**What research projects are you working on now?**

I'm leading a couple of projects for the Federal Highway Administration. One is focused on constraint-induced fracture bridges and developing guidance for how to retrofit structures and how to provide better guidance to engineers for avoiding that. Another project is focused on improving continuing education for practicing bridge engineers, looking at gaps in continuing education and higher education within the field of bridge engineering, and suggesting some ways to bridge those gaps.

**What's living in Lawrence like and what do people not know about it?**

Lawrence is a total gem. I think few college towns rise to its level. It's special. It's only 45 minutes from Kansas City, so you have everything associated with a mid-size city nearby. But Lawrence really feels like a college town. It's eclectic. It's diverse. It's fun. There are a lot of activities around arts and music, so it's just a great place to live, build a career, and raise a family. ■

*This interview was excerpted from my conversation with Caroline. To hear more from her, listen to the February Field Notes podcast at* ***modernsteel.com/podcasts****, Apple Podcasts, or Spotify.*

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

# Embrace the Cactus

BY KATE ZABRISKIE

Make difficult conversations with coworkers feel easier with this step-by-step guide.

**TENSE WORKPLACE CONVERSATIONS** about uncomfortable or difficult topics are inevitable in most people's professional lives, no matter their efforts to prevent them. A person only has so much control over their work environment and might end up in binds like these:

- "I don't like confrontation, but I'm tired of his abuse. He signed me up for another committee without asking."
- "I know I need to say something about her taking credit for my work, but how to start?"
- "Another joy of adulting, I've got to have one of those thorny conversations. Not fun."

Avoiding them or putting them off only leads to bigger problems in the future. But using a defined framework can make tough conversations strengthen relationships, foster growth, and achieve better results. This step-by-step guide provides a roadmap for navigating challenging coworker dialogues with calmness, empathy, and assertiveness.

**Prepare yourself.** Before initiating a difficult conversation, take a moment to think about how you feel and why you need to have the conversation. What is the core issue you want to address? What are your goals and desired outcomes? Are you trying to affect a behavioral change, or do you simply want to be right? If your motive is being right, it's wise to pause and reconsider the desired result before starting a dialogue.

A well-formed goal statement is a good way to outline your intentions and keep your actions in check. For example: "I want to discuss the project schedule change that happened without my input. My goal is to be included in the future and find a solution that works for everyone now. I'm not placing blame."

**Set the stage.** Timing matters. Schedule a suitable time and location for the conversation. The goal is to ensure you have privacy and few distractions. For instance, you could say, "I need to discuss something important regarding the project timeline. Can we talk in the conference room at 2:00 p.m. today?"

**Describe the situation objectively.** Once you and the other person are together, it's time to explain the situation objectively. Stick to the facts without judgment or blame, and use "I" statements to express your perspective. Those "I" statements often reduce defensiveness and create an environment of mutual understanding.

- Begin with "I feel" to take ownership of your emotions.
- Describe the behavior or situation objectively and without judgment.
- Explain the reason behind your feeling.

The description might look like this: "I feel frustrated that the deadline was moved again without consulting me. I'm now task-saturated and unable to get my work project work and other work done by the new milestone. I understand there may be valid reasons for the shifting timeline, and I would appreciate being included in decisions moving forward. This isn't the first time I've been left out of discussions. I would also like to see how we might adjust the current schedule."

**Allow the other person to respond.** After you've shared your perspective, listen actively and allow the other person to respond without interrupting. Additionally, ask clarifying questions to ensure you understand their point of view and validate the other person's emotions and experiences. You might say, "I understand speed was the goal. Can you tell me how I might be included in scheduling decisions in the future?"

**Identify common ground.** As the conversation progresses, look for areas where you agree or share similar goals. Validating each other's perspectives and emotions can help build trust and create a foundation for finding a mutually acceptable solution. For example: "It seems we both want to deliver a high-quality project, even if we have different views on the timeline and how it gets adjusted."

**Propose solutions.** Next, collaborate and be willing to compromise while still standing firm on your core needs and boundaries. You might suggest, "What if we extend the deadline by two weeks? That way, we can ensure the project is completed without cutting corners."

**Summarize and confirm next steps.** As the conversation ends, summarize the agreed-upon solution and action items. Express appreciation for the open discussion and the other person's willingness to work through the issue constructively. For example, you could say, "To recap, we'll extend the deadline to allow more time, and you'll provide an additional team member to assist me. Thank you for working through this constructively and for committing to including me to the extent possible when making future scheduling changes."

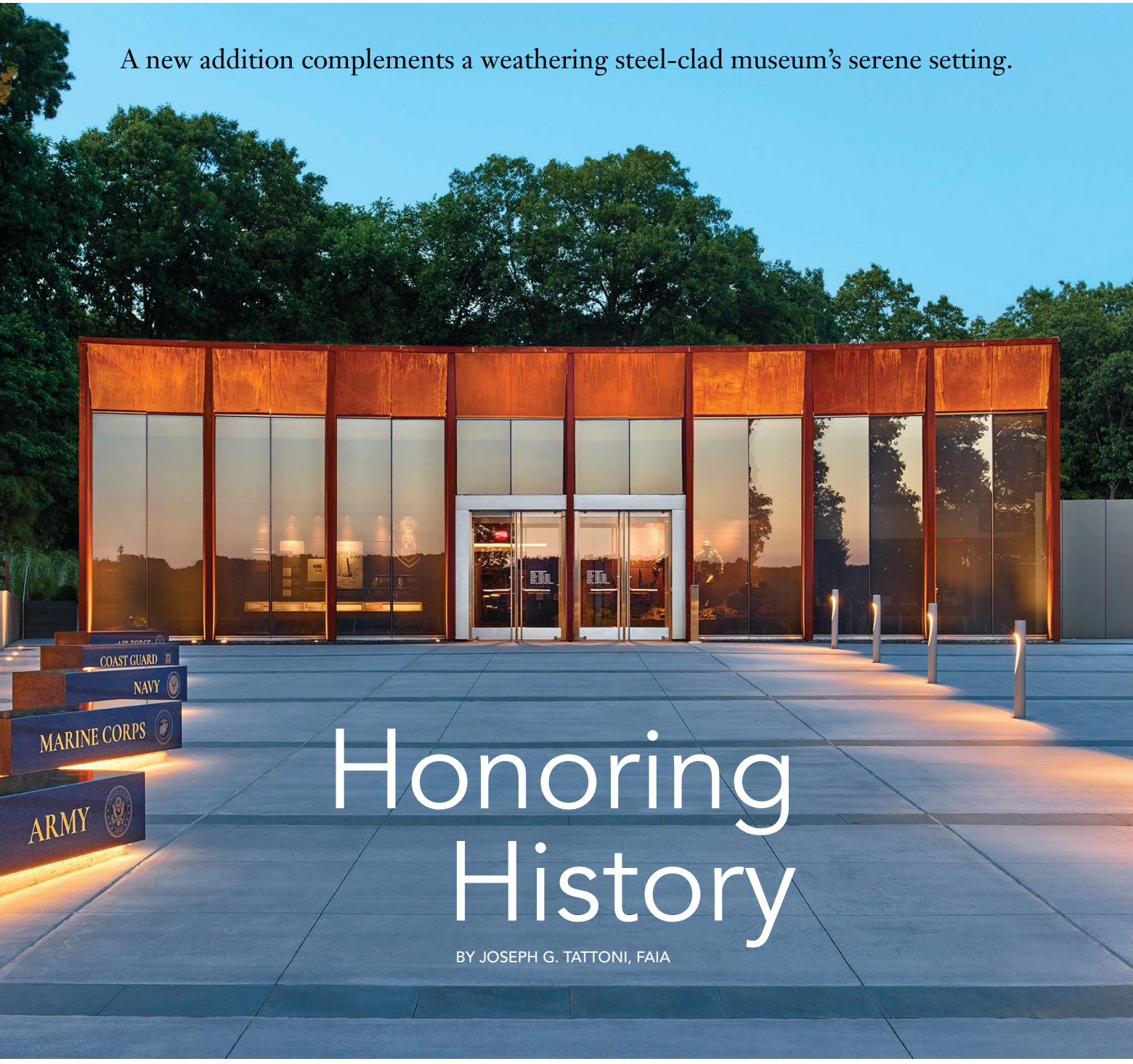
**Follow up.** It's essential to implement the agreed-upon solution and check in regularly to provide feedback on what's working or if any adjustments are needed. You might follow up by saying, "Now that we've had a week with the new plan, how do you think it's going so far? Is there anything we should tweak or address?"

Difficult conversations may never be easy, but with practice and a commitment

to effective communication, they can become opportunities for growth, understanding, and stronger connections with coworkers.

**Kate Zabriskie** is the president of Business Training Works, Inc., a Maryland-based talent development firm. She and her team provide onsite, virtual, and online soft-skills training courses and workshops to clients in the United States and internationally. For more information, visit **www.businesstrainingworks.com**.

A new addition complements a weathering steel-clad museum's serene setting.




# Honoring History

BY JOSEPH G. TATTONI, FAIA

**THE PURPLE HEART MEDAL,** the nation's oldest military award, honors those who have been wounded or injured in combat. An addition to the museum that commemorates its recipients should be no ordinary building, and the ikon.5 architects design team strived to create a compelling and respectful space to honor these heroes.

The National Purple Heart Hall of Honor, opened in 2021, is a tribute to Purple Heart recipients' valor and sacrifice. It's built on the slope of Temple Hill in New Windsor, N.Y., a historic cantonment site where Gen. George Washington established the Badge of Merit—the precursor to the Purple Heart—for valorous efforts during the American Revolution. The addition was conceived as a modern temple integrated into the rustic landscape.

Hall of Honor owner New York State Office of Parks, Recreation and Historic Preservation—along with the Museum and veteran representatives from each war since World War II—desired an addition that would appropriately express, with honor and dignity, the sacrifices that service women and men have made to preserve liberty for their fellow citizens. The 12,000-sq.-ft addition advances the mission of the Hall of Honor by carrying these stories of sacrifice forward through public awareness and education.



above: The weathering steel exterior is inspired by 18th-century log cabins nearby.

left: The museum's steel frame was designed with future adaptability in mind.

below: All exhibit and gathering spaces focus visitor views out to the landscape.


## Veteran Viewpoints

One of the main considerations for the design team wasn't created by site conditions or spacing. Rather, it came from initial commentary from veterans on the design committee about the team's initial understated, almost hidden conceptual design approach that paid deference to the historic cantonment site. They wanted a grander expression that would convey the gravity of the sacrifice and valor of Purple Heart recipients.

The team knew that an overtly monumental design would perhaps be inappropriate in the delicate historic park of Washington's New York cantonment. After working through various options and discussions with the owner and veteran representatives, the team developed a weathering steel portal that is monumental in form but understated in materiality. In this way, the project appropriately expresses its mission of recognition on a sensitive site.

## Complementary Texture

The weathering steel and bead-blasted stainless steel exterior is inspired by the 18th-century rough-hewn log cabins set in the wooded hillside of the cantonment. They provide color and texture that complement the deep russet colors of the Revolutionary War-era cedar cabins, blending in but still distinguished from Temple

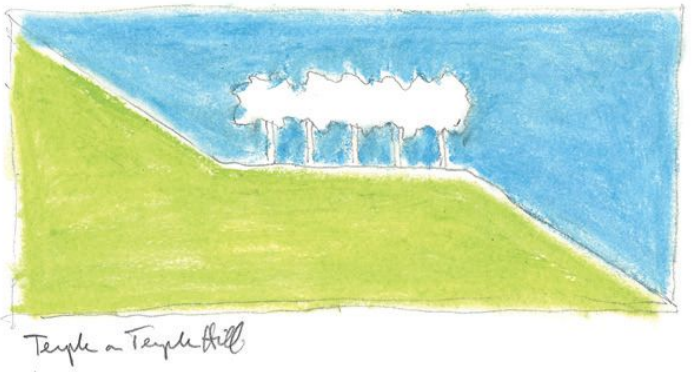
Hill's bucolic scenery. The weathering steel's earthy tone and texture is paired with the grand arcuated openings of its form to create a majestic and appropriately scaled response to its program and site.

A welcoming promenade negotiates a steeply sloping site from parking and is lined with five granite benches dedicated to each branch of military service. The promenade also provides a dignified accessible route to the facility.

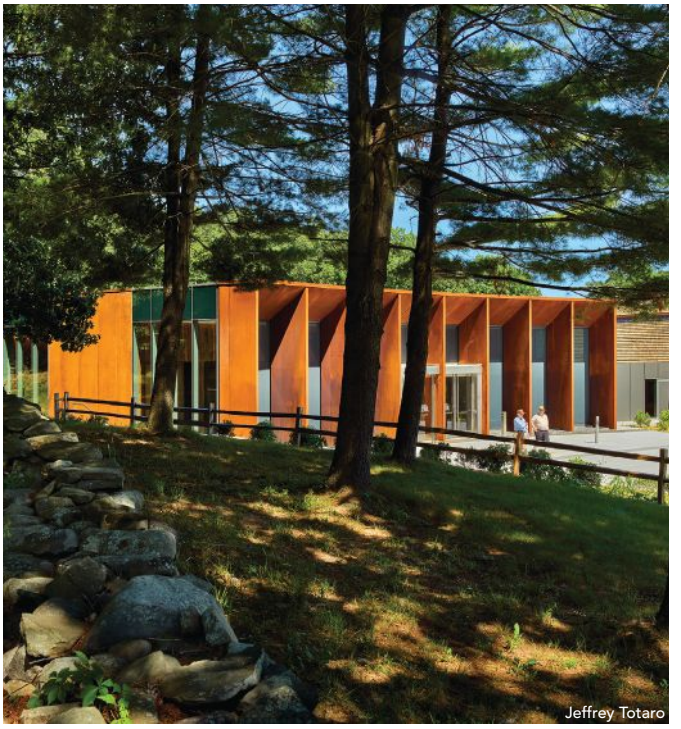
Choosing structural steel framing, wide-flange beams and columns, and steel tubes allowed the structure to be erected in a delicate historic park site with minimal disturbance to the ground footprint. The entire steel framework was erected from the front parking lot, enabling the design team to retain much of the adjacent landscape and only work within the already disturbed footprint. Additionally, the steel frame made the long spans for the exhibition gallery possible and gave the museum maximum flexibility for changing exhibits over time.

The rolled shapes and angles are ASTM A588 Grade 50 ksi, and the square HSS are ASTM A847 Grade 50 ksi. Typical beams were 24 in. to 30 in. deep, and typical columns were 12 in. deep. All steel tubes were square HSS4×4.

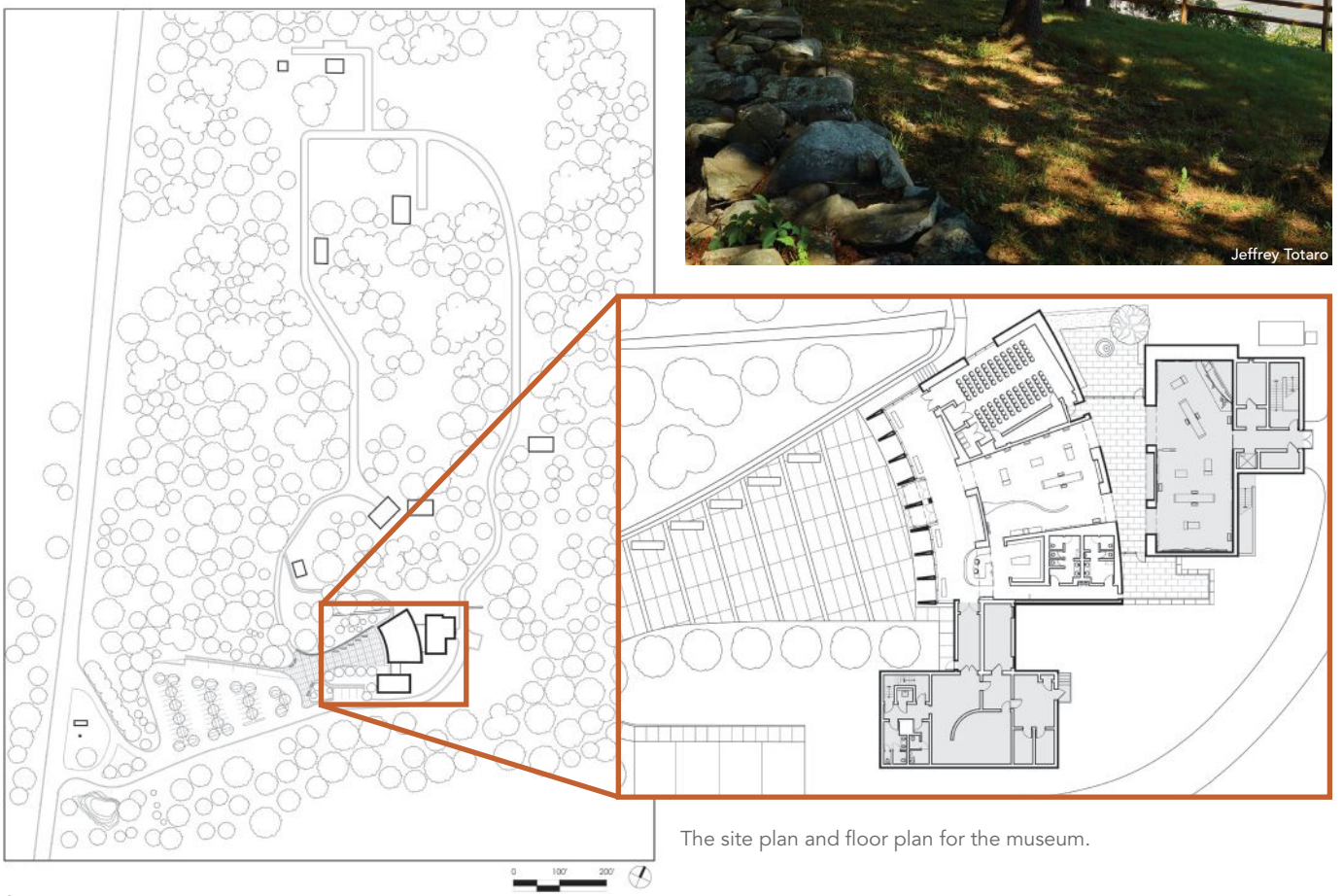
Expression, performance, and durability drove the selection of exterior materials and structural steel framing. The exterior façade, made of weathering steel and sandblasted stainless steel plates, accommodated all the project needs. The ¼-in. weathering steel plates were erected as a ventilated rain screen, which provides a high-performance exterior envelope that reduces heat gain on the building, thereby curtailing demands for energy consumption. Weathering and stainless steel require little or no maintenance over the life of the building and create a highly durable and low-maintenance facility. All told, the addition was designed and constructed in 18 months.



above: The original vision for a temple on the slope of Temple Hill.

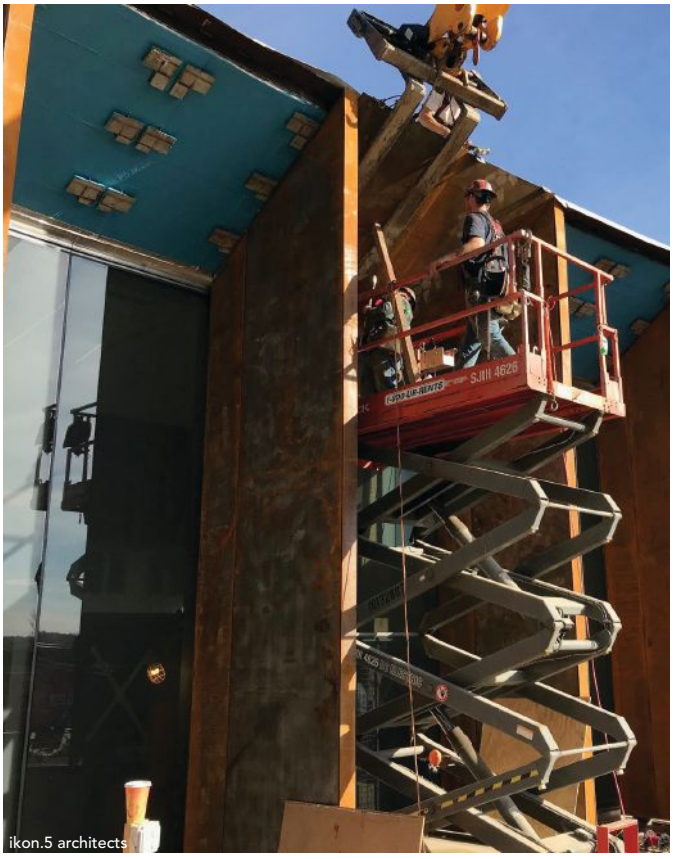



right: Weathering steel complements the wooded environment.



The site plan and floor plan for the museum.


The stainless steel Z-clips awaiting weathering steel panels.




The weathering steel panels are attached to square HSS.


above: The Z-clips are welded to the back of the panels and framing.


above: The panels are ASTM A588 weathering steel.

below: Another part of the Hall of Honor looks out onto a reflection terrace.


below: The Hall of Honor exhibition gallery.

## Adapting in the Field

The ASTM A588 weathering steel plates are supported by the structural steel frame and heavy-gauge cold-formed framing. The plates attach to the supporting framing with Z-shaped stainless steel clips welded to the back of each plate.

The team learned a critical lesson during installation of the heavy, monolithic weathering steel cladding: façade connections should be designed with sufficient adjustability to account for construction tolerances. The original clip detail could not provide enough adjustability to maintain the desired finish tolerances, so misaligned panels had to be taken down, reworked in the field, and then re-erected.

Even though these field adjustments delayed the construction schedule a few weeks, the project team still maintained the original schedule. Because the interior gallery spaces' open design is inherently constructable, those areas were completed faster than anticipated. Additionally, the exhibits themselves were largely manufactured off-site during construction, saving even more time.

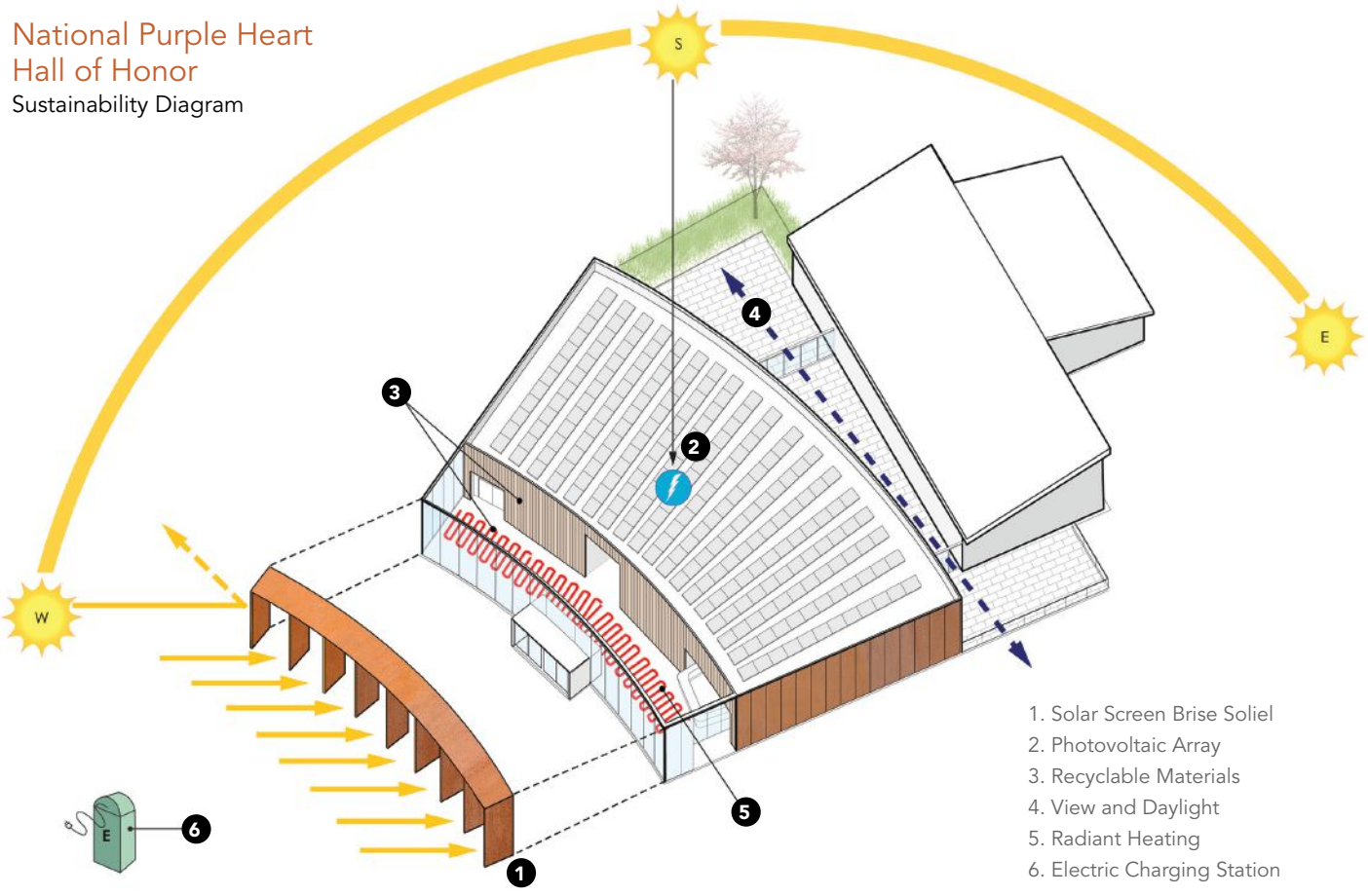
## Commemorating Courage

Internally, an enclosed court links the new addition to the existing structure. It houses the Purple Heart Roll of Honor, where veterans and their families can register medal recipients and where visitors can search for recipient names in the interactive Roll of Honor database. The federal government does not keep a database of Purple Heart recipients, making the Roll of Honor an ever-growing record of these nearly 2 million recipients and their stories of sacrifice that date to the American Revolution. Through presentations and interactive exhibits, the museum helps visitors—many of them youth—understand the value of service to others.

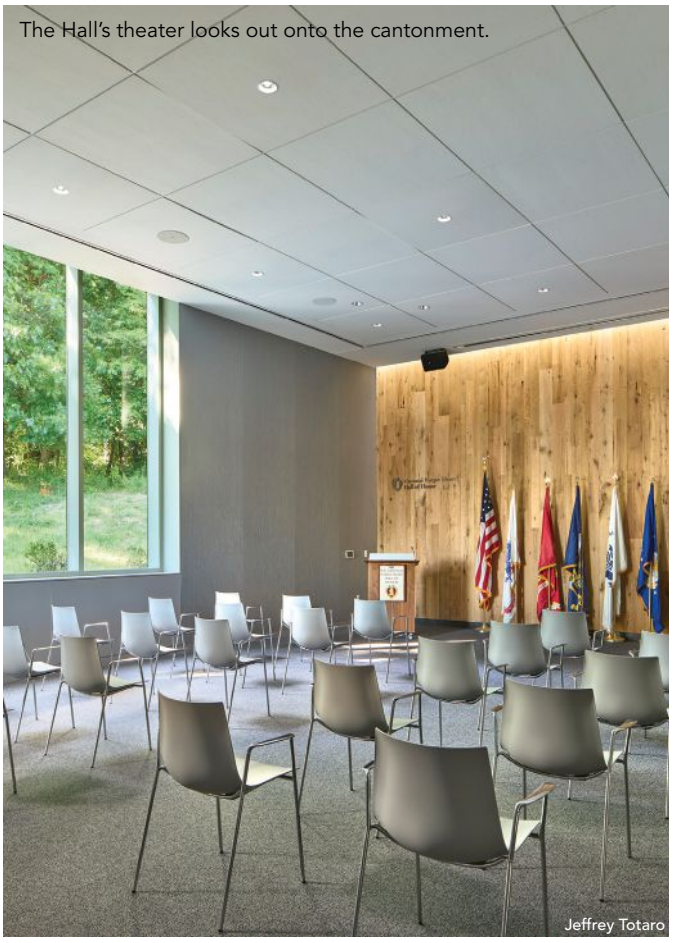
The Hall of Honor includes a welcome gallery, exhibit space, a program orientation theater, and a gift shop. Adjacent to the Roll of Honor is an exterior contemplative garden that houses an eternal flame for all Purple Heart recipients, and an outdoor reflection terrace that overlooks the nearby Catskill Mountains. Visual and physical connections to the historic and dramatic Catskill landscape provide moments of tranquility that counterbalance the somber and heroic messaging of the Museum. All exhibit and gathering spaces in the Hall of Honor focus visitor views out to the landscape to connect them with this historically important site.

## National Purple Heart Hall of Honor

Sustainability Diagram

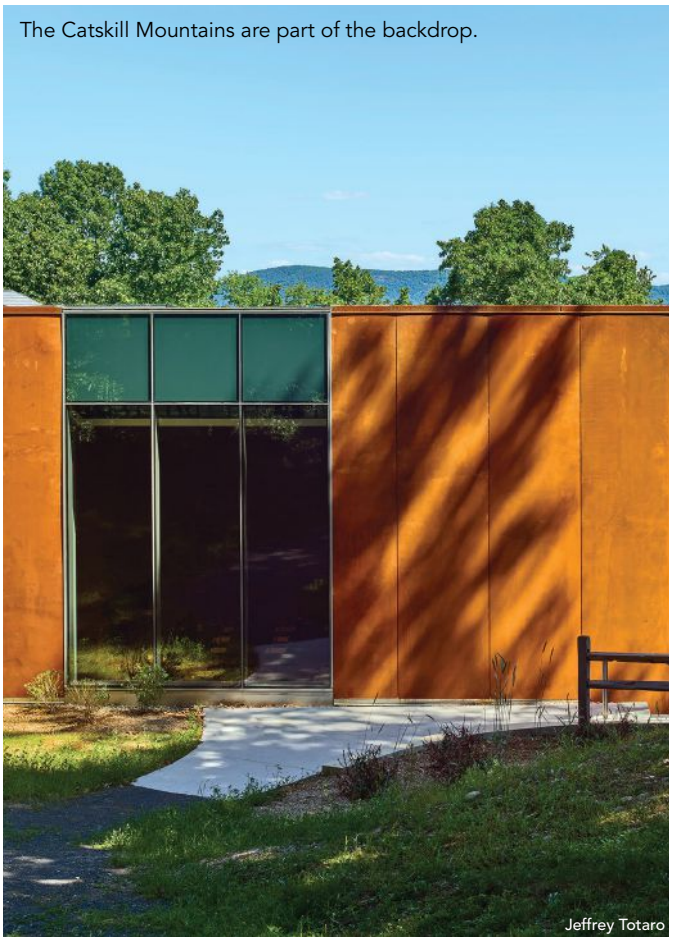



1. Solar Screen Brise Soliel
2. Photovoltaic Array
3. Recyclable Materials
4. View and Daylight
5. Radiant Heating
6. Electric Charging Station



The Hall's theater looks out onto the cantonment.

Jeffrey Totaro



The Catskill Mountains are part of the backdrop.

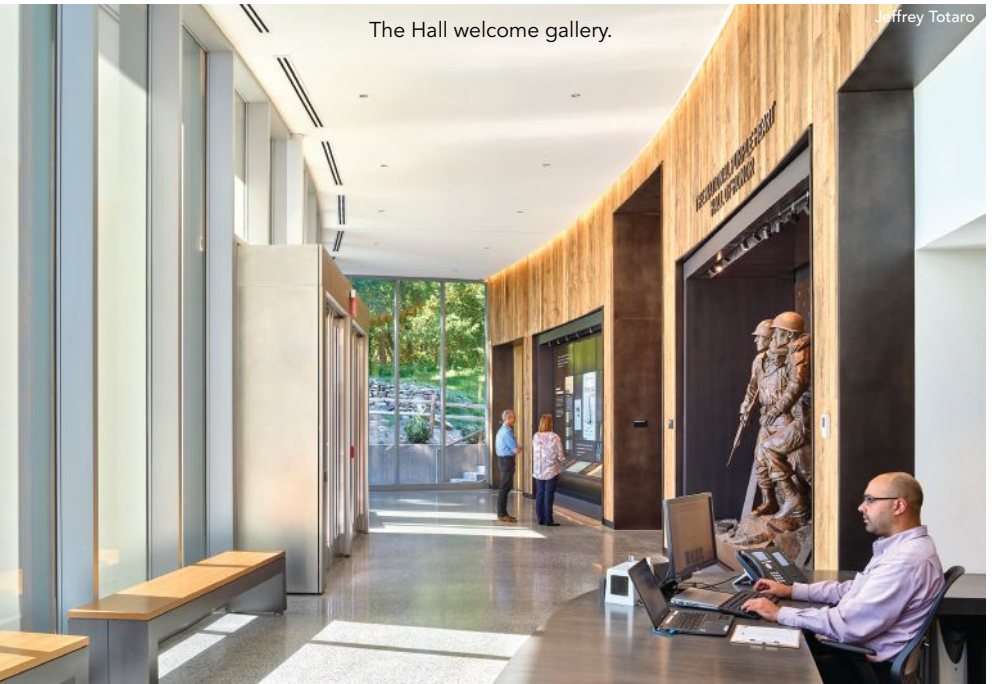
Jeffrey Totaro

ikon.5 architects

The steel framing before panel installation.

The weathering steel panels are ¼ in. thick.

Jeffrey Totaro



The Hall welcome gallery.

Jeffrey Totaro

Sustainable design elements are integrated within the building design to advance New York State Parks' mission to provide maximum public benefit through conservation of resources. The all-electric, high-performance facility creates supplemental on-site energy with a photovoltaic roof array. Radiant heating and cooling is embedded in the floor slab for comfort and effective environmental conditioning, while electric charging stations in the parking lot encourage electric car use. At the low point near the entrance to the park, collected storm water is channeled to a rain garden and bioswale. The rain garden is planted with native regional flora, and while it has a real functional purpose of retaining storm water, it also is a landscape gateway to the park.

Listening carefully and responding attentively to all stakeholder input is crucial to any job, especially one with such a sensitive and emotional history. The veterans on the design committee advocating for a monumental expression and experience and sharing insights and stories helped the design team understand and creatively express their ideas for a Hall of Honor on this site. The new Purple Heart Hall of Honor is a distinguished civic experience commensurate with the sacrifices of the Purple Heart recipients. ■

**Owner**
New York State Parks and Recreation

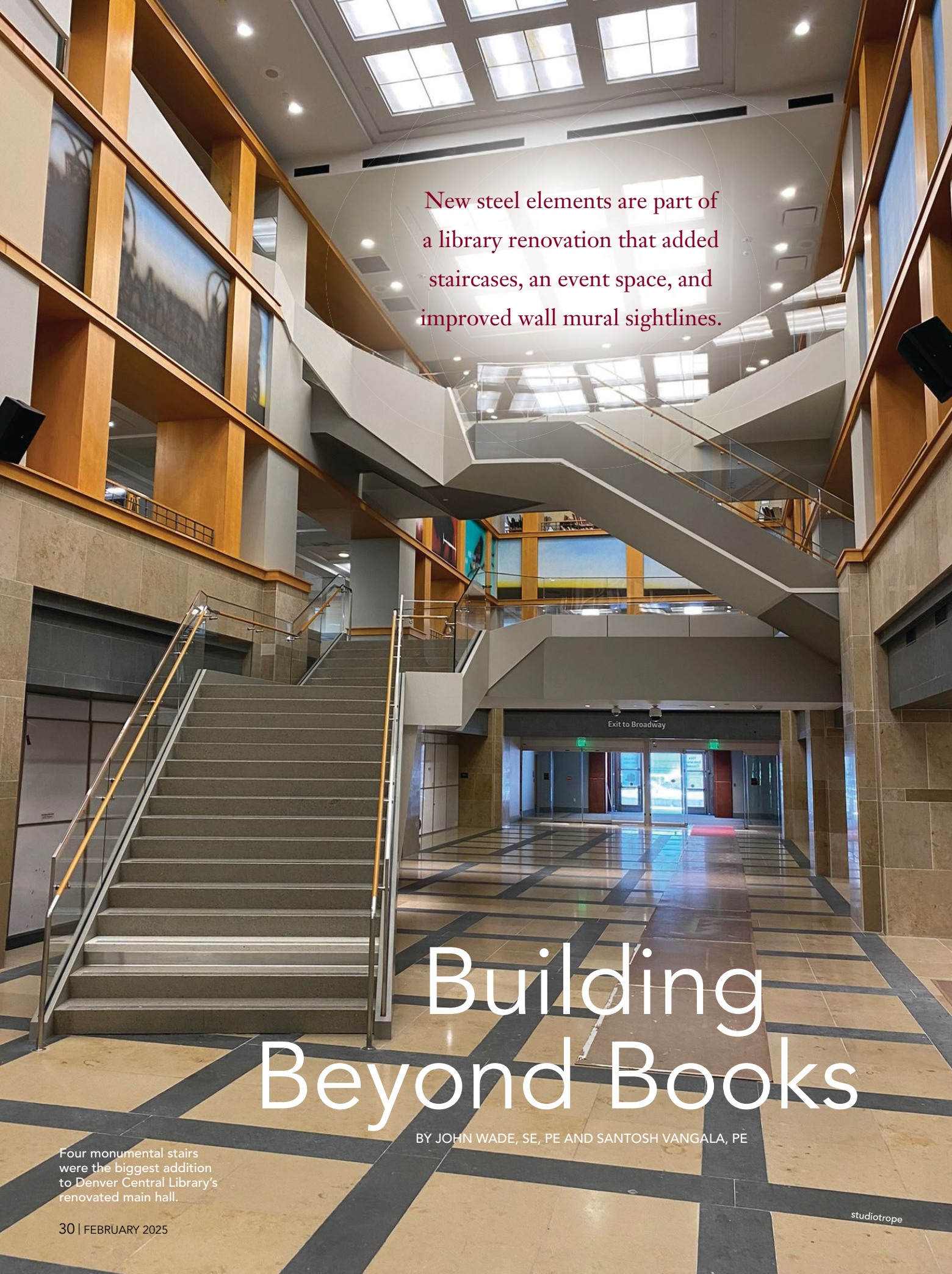
**Architect**
ikon.5 architects

**Structural Engineer**
LERA Consulting Structural Engineers

**General Contractor**
Kokolakis Contracting

**Steel Fabricator, Erector, and Detailer**
Orange County Ironworks, LLC

**Joseph G. Tattoni** (**jtattoni@ikon5architects.com**) is a design principal at ikon.5 architects.




New steel elements are part of a library renovation that added staircases, an event space, and improved wall mural sightlines.

# Building Beyond Books

BY JOHN WADE, SE, PE AND SANTOSH VANGALA, PE

Four monumental stairs were the biggest addition to Denver Central Library's renovated main hall.

studiotrope

The stair stringers and truss are square HSS. AECOM

**DENVER CENTRAL LIBRARY** was designed in the early 1960s to serve a burgeoning city, and underwent a major addition in the 1990s. Sixty years after opening, it's the main library for a larger and still-growing metropolis, but libraries' place in large cities have changed. To ensure it remains a community centerpiece for the next 60 years, the city decided to reimagine its use with upgrades that modernized the building, added a programming space to expand its functionality, and reconfigured the way that the public interacts with the main entrance hall.

The library, designed by architects Michael Graves and Burnham Hoyt, is a national historic landmark despite its relatively short lifespan. That status added structural challenges and parameters for the AECOM design team in charge of the renovations. Three major components in the project were remodeling existing bridges in the main hall, adding monumental staircases, and modifying the building frame to create an event space. Steel achieved all three.

The original main entrance hall, called Schlessman Hall, had several waffle slab bridges that were a bulky outlier in an otherwise open three-story space in the library. They did not allow for much interaction with the featured murals and other art in the hall.

The bridges were built structurally integral with the floor to either side of Schlessman Hall, meaning that removing the bridge span increased positive moment in the adjacent bays. Steel was selected for the replacement bridge for its ease of installation and because it best integrated with the new stair geometry.

Installing the new steel bridge required an analysis and retrofit of the existing waffle slab floor. The retrofit of the adjacent bays also provided a backspan for the stair stringers, which greatly increased the stiffness of the stairs, allowing very shallow members while also providing great vibration performance.

The renovation added four monumental stairs, two on each end of the triple-height main entrance hall. They seamlessly connecting the first, second, and third floors, and more importantly, are a signature statement. The stairs captivate visitors and elevate the entire space, accomplishing efficient function and enduring visual appeal.

Schlessman Hall displays murals by artist Edward Ruscha painted in 1996. Like the new bridge, the stairs provide better viewing distance and intimacy with the murals, which are on the walls between the second and third floors. The murals are too high above the ground floor to allow for good viewing and experiences from there, and the existing bridges across the main hall included low ceilings that isolated visitors from seeing the murals. The new grand stairs include a viewing platform with open views of the murals.

The first-floor stairs allowed for intermediate support of the stair run, which was incorporated with casework to fit the space. The floor of the existing Schlessman Hall was evaluated for the new point loads of the stair stringers and found to be inadequate, so steel reinforcing was designed to allow the stairs to bypass the first floor entirely.

The most challenging element of the project was the design of the stairs between the second and third floors because of the need for mural views. The new stairs' span is approximately 34 ft between support points, with discontinuities in the stringers for the intermediate landing. Since the goal was to make the system long and slender, HSS12×6 were picked to provide torsional stiffness and bi-directional strength.

HSS4×4 horizontal diagonals were used to form a truss between the stringers. This truss created a diaphragm across the entrance hall, ensuring lateral strength and stability of the system. A typical detail for truss web member connection eccentricity was included to allow for simpler fit-up and avoid overlapping K-connections. The rigidity of the horizontal truss allowed a flexible connection at the base of the stair, with a rigid connection at the top.

A new programming space was part of the renovation.


GH Phipps

Mural sightlines improved when bridges were removed.


AECOM

The top connection was designed to transfer biaxial shear and moment, resolve the chord forces of the truss diaphragm, connect to the backspan that greatly stiffened the stairs and reinforced the bridges, and resolve the eccentricity inherent in the atypical geometry of the stair.

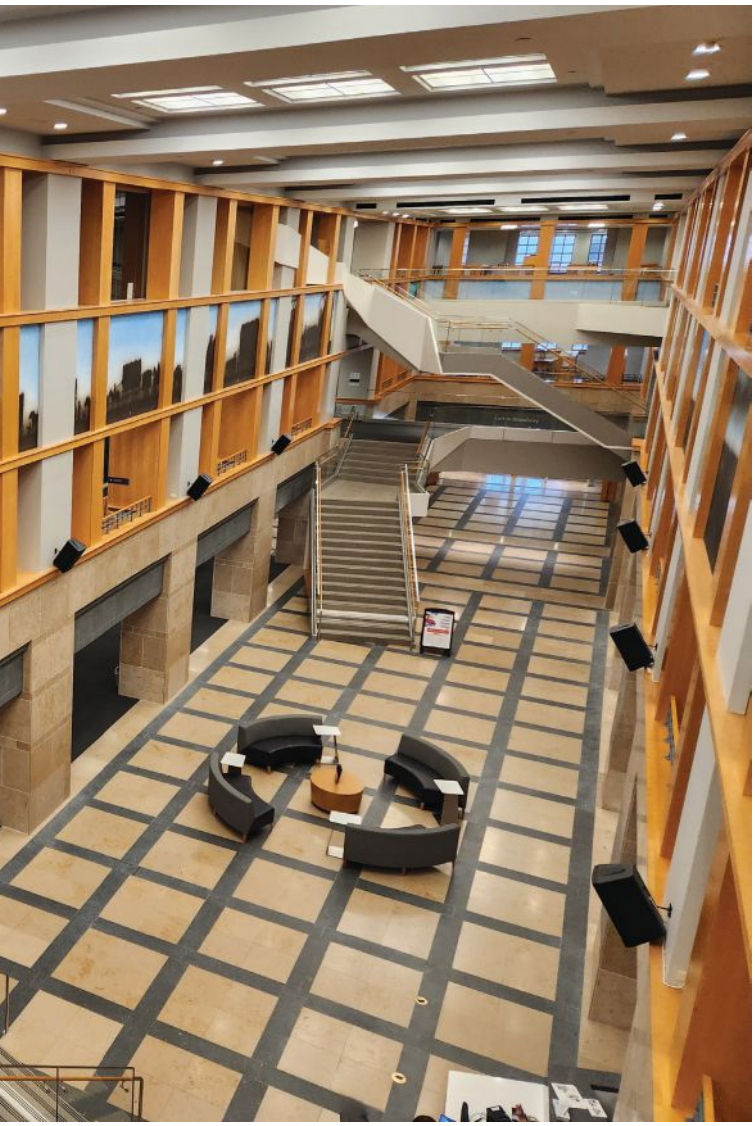
AISC Design Guide 11: *Vibrations of Steel-Framed Structural Systems Due to Human Activity*, Second Edition (download for free at **aisc.org/dg**) provided monumental stair recommendations for performance-based analysis. Along with a linear dynamic finite element analysis, those recommendations allowed the design team to push the envelope with the stair's structural depth. To test the stairs' performance for stiffness and vibration, their dynamic behavior was measured during construction after the primary structure was erected and rigidly connected. Widely available accelerometers on smartphones were used with commercial software to measure the wave form of vibration of the stairs.

A Fourier transform was performed on the wave form to develop a spectrogram, and the natural frequency of the stairs was measured. The frequency was compared to the natural frequency of the bare structure as calculated by a finite element analysis using a common commercial structural engineering software package, and the measured vibrations were found to be within 10% of those calculated by analysis. Although the accelerometers were not calibrated to measure accelerations accurately at this scale (which the Design Guide 11 parameters aim to limit), the measured accelerations were similar to those determined by analysis.

Although the library is in the municipal and cultural heart of Denver, its original configuration did not have an event space. The renovations changed that by adding a large programming space to host seminars, town halls, performances, cocktail parties, and other miscellaneous events. The library is in the same district as the Denver Art Museum, and a grand event space ensures it remains a primary feature of the already vibrant Denver downtown and government district.

The original frame did not have a natural spot for an event space, so creating one required the removal of existing columns on the first floor to provide a wide-open room. Extracting the columns required special attention to the existing load path and the stiffness of the new structural elements. Transfer girders were designed as six W24 sections spanning 60 ft, with transverse spreader beams to make the W24 sections deflect and flex together.

New corbels support the W24 transfer girders.



AECOM

The existing concrete columns were reinforced with a new concrete thickness of 8 in. all around, and doweled reinforcing was designed to create composite action between the old and new concrete. The column retrofit also included new concrete corbels to support the transfer girders. A jacking sequence was carefully coordinated with the construction engineers to ensure the column load was transferred to the new steel, columns were demolished, and the girders were cut loose. This design resulted in opportunities for brand new ceiling aesthetic and a wide-open floor for activities.

All told, the Denver Central Library reinvigoration took six years of planning, design, and construction. Countless historical preservationists, city officials, designers, construction managers, and contractors worked passionately to make this vision a reality. The renovated library reopened in November 2024 with sleek finishes, inspiring new spaces, and right-sized structural steel throughout, preparing the library to be a beating heart of the vibrant city for decades to come. ■

**Owner**
The City and County of Denver

**Architect**
studiotrope Design Collective

**General Contractor**
GH Phipps

**Structural Engineer**
AECOM

**Steel Fabricator**
RK Steel

**John Wade** (**john.wade1@aecom.com**) is a structural manager, and **Santosh Vangala** (**santosh.vangala@aecom.com**) is an associate structural engineer, both with AECOM.


NEED
STEEL
FOR
SPEE

# Meeting the Need for Speed

Project teams can design, fabricate, and erect steel frames 50% faster than in 2019 because of speed-related improvements at every step of the process.

**SPEED HAS ALWAYS BEEN** one of structural steel's advantages. In 2019, though, the industry shifted into another gear. AISC's Need for Speed Initiative committed the industry to increasing the speed of designing, fabricating, and erecting steel buildings and bridges by 50% by 2025.

That target date has arrived, and so has that 50% time reduction—thanks to research breakthroughs, innovative new products, product advancements, and other contributions from all corners of the AEC industry. Project teams have ample resources available that, when combined, can slash the time from conception to completion by 50%. We discussed the Need for Speed program in the January issue (you can see more detail at **aisc.org/needforspeed** and in the January issue archive at **modernsteel.com/archives**). In this issue, we're highlighting some of the amazing building successes, and next month we'll do the same with bridges.

Some breakthroughs have come from AISC-sponsored research projects. SpeedCore (Figure 1 on page 36) is a non-proprietary, revolutionary composite shear wall system that created 43% time savings in two projects compared to a traditional concrete core. An 850-ft-tall building in Seattle called Rainier Square used SpeedCore and topped out in 10 months, and an office building in San Jose, Calif., trimmed three months off construction time with it.

Shuriken (Figure 2), recently developed by Atlas Tube, allows erectors to field-bolt columns, trusses, and beams from one side. It is tack-welded to a metal plate in the shop, the plate is installed on hollow structural sections (HSS), SpeedCore, or other material, and the adjoining piece is field-bolted.

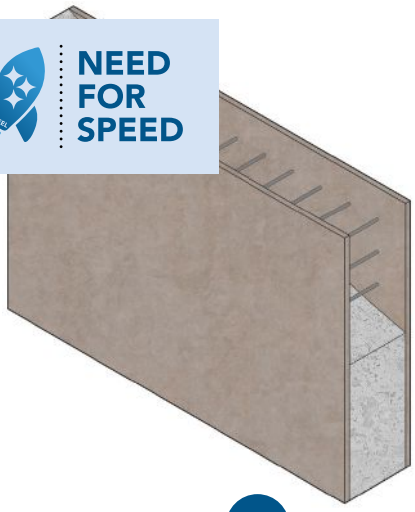
Drop-in connections (Figure 4) seat the girder or beam on the bottom of the top flange. Angles are shop-welded to the column or girder, and the girder or beam is coped on the bottom flange to allow for a simple drop-in during steel erection. The SnapLocX Connection (Figure 6) increases the erection speed of column splices in gravity columns. It uses snapping plates that are shop-bolted to the lower column in a connection designed to engage two plates that are shop-welded to the column above the splice. Bolts connect the lower snap plate to the lower segment of the column using a spring mechanism.

Research projects have focused on fabrication shop speed as well. Augmented reality (AR) and virtual reality (VR) devices that overlay design elements onto steel shapes in the shop (Figure 7) have helped increase fabrication speed with their error-reducing capabilities. The AR/VR program uses a fabrication document model to tell a fabricator which operations need to be done to a steel section. It also speeds up quality control by overlaying the drawing with the fabrication work. Read more about it in the "Augmented Approach" article in the March 2022 issue at **modernsteel.com/archives** and on page 53.

Lastly, floor fabrication and erection time can be cut by 30% to 50% with FastFloor (Figure 8), a shop-fabricated, panelized structural floor system designed as an alternative to concrete-on-metal deck systems. FastFloor commercial has wide-flange beams and a steel plate sub-floor and can be shipped in modules. FastFloor residential is for low- and mid-rise buildings and consists of metal deck sandwiched together to create a cellular shape or deep metal deck covered with non-combustible structural panels. Wide-flange beams support the deck.

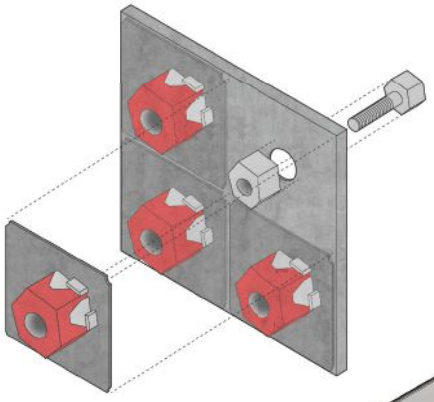
The research projects are a crucial part of constructing steel buildings much faster than was possible in 2019. They are not the only pieces, though. New versions of products—and new products themselves—have enabled speed increases in fabrication, erection, and design. Start on page 38 to read about nearly 40 new and updated products that have contributed to speedier steel projects. All product, software, and service information was submitted by the manufacturers, developers, and providers.

NEED FOR SPEED



SpeedCore 1

2 Shuriken Bolted Connections

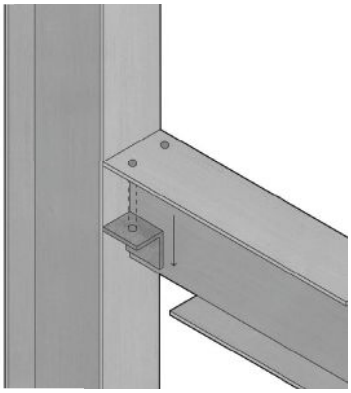





3 Software Resources

- Autodesk
- Dlubal Software RFEM 6
- Gone In 60 Seconds
- IDEA StatiCa
- IES BuildingSuite
- LIFT by sketchdeck.ai
- P2 Programs STSX
- Qnect
- RISA-3D
- SDS2 and SCIA by ALLPLAN
- Steel Projects production management
- VIRTUELE

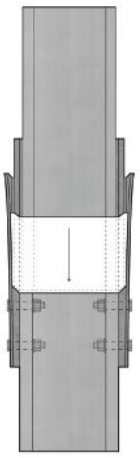
4 Drop-in Connections

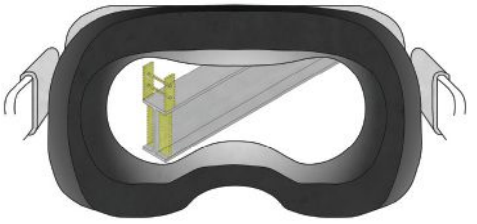


5 Connection and Bolting Equipment

- Applied Bolting Technology Squirter DTIs
- Birmingham Fastener
- DuraFuse moment frames
- Infasco tension-control bolts
- Lindapter Hollo-Bolt
- SidePlate connections

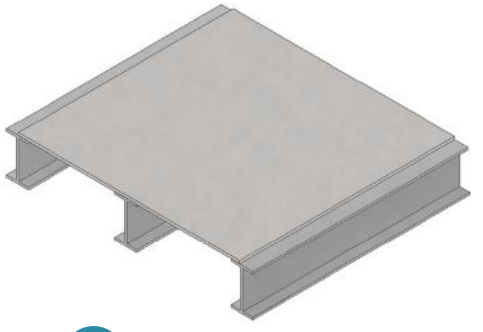
6 SnapLocX Connection





7 AR/VR in the Shop



8 FastFloor Modules

9 Fabrication Equipment

- AGT BeamMaster
- Automated Layout Technology Lightning Rail
- Machitech/Beamcut Systems profiling machine
- Messer Cutting Systems Element 400L, MetalMaster Xcel
- Miller XMT 400
- Peddinghaus PeddiSubX-1120
- Threadline custom fabrication solutions

10 Other Resources

- Acrow
- Atlas Tube Jumbo HSS
- Canam BuildMaster
- CastConnex steel castings
- Chicago Metal Rolled Products
- CSC NS32 steel deck
- FabStation AR/VR
- GWY rapid tool recalibration and repair
- LIFTbuild
- MCL Hangers
- Nucor Aeos ASTM A913
- OTH Rigging Wireless Quick-Release Lifting Hook
- Schöck thermal breaks

Turn to page 38 to learn more about nearly 40 products that can help save time on your next project.

NEED FOR SPEED

## An All-Star Cast for Faster Construction

Steel casting manufacturing provides the ability to sculpt steel into freeform geometric shapes that can improve a structure's performance and aesthetics. Steel castings allow for optimal connection shape and can help solve complex geometric and structural challenges efficiently and economically. They are also often used to simplify fabrication and speed up construction.

Fabricators and erectors agree that $1 spent in the shop can save $2 or more in the field. Precision-machined cast steel nodes reduce risk, reduce or eliminate difficult welds from complex connections, and compress construction schedules. All are critical for successfully constructing stadiums, transportation hubs, high-rises, and other complex construction projects.

For example, Bechtel and Paxton & Vierling Steel—the design and construction team behind NASA's Mobile Launcher2 (ML2)—leveraged steel castings to reduce ML2's weight, better modularize shop fabrication and field construction, and enable field-bolted construction. Castings also replaced complex TYK welding with simple butt welds and improved tolerances by greatly reducing distortion during fabrication.

Before that, Severud Associates and W&W | AFCO Steel used cast steel nodes in the world's largest spherical structure at The Sphere in Las Vegas. The venue's geosphere, measuring 520 ft in diameter and 366 ft in height, incorporates 368 custom-designed cast steel nodes. Each node provides the 3D curvature of the structure while also reducing connection tonnage by 55%. The lower connection tonnage reduced the number of bolts required by 75% and the surface area of the connections by 75%. With each node providing CNC-level tolerances, the cast nodes were critical to controlling field tolerances and meeting the project's construction schedule.

Casting manufacturing also offers the ability to produce complex, repetitive parts in high volume and short durations. For example, the exterior trellis on The Sphere includes more than 9,000 Cast Connex Diablo Bolted Splices, a solution W&W | AFCO chose instead of weld fabricating the intricate cruciform-style bolted splice connections required in the structure.

These are just two examples of the structural value, aesthetic value, cost reduction, and, of course, the time-savings value of using cast steel connections, whether standardized or customized. For more information, visit **www.castconnex.com**.

## Master Machine Welder

Robotic welding has generally required a large volume of identical parts to be profitable. The BeamMaster is challenging that notion. It can churn out pre-fit beams with high-quality welds in a fraction of the time as welding by hand. Its dual-robot configuration is engineered for maximum efficiency. With two synchronized robots working seamlessly, your production line operates twice as fast, doubling throughput without compromising weld quality. Whether tackling long beams or high-weld volumes, the dual robots reduce cycle times and keep your shop running at peak performance.

The BeamMaster's SnapCam has unique 3D vision technology that takes seam finding to the next level, improving cycle times by at least 30%. By ensuring unmatched precision and minimizing downtime, SnapCam delivers faster, flawless results. Together, the dual-robot system and SnapCam integration boost throughput by an impressive 130%, redefining productivity for modern fabricators. For more information, visit **www.agtrobotics.com**.

## Maximum-Impact Machine Management

Software solutions implemented to manage a production process are most impactful if they can integrate live with CNC machines, and Steel Projects by Ficep can make production management efficient and shorter in several ways.

It can create CNC data automatically for nesting instead of individual parts to simplify the job for the operators—saving raw material and optimizing the machine sequences based on advanced planning tools. Workflows can be managed before production while creating the required CNC data to program automatic material handling.

Steel Projects allows live interactions with the CNC machines to track their activity from the office, which helps to eliminate manual programming. Users can see machine status, the operator in charge, potential alarms, preventive maintenance information, and details on the ongoing CNC program. It can also collect automatic feedback from the machines, allowing live production monitoring to track the progress of projects, thus eliminating unnecessary trips to the shop floor. Go to **www.steelprojects.com** to learn more and access a free trial.

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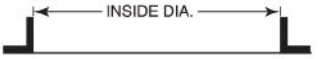
We bend ALL sizes up to:

**1 Angle Leg Out**




10" x 10" x 1" Angle

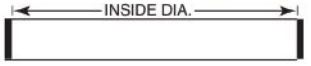
**2 Angle Leg In**


10" x 10" x 1" Angle

**3 Flat Bar The Hard Way**

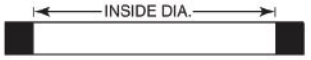

24" x 12" Flat

**4 Flat Bar The Easy Way**




36" x 12" Flat

**5 Square Bar**

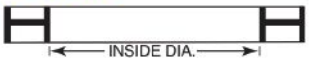



18" Square

**6 Beam The Easy Way (Y-Y Axis)**

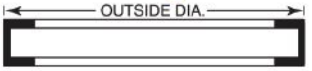

44" x 335#,
36" x 925#

**7 Beam The Hard Way (X-X Axis)**



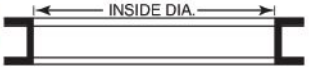

44" x 285#

**8 Channel Flanges In**



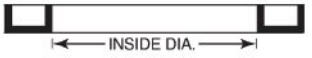

All Sizes

**9 Channel Flanges Out**



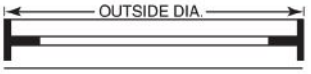

All Sizes

**10 Channel The Hard Way (X-X Axis)**




All Sizes

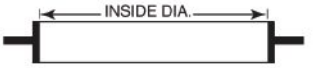
**11 Tee Stem In**




22" x 142½# Tee

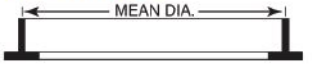
We bend ALL sizes up to:

**12 Tee Stem Out**



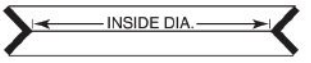

22" x 142½# Tee

**13 Tee Stem Up**



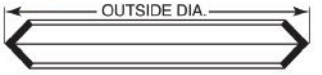

22" x 142½# Tee

**14 Angle Heel In**



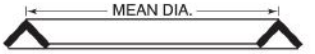

8" x 8" x 1" Angle

**15 Angle Heel Out**




8" x 8" x 1" Angle

**16 Angle Heel Up**

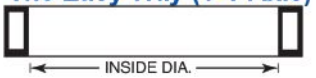



8" x 8"x1" Angle

**17 Square Tube**

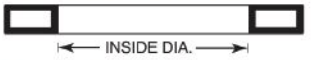

24" x ½" Tube

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



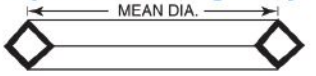

20" x 12" x ⅝" Tube

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



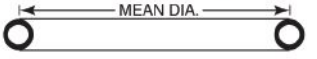

20" x 12" x ⅝" Tube

**20 Square Tube Diagonally**



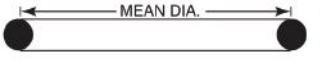

12" x ⅝" Square Tube

**21 Round Tube & Pipe**




24" Sched. 80 Pipe

**22 Round Bar**

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## Lifting Productivity to New Heights

Unprecedented labor shortages and supply chain challenges have made the construction industry look harder at ways to design and build more efficiently. One solution, LIFTbuild, draws from the ingenuity of the automotive assembly line and is driving productivity levels to new heights by using vertical manufacturing to deliver tall buildings. It's best suited for buildings 12 stories or higher and takes advantage of intensive collaboration and standardization in design and construction to enhance project speed, efficiency, and safety.

Structural spines are erected on site, and a concrete assembly pad at grade is the primary workspace for constructing the roof and subsequent floor plates. Each floor is built just above the ground—complete with steel, decking, concrete, fireproofing, select building systems, façade, and the loading of select materials—before being lifted to its final height. Once the floor plate is locked into the building's structural spines, fit-out commences in a safe, weather-tight environment, and crews assemble the following floor plate below.

LIFTbuild reduces the non-value-added time associated with the movement of people and materials during construction by focusing as much work as possible on the ground, accelerating project schedules and saving on costs. The repetitive assembly process and intentional focus on continuous improvement also allows work crews to improve speed floor-over-floor. The steel team benefits from the clutter-free assembly pad working surface, a safe and ergonomic height for steel erection, the absence of a costly tower crane, on-demand material deliveries, and drastically reduced hook time. Concrete placement and fireproofing also occur on the ground using smaller pumps, again minimizing people and materials travel time.

On LIFTbuild's 16-story proof-of-concept project—the Exchange Residential Tower in Detroit—the steel crew found additional efficiencies floor-to-floor through improved sequencing, bolt kitting, and minimizing downtime during lifts. Those reduced floor plate steel erection time by 45% from Level 16 to Level 6. Due to the assembly process, the project also saw a 50% reduction in steel and concrete labor compared to a conventional twin. Overall, LIFTbuild aims to reduce construction schedules by up to 30%. For more information, visit **www.liftbuild.com**.

## Changing the Status Quo with Fully Connected Models

Accelerating timelines on structural steel projects isn't always a matter of finding better fabrication equipment, specialized connections, or construction methodology. Sometimes, it's about challenging the status quo.

For years, engineers in many regions have operated with the expectation of delivering only stick models with basic structural details to the fabricator, leaving detailers to fill in ambiguous design requirements for connections and other elements. Though common practice, it causes frustrating RFIs that bottleneck progress and complicate the design process.

Whether you're used to delegated design, design assist, or another design method, many consider the RFI back-and-forth inevitable, but it doesn't have to be. Industry-leading engineering firms are realizing that delivering fully designed and connected models directly to the fabricator creates project timeline, cost, and quality. With two time-tested design solutions together under the ALLPLAN roof, engineers can combine SDS2's fabrication-focused intelligence with SCIA's analytical power to deliver structural steel models with connections already designed, applied, and approved.

SDS2 by ALLPLAN takes a unique approach to structural steel modeling that optimizes steel connections. Connections are designed automatically as you model and fully validated with expanded calculations and optimized for fabrication and erection, with 360° intelligence that considers the load requirements, fabrication preferences, and unique framing conditions.

SCIA by ALLPLAN is a multi-material structural analysis software and design tool for all structures. It supports all standard U.S. design codes and offers comprehensive design and analysis with clear, step-by-step formulas for everything from static calculations to construction stage analysis and finite element analysis. Its high-performance modeling environment is easy to learn and equipped with the latest technology for high-speed processing of even the largest projects.

Data can be easily and quickly exchanged between the two solutions using Structural Analysis Format, which is readable and editable in Excel. Once the engineering firm is finished, it can deliver the connected model in either a universal format or as an SDS2 model, primed and ready for expedited detailing.

For engineers, delivering complete, higher-quality designs minimizes costly RFIs and adds value to the project by fast-tracking design and bypassing reviews. For fabricators, it means more accurate estimates, earlier involvement, and reduced detailing costs. For structural steel projects at large, fully connected models deliver speedier construction. For more information, visit **sds2.com/connected-models**.

NEED FOR SPEED

## Get Your Fasteners Faster

Don't risk long lead times that cause increased costs, missed deadlines, and business disruptions—Birmingham Fastener typically offers significant time savings by having the largest structural inventory in the nation and coast-to-coast strategically located distribution centers.

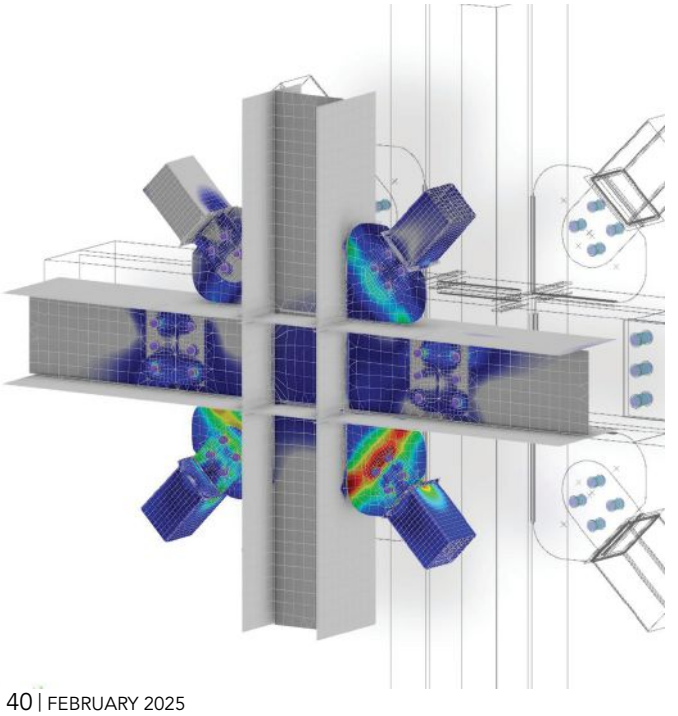
The Birmingham Fastener family of companies manufactures standard, non-standard, and custom fasteners and operates the highest volume distribution center of nuts, bolts, and standard fasteners in the U.S.—and the country's largest distributor of A325 and A490 bolts. In addition to standard manufacturing and distribution, Birmingham Fastener offers state-of-the-art specialty manufacturing capabilities and custom packaging and kitting services.

In recent years, Birmingham Fastener has grown its family of companies to include Atlanta Rod and Manufacturing Inc., K-T Bolt Manufacturing, and Champion Manufacturing. Its diversity provides certified quality, superior service, and fast delivery. For more information, visit **www.bhamfast.com**.

## Comprehensive Software for Faster Design Completion

Dlubal Software's RFEM 6 finite element analysis (FEA) program provides a comprehensive and speedy steel design solution, especially with its ability to carry out AISC-specified member and connection design within a single model. Its integrated approach significantly enhances efficiency by eliminating the need for external tools or manual data transfers between software during different design stages. The integration gives engineers an estimated 50% time savings by eliminating the frequent need to export and import member end forces between unrelated programs.

RFEM 6 is created by engineers and for engineers. Its interface is thoughtfully designed to provide intuitive workflows, minimizing the learning curve for newcomers. Days or weeks of valuable time can be saved, eliminating hours spent navigating complex software or multiple programs needed for the single workflow provided in RFEM. The interface aims to reduce the time spent on repetitive input by defining data once, making it permanently accessible in relevant drop-down menus throughout the program. Additionally, hundreds of free online introductory resources are available on the Dlubal website, offering quick access to essential information.



RFEM 6 performs member and connection design according to the 2022 AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22). Most structural analysis programs focus on member design or connection design, leading to fragmented workflows and potential discrepancies. RFEM allows engineers to design beams, columns, and bracing systems—along with moment, shear, and brace connections—in a single model. It minimizes inconsistencies and maintains a unified source of truth for structural models, simplifying the design process.

The steel joints add-on further extends the program's capabilities by allowing users to design any type of steel connection—whether standard or nonstandard—according to the Specification. Unlike competitor programs that rely on simplified analytical equations, RFEM uses an FEA submodel in the background to capture the behavior of complex or unique connections. The submodel is particularly useful for designing intricate connections in geometrically irregular or heavily loaded structures, which standard templates or equations may not accurately capture.

RFEM 6's second-order effects, stability checks, and nonlinear material models provide an in-depth understanding of structural behavior essential for optimized steel design. Additionally, its integration with the RSECTION 1 standalone program allows for custom cross-section modeling, enabling standard and nonstandard sections to achieve better performance and cost savings.

RFEM 6's detailed reporting tools and seamless integration with BIM software promote efficient collaboration among various teams. Users can generate comprehensive design reports that include all relevant code equations and references for members and connections, eliminating the ambiguity often associated with black box outputs. Additionally, bi-directional integration with BIM software enables streamlined coordination between the design and detailing teams, accelerating project timelines. For more information, visit **www.dlubal.com**.

## Bolt Four Times as Fast

Squirter DTIs from Applied Bolting Technology are revolutionizing the steel design and construction industry by significantly speeding up the bolt tensioning and inspection process. With the unique capability to visually confirm correct bolt tension, Squirter DTIs ensure efficiency, accuracy, and reduced time on-site.

Traditional bolting methods like turn-of-nut can be slow and lead to inconsistencies in bolt tensioning, which can delay projects. Squirter DTIs are proven to be four times faster than the turn-of-nut method. The speed advantage comes from the Squirter DTI design, which includes semi-permanent orange indication media that deploys when a bolt has been properly pretensioned.

With tens of millions used worldwide, Squirter DTIs have earned a reputation for reliability in even the most demanding environments. They provide nearly 100% accuracy in bolt tensioning inspection and eliminate the need for inspectors to use feeler gauges or climb difficult-to-reach structures, streamlining their process.

Squirter DTIs offer a game-changing solution for installers and inspectors. Installers can quickly confirm when to stop tensioning, while inspectors can easily verify proper tensioning without additional tools. Squirter DTIs help teams meet tight deadlines while maintaining the highest standards. By incorporating them into your bolting process, you can expect faster installation, reduced inspection times, and greater confidence in your projects' structural integrity. For more information, visit **www.appliedbolting.com**.






NEED FOR SPEED

## Rapid Repairs

GWY repair and calibration services ensure projects stay on schedule, even if a tool breaks or needs adjusting. They include annual in-house, same-day calibration services for torque tools and bolt tension calibrators. The calibration bench is equipped to handle a variety of torque tools, including electric, manual, and hydraulic options, ensuring accuracy and efficiency in your projects.

GWY's technicians guarantee the fastest wrench repair turnaround time in the industry, restoring your tools to optimal condition with their comprehensive parts inventory and industry experience. Additionally, GWY offers many rental tools, including electric, manual, hydraulic, and battery-powered wrenches to support short-term projects.

If repair requests cannot be accommodated due to part availability or other reasons, GWY can overnight a rental replacement until the tool is repaired and returned. Repair service speed and accuracy are unmatched, and GWY guarantees a turnaround time of under seven days. Partner with GWY for all your tooling needs and discover the impact of experience, expertise, and innovation on your projects. For more information, visit **www.gwyinc.com**.

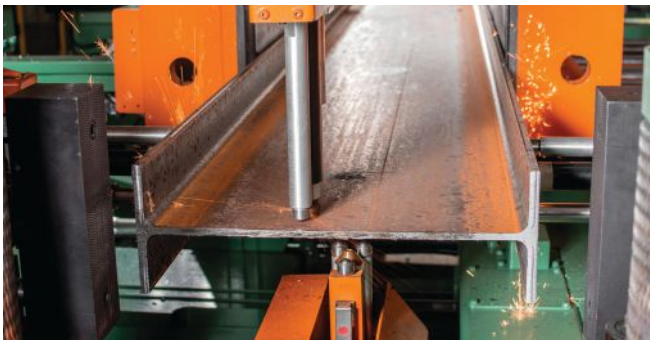
## Process Steel in Seconds

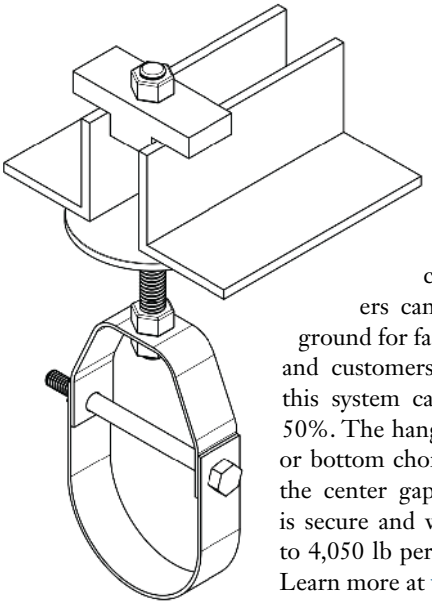
What motivates a steel fabricator already heavy in current machine tool technologies to invest in a new fabrication system that promises unlimited potential? When you can process holes, copes, flange thins, weld preps, rat holes, plasma marks, scribes, and tool changes simultaneously, there's no going back—and the Peddinghaus PeddiSubX-1120 does it all.

The PeddiSubX-1120 targets efficiency by using independent Sub-X axis spindle movement and powerful carbide technology to maintain speed and accuracy throughout the processing of each piece of material. With each axis operating independently, 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.

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. Manhours are restored and profits are maximized by eliminating the need for grinding or any other type of post-processing.

No other beam drill line can complete drilling, milling, coping, and layout marking within an impressive 19 11/16 in. operating window in seconds. Visit **www.peddinghaus.com/videos** to watch the PeddiSubX-1120 in action.

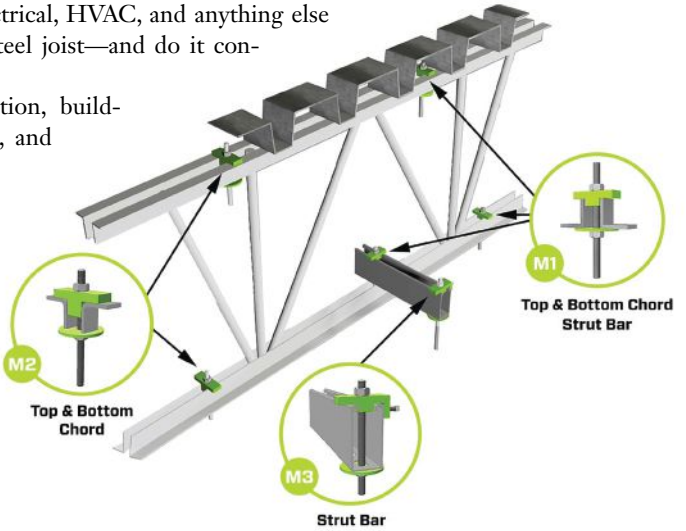




## Low Hangtime

MCL Hangers can help you reduce installation time for fire suppression, plumbing, electrical, HVAC, and anything else attached to an open-web steel joist—and do it concentrically.

Ideal for new construction, building upgrades, maintenance, and floor plan changes, these concentric bar joist hangers can be pre-assembled on the ground for faster installation on the joist, and customers have reported that using this system can cut installation time by 50%. The hangers can be used on the top or bottom chord and on Unistrut, lock in the center gap (ensuring the attachment is secure and will not twist out), hold up to 4,050 lb per hanger, and are UL listed. Learn more at **www.mclhangers.com**.



## Accelerating Disaster Response, Restoration, and Recovery

A robust framework to anticipate extreme weather events and climate hazards should include strategies and solutions to expedite response and recovery when routes are damaged or destroyed. Acrow has seen an increase in customers buying modular steel bridges for recovery efforts.

Modular steel bridges are rapidly installed, safe, and reliable. They are often chosen over traditional construction for emergency applications for numerous reasons. Components are immediately available, easily shipped to remote or challenging locations, quickly assembled with minimal equipment, and precision-engineered to ensure trouble-free installation. High-quality modular steel bridges can be deployed, dismantled, and redeployed in many configurations to deliver outstanding versatility.

Reconstruction speed is critical after an emergency, and Acrow holds a significant inventory of bridging components available for immediate deployment to customers. Additionally, many states, provinces, military organizations, and transport ministries maintain inventories of modular bridging for emergency use, with technical support provided by Acrow's Rapid Response Team on demand.

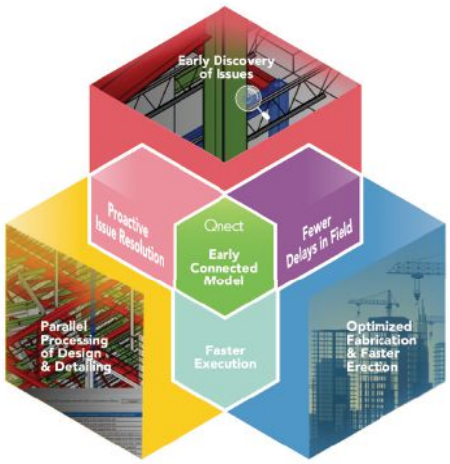
Heavy snowmelt caused flooding across Colorado in May 2023, collapsing a section of Colorado State Highway 133. Replacing a main road in a sparsely populated area was of immediate concern, because the only alternative detour route for most travelers added more than 200 miles. A two-lane modular steel bridge from Acrow was selected to serve as a temporary detour, and the bridge was opened to traffic six weeks after construction began.

When flooding from heavy rainstorms in early 2023 destroyed two bridges in rural San Luis Obispo County, Calif., Acrow's modular steel structures were installed to serve as long-term detours. Each bridge is on a critical route used by first responders and provides the most efficient way to evacuate in an emergency. Assembly-to-opening of each bridge took less than a month, and they are expected to stay in place for several years.

In June 2022, flooding washed away a bridge in Montana's Absaroka-Beartooth Wilderness, stranding residents who needed helicopter rescue. A single-lane modular structure from Acrow was selected as a short-term replacement because it could quickly be set and modular components could be easily delivered to the remote site. Construction and installation of the temporary bridge took place in June 2023, with the bridge opening to traffic in early August. It's expected to be in service for at least two years.

Acrow has deployed emergency structures worldwide for disaster relief and reconnect affected communities. For more information on the benefits of accelerated bridge construction, visit **www.acrow.com**.

## Qnect Adds Quickness




Efficiency and precision are crucial in the construction industry, and Qnect has software and services that can be a centerpiece of streamlining steel design, fabrication, and erection. Integrating Qnect's early connected models, Qnect for Autodesk Revit, and QuickQnect early on in a project cycle can reduce project timelines and improve collaboration between engineering and fabrication disciplines.

Early connected models and Qnect for Autodesk Revit significantly reduce RFIs by enabling structural engineers to identify and resolve potential steel issues during the design phase. The Revit extension proactively discovers framing problems related to modeling, constructability, and engineering, preventing these issues from escalating into time-consuming RFIs. QuickQnect, Qnect's Tekla extension, also uncovers hidden issues by using data to mine for valuable insights.

Traditionally, structural design in Revit and connection design and detailing in Tekla have operated sequentially, leading to delays and potential misalignments in construction documentation. Early connected models, however, allow for parallel processing—design and detailing tasks are initiated together instead of one after the other. Their concurrent approach means connection engineering and detailing can begin while structural design is still in development, reducing the time required to complete the construction workflow. QuickQnect's effective change management capabilities enable rapid implementation of connection modifications, minimizing delays and maximizing efficiency.

Using Qnect at the center of an integrated workflow provides a single source of truth for connection information, enabling seamless coordination between Revit and Tekla. With Qnect's cloud-based connections, decisions flow easily across software, allowing teams to instantly access, adjust, and apply connection data as design changes occur. Synchronized integration ensures all stakeholders are on the same page, minimizing time-consuming rework and enhancing accuracy in the final model.

With early connected models and QuickQnect for Tekla, fabrication and steel erection efficiency can be improved while accelerating shop drawing review. By implementing in-model changes rapidly, QuickQnect allows fabricators, detailers, and connection engineers to optimize connection types, resulting in a 20% to 40% reduction in the number of bolts required for a building. The optimization streamlines fabrication and reduces on-site crane time, enabling faster assembly.

Qnect's analysis of extended shear plate connections further accelerates field erection. The software's adaptability to various company standards and fabrication preferences makes it suitable for diverse projects. Crucially, Qnect excels in change management, implementing connection modifications within minutes. This rapid response minimizes delays and maintains project momentum, enhancing overall efficiency. For more information, visit **www.qnect.com**.

NEED FOR SPEED

## Moment Frames in Mere Moments

DuraFuse Frames has solutions that increase speed for all moment frame design and construction phases. The connections are developed with performance and frame economy in mind and are simple to fabricate and erect rapidly, while also having the lowest tonnage solution available. DuraFuse can support your team with its complimentary and quick design-assist services that optimize the frame sizes and design the connections.

Whether controlled by seismic or wind loads, projects with DuraFuse connections have numerous speed advantages and the lowest overall frame tonnage. Fit-up and welding are on the column side and can be completely robotically welded. The fabricated piece count is less than half of other connections, and there are no pieces to install in the shop and remove in the field. A recent wind-controlled project in Las Vegas beat the estimated erection steel schedule by 20%, highlighting erection speed. A complex, seismic-controlled project in Salt Lake City erected 600 pieces of steel in five days to maintain the schedule after multiple lost crane days due to high winds.

The DuraFuse seismic speed advantage extends through and beyond construction. During steel erection, eliminating seismic lateral bracing reduces the fabricated and installed brace count by at least 70%. Not having a protected zone in the beam or column simplifies field coordination and minimizes RFIs and repairs. In an earthquake, the damage is confined to the bottom flange fuse plate rather than the beam. The bottom flange location and bolted connection make post-event repairs easy: unbolt the damaged fuse plate and replace it with a new one. Independent research indicates a 60% or more reduction in post-event repair time and cost following a major earthquake.

No matter the project, DuraFuse Frames moment connections have an unmatched combination of speed, economy, and resilience. For more information, visit **www.durafuseframes.com**.

## Thermal Breaks: the Sooner, the Better

Structural steel beams that penetrate the building envelope have higher thermal conductivity than the insulated wall assembly, creating a thermal bridge. As cold travels through the steel, it cools the beam's interior portion below the interior air's dewpoint. The cooling causes condensation to form, providing an ideal environment for mold growth that can pose health risks for occupants and raise maintenance and durability concerns.

Installing structural thermal breaks at the building envelope to thermally isolate exterior steel elements from interior steel framing mitigates the path of thermal conductivity, preventing moisture issues and reducing heat loss by up to 74% at the connection, with no maintenance required over the life of the building. When discussed and incorporated in the initial plans, thermal breaks are part of the overall wall assembly designed to help meet requirements for continuous insulation while also meeting structural load requirements. Early engagement with suppliers strengthens the outcome by bringing expertise, details, and customized engineered solutions.

One recent example of helpful early engagement was 425 Grand Concourse in the Bronx, N.Y., a 26-story mixed-use, mixed-income building believed to be the largest Passive House project in North America. Passive House certification requires the building envelope to be free of thermal bridges, while New York City's building code requires mitigation of thermal bridging at penetrations through the building envelope.

The concrete-to-steel thermal breaks helped install steel sunshades on 13 floors and rainscreens at the building envelope. Pre-planning helped speed up installation of the thermal breaks to maintain an uninterrupted construction schedule. The project general contractor created mockups and worked out formwork beforehand to try the installation in different ways to minimize construction tolerances and improve consistency. The formwork was used on multiple floors, which helped save material and ensured thermal breaks lined up between floors to achieve the intended alignment between the metal joints and the sunshades.

To offset heat gain or loss where the sunshades connect, the design team specified Schöck Isokorb concrete-to-steel structural thermal breaks installed between the interior slabs and building exterior steel sunscreen attachments.

The senior structural engineer stressed the importance of planning with the thermal break supplier as early as possible, and in this project, started coordinating with Schöck in the design phase. The engineer gave Schöck preliminary drawings and sketches and showed each thermal break's loading, shear, moment, and deflection. Schöck reviewed it and recommended products that optimized the sunshades' performance and improved the building's success. For more information, visit **www.schoeck.com/en-us/home**.

## Track Steel from Your Seat

P2 Programs' newest product, STSX, provides fabricators, painters, galvanizers, and erectors with extreme mobility in barcoding using phones, tablets, and other devices. STSX is a web-based application that brings instant, real-time tracking information to your fingertips to reduce decision-making time and errors while trimming necessary manpower and manhours.

Barcoding with STSX increases the speed of existing processes and negates inefficiencies long accepted as normal within the steel fabrication industry. Customers say they have found efficiency improvements in organization, processing times, and the ability to track all their inventory from their desk—leading to decreased wasted hours and increased productivity.

STSX can help with receiving raw material, its heat traceability, and its location in the yard. The speed at which you can process a cut list with full heat traceability from the raw material to the final piece mark is unmatched. Inventory audits become simpler and faster; instead of a biannual or yearly audit of your inventory, audit activities can be accomplished in minutes and allow for more frequent inventory reviews. Inventory traceability alone can cut hours or days out of the manufacturing process.

We have all experienced delays in trying to determine the location or status of a piece mark on the shop floor. Needless hours are spent looking through paperwork to determine if all the piece marks passed quality control before being loaded or double-checking that the required piece marks made it onto the load.

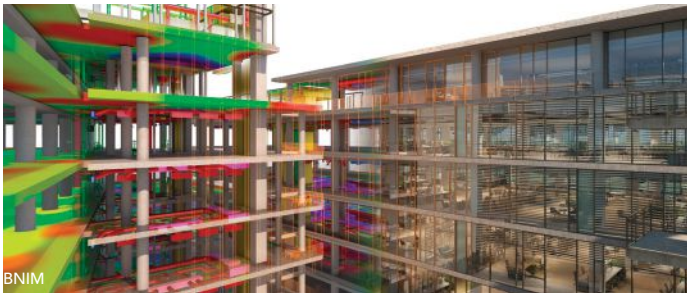
Using STSX provides a nearly error-free data collection environment while saving money and employee time with a return on investment of approximately one year. Ready to barcode and track your material? For more information, visit **www.p2programs.com**.

## You Move a Beam—BIM Helps Lighten the Load

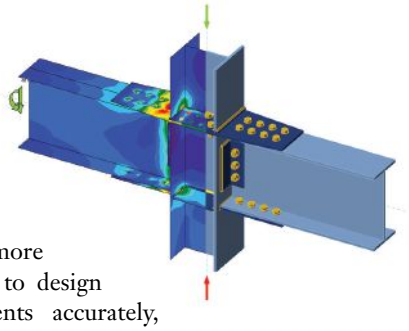
Integrated BIM workflows and cloud-based collaboration have become essential tools for achieving a balance between tighter margins and complex projects, allowing engineers to turn the most complex structural challenges into streamlined, optimized solutions. Autodesk's AEC Collection and BIM Collaborate Pro help teams meet these challenges head-on by centralizing data, design, and project management across all phases. For firms like GRAEF, embracing interoperable solutions in the AEC Collection has proven transformative in addressing the high expectations for precision, speed, and quality in steel construction projects.

With Autodesk Revit and Advance Steel, GRAEF integrates connection details into the structural model from the outset, enabling them to resolve conflicts earlier and produce a comprehensive 3D model for seamless collaboration with stakeholders. The integrated approach has shaved months off project schedules and minimized costly rework, helping GRAEF deliver higher-quality projects under tight deadlines.

The firm's investment in integrated workflows is also shaping a new generation of engineers. GRAEF's initiative, GRAEF Accelerate, puts junior engineers at the helm of detailed 3D modeling, fast-tracking their training and giving them critical experience in real-world steel detailing. The immersion is creating what the company calls "super engineers"—skilled professionals who have the knowledge and insight to catch potential issues long before they reach the field. For more information, visit **www.autodesk.com**.




## Software Staple



IDEA StatiCa's desktop-based structural design applications enable structural engineers in more than 110 countries to design structural components accurately, and engineers can save time using IDEA StatiCa by using its integrations with analysis and BIM software. In 2024, IDEA StatiCa released a free version of its Checkbot app to help facilitate information sharing between engineers and detailers—and connection designers for those that delegate connection design.

The engineer of record can import its analysis model into Checkbot, which will include the structure geometry and the member load reactions. That file can then be used to design the connections. Once the connection design is completed, an IFC file can be exported, and the detailer can use it to model the connections in a detailing model. IDEA StatiCa allows detailers to use their desired platform without having to mark up PDFs or sketches to send back and forth among the project team. Some engineers who use it said they have saved 80% of the connection design time.

A recent IDEA StatiCa development is the ability to group connections and batch design them—a time-saver by allowing many connections to be designed at once. It also reduces the time spent modeling the connections; when a designer models one connection per group, the model is applied to all the connections in that group. The workflow improvement moves IDEA StatiCa from a solution for complex connections to a tool for all connections. For more information, visit **www.ideastatica.com**.


## Whittle Away at Weld Preheat

For 30 years, ASTM A992 has been the industry standard for wide-flange sections. However, quenched and self-tempered (QST) high-strength structural steel like ASTM A913 is transforming the construction market.

Aeos, Nucor's ASTM A913 wide-flange sections, goes through a QST process that enhances its grain structure. The result is weld preheat reductions and increased strength-to-weight ratios, which can optimize the design, fabrication, and erection processes. It's made using Nucor's circular EAF steelmaking technology, which produces one-third the carbon emissions of traditional steelmaking methods. Aeos is a sustainable, low-embodied carbon construction material that increases construction speed.

A913 is a prequalified material per American Welding Society (AWS) D1.1-2020: *Structural Welding Code* for Grades 50 and 65. When the appropriate processes are used, A913 is classified as a Category D material, which does not require preheating for welding at all thicknesses due to the limits on the material's maximum carbon and carbon equivalent values. As detailed throughout AWS D1.1-2020, preheat conditions for welding Aeos can be greatly reduced or eliminated. Removing preheat welding requirements can help move the material through the fabrication shop faster and save energy, plus improve efficiency for erectors' field welding operations. Since less material is needed to support the same loads compared to A992, Aeos is more efficient to handle and transport.

Many projects, including Salesforce Tower in Chicago, have used Aeos material instead of A992 due to the time savings and efficiencies Aeos' welding preheat benefits offer. Visit **www.nucor.com/aeos** to read case studies, explore design tools and resources, and download Aeos Welding Guidelines.

Nucor is the only domestic producer of A913. Domestic production enables timely delivery and can lead to further reductions in emissions compared to imported materials. For more information, Nucor specialists (found at **www.nucor.com/construction-solutions**) can discuss Aeos' speed to market and the steel solutions Nucor can provide for vertical and horizontal construction projects.

## Off the Hook

Since the early days of the steel industry, ironworkers have manually unhooked rigging from steel after lifting—a time-consuming, physically demanding, and hazardous process. It's no longer necessary, though, after OTH Pioneer Rigging introduced the groundbreaking Wireless Quick-Release Lifting Hook that opens with a remote. It enables crews to unhook the rigging from the ground in seconds, saving time, reducing labor costs, and contributing to improved steel erector profitability without compromising safety standards.

On a typical jobsite, ironworkers spend 30 seconds to several minutes per lift climbing up to release the rigging from beams, columns, joists, or any other steel piece. Over one year, that's more than 10,000 minutes and hundreds of hours spent unhooking loads. With a crew and lifting equipment exceeding $500 per hour, the unhooking step costs contractors around $50,000 per year, per crew.

The Wireless Quick-Release Lifting Hook helps crews disengage loads within seconds and with the click of a button. It also offers the flexibility to sync multiple hooks on a single remote, enabling crews to coordinate and control multiple leg lifts simultaneously. Multiple hooks can be released at once or individually by color code, and each hook is built to perform up to 500 lifts on a single charge.

The quick-release hooks have a fail-safe mechanism that ensures secure locking under load, even if the hook battery is fully discharged. There is also a two-button hook-release sequence on the remote that prevents accidental releases. The highly durable design is derived from a rugged choker system used in the forest industry.

Quick-release hooks are highly sought for handling joists (including Christmas tree setups), beams, purlins, and girts. No matter the rigging configuration—basket, choker, or direct—the remote control releases the rigging in one second, allowing it to retract effortlessly with the crane hook. It's a game-changer in lifting technology. For more information, visit **www.othrigging.com**.

## Build Faster with BuildMaster

Drastically change how you build with Canam's BuildMaster systematic approach, which aims to minimize risks and eliminate waste on job sites. With BuildMaster, construction projects are safer and are completed using leaner, faster methods.

Sequentially ordered joists and steel decking, bolted joist shoes, and pre-bolted cross-bridgings are key features of Canam's approach that provide peace of mind to our partners.

BuildMaster can save erectors up to 20% on installation time. It eliminates material sorting, reduces the number of picks and lifts, and accelerates the fastening of joists and cross-bridgings to the structure. Steel components are supplied sequentially, delivered aligned with clear identification, and organized according to the bay where they will be installed once they arrive on site. All steps lead to considerable time savings.

Canam's approach optimizes operations and enhances workflows by mitigating risks and inefficiencies through clear communication, real-time data connectivity, and improved jobsite organization. You will enjoy greater predictability and need fewer contingency requirements as your budget and schedule become clearer.

Over the past decade, Canam has successfully implemented BuildMaster solutions in thousands of projects. Its approach eliminates risks, inefficiencies, and excuses, and those who have experienced it do not want to return to old ways.

If you want to complete your building structure at least 20% faster than the competition with less stress and less mess, BuildMaster is your best option. Experience it firsthand and discover why countless owners and general contractors choose it. For more information about BuildMaster, visit **www.canam.com**.

## The Speedier Way to Connect Steel

A lot can slow down connecting steel in the field, from misalignment of pre-drilled holes to time-consuming traditional installation methods like welding or drilling. Extra challenges that come with working at height or finding expensive skilled labor for a simple steel connection also hinder speed.

Have you ever been held up by needing a hot work permit for welding or faced delays because of difficult access that required installation from both sides? These delays eat into project timelines and budget, but they can be eliminated. With faster, simpler solutions such as Lindapter's expansion Hollo-Bolt, you can focus on the bigger picture and complete your project efficiently and on schedule.

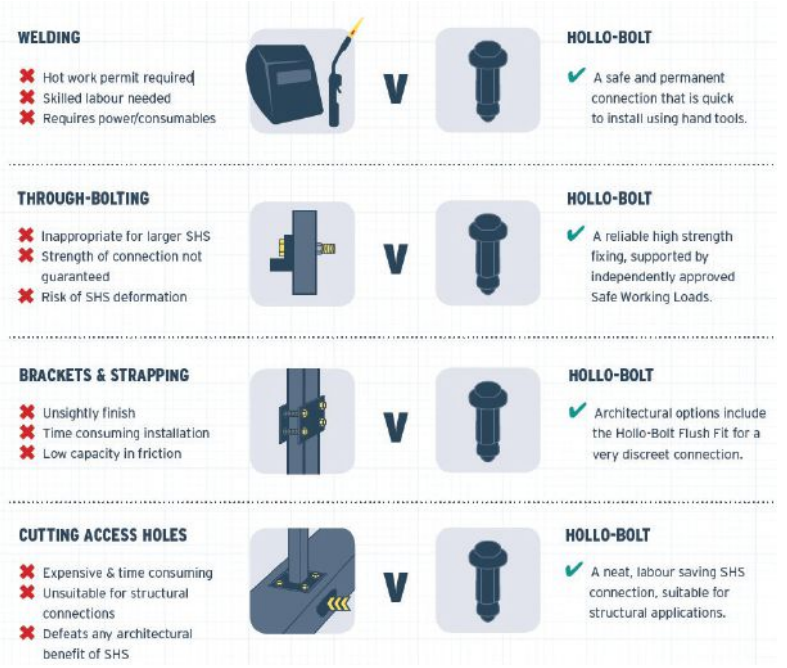
Hollo-Bolt has two options: the three-part (sizes 5⁄16 in., 3⁄8 in., and ½ in.) and the five-part with high clamping force design (sizes 5⁄8 in. and ¾ in.). The three-part Hollo-Bolt is a robust and versatile fastener perfect for connecting hollow structural sections (HSS) with access to just one side. It offers reliable performance for a wide range of standard applications, combining ease of installation with the ability to handle significant loads. Its straightforward design makes it a go-to solution for projects requiring strong, durable connections without the complexity of welding or through-bolting.

The five-part Hollo-Bolt takes the same ease of installation and enhances it with a patented high clamping force mechanism. It's engineered for heavy-duty structural applications, providing up to three times the clamping force of the three-part model. It's ideal for projects demanding higher strength and performance and offers additional security by minimizing displacement, making it a top choice for seismic or high-load environments.

Hollo-Bolt is also the only blind fastener for structural steel approved by ICC-ES 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 Hollo-Bolt, steel sections can be connected quickly to pre-drilled HSS with no proprietary tools and with access from only one side, a welding and through-bolting alternative that helps contractors reduce construction time and labor costs.

When specifying or installing Lindapter Hollo-Bolt, you can be confident the product is fit for purpose, will get through planning permission without delays, and will be approved on-site by building inspectors. For more information, visit **www.lindapter.com**.



NEED FOR SPEED

## Just-in-Time Custom Fabrication Solutions

Threadline's quick-turnaround custom fabrication solutions are an invaluable partner for any steel design and construction project and are designed to meet the changing needs of complex projects. From concrete embeds and grating to anchor bolts, Threadline's extensive product offerings support a range of structural requirements. It also specializes in fabricating pipe bollards, providing plate-burning services, and more. This diverse portfolio of fabricated products addresses many construction needs with precision and quality assurance.

Even minor delays can cascade into significant setbacks, but Threadline's optimized production process offers rapid turnaround times. It has an industry-leading 48-hour product delivery window in the Southeast and along the Eastern Seaboard for all in-stock products. Clients can rely on Threadline's to provide the materials they need when they need them—keeping projects on track and reducing costly delays.

When a steel fabricator needed over 1,700 pieces of galvanized anchor bolts to keep a large office building project in Austin, Texas, on track, Threadline completed the order in less than a week. The project was waiting on the custom-fabricated anchor bolts to pour the foundation, and the client risked significant delays without them, potentially losing key crew members to other jobs or incurring extra costs to keep them on standby. Threadline expedited the fabrication and galvanizing processes, delivering nearly four tons in just a week.

If a site requires anchor bolts or miscellaneous steel to accommodate evolving designs, Threadline can fulfill these needs without missing a beat. Its fabricated products are manufactured to the highest standards, ensuring long-lasting performance and structural stability that minimizes the chance of unexpected issues during the build, further expediting the project. Threadline helps steel contractors and builders avoid costly and time-consuming adjustments or replacements by using precision-engineered materials that fit seamlessly into existing designs.

Threadline's approach to customer service is centered on providing proactive support and problem-solving. Threadline collaborates closely with clients, offering design consultation to ensure all fabricated products meet precise specifications. The preemptive attention to detail reduces the risk of errors or misalignments in the field, allowing the entire team to maintain a steady workflow without interruption. Threadline's quick turnaround services empower contractors, engineers, and project managers to accelerate steel construction timelines and eliminate potential bottlenecks. For more information, visit **www.threadlineproducts.com**.

## Speed Is on Our Side(Plate)

SidePlate connections are stiffer and have more capacity and resilience than other moment connections. When working with SidePlate, design, bidding, detailing, and installation all move faster than in a conventional moment frame or braced frame design. Improving the lateral system with a focus on constructability makes a SidePlate design different.

SidePlate engineers save design hours for the structural engineer of record by assisting with the overall lateral analysis and design. They save time for bidding fabricators by delivering a complete takeoff of all the SidePlate components on the project. They provide detailers with a project-specific digital XML file that assists in modeling the SidePlate pieces and parts in SDS2 or Tekla, eliminating manually detailing the connections.

The absence of field welding allows SidePlate projects to be erected quickly. Customers say a SidePlate bolted joint takes approximately 20 to 30 minutes to bolt up and detail, much lower than four to eight hours per moment connection when welding and ultrasonic testing a complete joint penetration (CJP) welded joint.

SidePlate was one of many structural systems considered for the Atrium Health Carolinas Medical Center. A thorough comparison of vetted concrete, braced frames, the all-bolted SidePlate moment frame designs, and an A3 analysis proved SidePlate was the fastest, most cost-effective way to deliver the building. Ultimately, it was delivered 10 weeks faster than other designs.

Bringing SidePlate to the design of several large industrial projects from New York to California to Florida consistently shaved two to four weeks off the installation schedule. SidePlate's speed allows teams to absorb unforeseen delays and meet or beat proposed schedules.

SidePlate saved six weeks of construction schedule compared to a concrete shear wall design for a Denver Health hospital project. (Read about it in the September 2022 article "Come Together," available in the archives section at **www.modernsteel.com**). It was a significant piece of completing a large hospital project in the Midwest ahead of schedule despite losing 30 days of installation work due to high winds.

SidePlate isn't for every job. Its team of regional engineers (find them at **www.sideplate.com/contact**) is always open to consulting on your project specifics. There is no obligation for SidePlate to evaluate a possible project, and the licensing fee is paid during construction, typically by the project's steel fabricator. For more information, visit **www.sideplate.com**.

## Decked Out in Little Time

Canam Steel Corporation's (CSC) new NS32 series is the latest addition to its extensive steel deck product line, designed to maximize efficiency, speed, and strength for your next project. Engineered with a 32-in.-wide profile—33% wider than the industry standard 24 in.—the NS32 delivers significant time savings. The new width means 33% fewer sheets can cover the same area, reducing side lap connections and fastener requirements by 33%. Fewer sheets mean a quicker installation process and lower overall erection costs, streamlining your project from start to finish.

The NS32 also creates efficiency during installation. Its wide, low-flute design makes HILTI stand-up tools easier to use, allowing your team to secure sheets quickly, saving additional time and labor. Plus, the wider spacing between the flutes enables easier access to fastening points, meaning crews can work more efficiently without compromising the quality of the connections.

In addition to installation speed, the NS32 series sets a new standard in strength. CSC engineers saw an opportunity to increase capacity by reinforcing the top and bottom flanges with stiffeners, creating the NS32-XS variant. The variant boasts up to 15% higher load capacity, allowing for thinner, lighter sheets that are easier for ironworkers to handle—further shortening handling and spreading times. As a leader in steel manufacturing, CSC is proud to deliver a high-strength, high-quality decking solution that fast-tracks project timelines. For more information, visit **cscsteelusa.com**.

NEED FOR SPEED

## The Cutting Edge of Speed

Messer Cutting Systems is driving innovation in steel fabrication that helps accelerate steel design, fabrication, and construction by 50%. Messer's Element 400L Unitized and the MetalMaster Xcel are engineered for speed, precision, and flexibility, delivering faster project completions without sacrificing quality.

The Element 400L Unitized offers flexibility and efficiency with customizable configurations, allowing fabricators to adapt to construction and structural steel requirements. Its advanced Global Connect CNC control system gives operators easy access to production data throughout the workflow. Automation features, including shuttle pallets for plate loading and unloading, reduce downtime and speed up turnaround times. Its precision ensures high-quality results with minimal rework.

The Element 400L also includes a Slagger automatic push-button clean-out table. With a cleaning time of only five minutes for an average size 10 ft by 40 ft cutting table, the Slagger drastically decreases downtime for table cleaning and subsequently reduces labor costs.

Messer also offers drilling capability on several machine models. Structural steel customers want machines that drill, tap, and mill, and Messer machines with drill units can drill up to 4-in.-diameter holes and tap up to a 1½-in. diameter. Adding a drill unit eliminates the need for secondary drilling and milling equipment, saving time and money in the long run. A drill unit combines plasma and oxyfuel cutting, allowing for more work on the piece part in a single handling. All processes are done in the same setup, providing accurate, feature-to-feature relationships within a single piece and from part to part. The MPC2000 MC offers a vacuum chip collection system for easy automatic swarf removal.

The MetalMaster Xcel is designed for high-speed straight laser cutting and plasma-beveled parts, providing fast and accurate cuts for thin and thick sheets and intricate and heavy-duty parts. Its precision reduces the need for secondary operations, ensuring tight deadlines are met while producing flawless edges.

When coupled with a shuttle system, the MetalMaster Xcel can result in a 30% to 40% increase in productivity over traditional cutting systems. Shuttle systems provide greater flexibility and are the most efficient and safest way to load plate and unload parts. Customers who added a fully automatic storage and retrieval system to the MetalMaster Xcel have seen productivity increases as high as 90%, depending on the configuration. For more information, visit **www.messer-cutting.com**.

## Welding Without Movement

Welding jobs take less time when the welder rarely has to move positions or ask for help. The Miller XMT 400 with ArcReach technology keeps projects on schedule by ensuring welders don't have to leave their position and walk to adjust parameters or shout to someone on the ground to adjust the power source to dial in a good weld. It's a safety and time benefit that minimizes fatigue for operators and keeps them in a position to do quality work.

ArcReach allows operators to control the power source remotely without a control cord. The ability to adjust parameters remotely helps ensure welders meet structural welding code requirements because they do not operate with less-than-optimal settings. The XMT 400 ArcReach's CLC feature gives welders the power level they set, regardless of voltage drop over long weld cables. Remote technology promotes the precision and accuracy needed to meet code and produce high-quality welds and minimizes the potential for accidents involving welders walking to a power source.

The XMT 400 ArcReach supports a variety of welding processes, including solid wire, flux-cored wire, self-shielded wire, stick, gouging, and TIG. Its versatility allows operators to switch between different welding techniques as required by the project without needing multiple machines. That flexibility ensures the right process is always available for the job, reducing setup times and streamlining operations.

By keeping the welding operator at the weld joint, the XMT 400 ArcReach minimizes interruptions and maximizes welding time. Continuous operation is crucial for maintaining high productivity levels, especially on large-scale steel projects where every minute counts. The ability to adjust without leaving the work area ensures that weld quality is maintained without sacrificing speed.

With fewer trips back and forth to the power source, accident and injury risks are also reduced. The XMT400 ArcReach technology keeps operators in a safer, more controlled environment. For more information, visit **www.millerwelds.com**.


## Profiling to Help Production

Achieving precision cutting with high accuracy and repeatability leads to improved efficiency and, in turn, faster production. Machitech's 6-axis beamcut profiling machine increases productivity and decreases time by incorporating advanced proprietary technology, including a laser measurement system that verifies the material's position in the cutting cell.

No two beams are identical, and Machitech's laser system scans each beam for inconsistencies before cutting. Data gathered during a scan is sent to proprietary software, which automatically adjusts the cutting path to ensure accuracy. In addition, a standard magnetic breakaway torch helps prevent time-consuming repairs while reducing the possibility and related costs of a plasma torch crash.

STEP and DSTV files are easily converted using proprietary software without third-party intervention. Simulation software verifies that the cutting program is correct before files are sent to the operator. The process is designed to prevent bottlenecks on the shop floor, speeding up production and increasing overall productivity. For more information, visit **www.beamcut.com**.

## Big Tubes and Bolted Connections

The railroad passing through Corona, Calif., has long bolstered the local citrus industry, earning the city the nickname "Lemon Capital of the World." That rail infrastructure, though, also caused division among residents. Long waits for freight and passenger trains to clear a busy grade-level crossing became common.

The city explored ways to shorten commutes and improve safety and chose to build a new bridge over the railway and adjacent open-channel drainage canal. Initial plans for a concrete span would increase the project's difficulty and timeline, and a temporary rerouting of the canal would be required. Project engineer Biggs Cardosa found a solution by changing the bridge to a steel-based design.

Conflicts with the drainage canal would be eliminated by spanning the entire 291-ft gap over the railway, canal, and access roads. Using a lightweight steel span meant the bridge could also be constructed adjacent to its final location and lifted into place, minimizing railway disruption. In this case, an arch design was the perfect solution. Using interlaced network suspenders to support the deck reduced moments imposed on the arch ribs compared to vertical suspenders, allowing the arch ribs to be lighter, more slender, and more aesthetically pleasing.

While initial designs included wide-flange X-bracing between the arch ribs, those members were switched to parallel 22 in. by 22 in. by ⅞ in. Jumbo HSS members from Atlas Tube because of their constructability and cleaner aesthetics. With easily customizable lengths, Atlas Tube's 100% domestic Jumbo HSS helped engineers reduce waste and fabrication time, and the readily available Jumbo HSS sections meant shorter lead times. Jumbo HSS' near-immediate availability also meant that engineers benefitted from closed sections and did not need to make custom-built parts.

Atlas' domestic Jumbo HSS was not the only innovation that reduced construction time. A newer technology, Shuriken, led to faster installation by reducing time spent on field splices and visual inspections. Additionally, while the tie girders were large enough to allow ironworkers to reach the interior of the bolted splices, the arch ribs, tie beams, and support diaphragms were not and could lead to delays in construction.

Using Shuriken meant a simplified connection process, especially at challenging angles. Instead of struggling to get connections right and creating delays, engineers were able to utilize Shuriken to create strong, secure joints quickly and easily. Shuriken allowed the installation of A325 and A490 bolts from one side, which was the perfect solution to the connection problem confronting the team. By mounting the nuts on the interior of the HSS and box members, splices could be bolted up from the exterior. Shuriken's built-in lateral flexibility preserved erection tolerance.

AISC full member Thompson Metal Fab fabricated the geometrically complex bridge and stated that Atlas Tube's Jumbo HSS and Shuriken made a difficult job faster and simpler. For more information, visit **www.atlastube.com**.

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## Model Mastery

RISA's integrated software solutions enable structural engineers to model, analyze, and design complex steel structures quickly and precisely. RISA-3D allows engineers to create detailed 3D models rapidly, evaluate load-bearing capacities, and visualize structural behavior under various conditions. The software's intuitive interface and fast, reliable analysis empower engineers to meet demanding project schedules while ensuring quality and safety. Its unique combination of speed and functionality has made RISA a go-to tool for engineers on challenging projects across diverse environments, demonstrated in two recent projects:

**LodeStar at Burning Man by Rbhu Engineering:** RISA-3D enabled Rbhu Engineering to adapt a 50-ft-tall sculpture from a Lockheed Martin Loadstar military jet into a structural marvel that invited visitors to a new viewing platform at Burning Man in the Nevada desert. With its frame and plate analysis tools, RISA-3D allowed the team to assess and reinforce the structure by adding 150 new steel pieces, which made the upper platform accessible. The software's speed in frame analysis was critical in meeting strict timelines, ensuring structural soundness without compromising artistic intent, and enabling visitors to experience the artwork from a unique and safe perspective.

**Wekiva Parkway (Section 6) by Construction Technologies & Engineering (CTE):** RISA's powerful and efficient software solutions helped accelerate the design review process of three balanced cantilever bridges on the Wekiva Parkway (Section 6) in Lake Seminole County, Fla. Speed was a decisive factor in this project, and RISA-3D delivered. The software's user-friendly interface and rapid analysis capabilities allowed CTE to model the form traveler's complex structural elements efficiently, easily integrating stick-built designs and CAD imports. The ability to run iterations swiftly and verify compliance with steel codes ensured that design validations were completed without delay, keeping the project on schedule.

RISA-3D's unmatched speed and reliability empowered CTE to tackle the challenges of bridge construction equipment design, enabling precise calculations for form traveler weight, center of gravity, and structural reactions. By leveraging RISA's full spectrum of capabilities, CTE could deliver fast and accurate results, significantly impacting the timely and effective execution of this critical infrastructure project. For more information, visit **www.risa.com**.

## Gone in Sixty Seconds

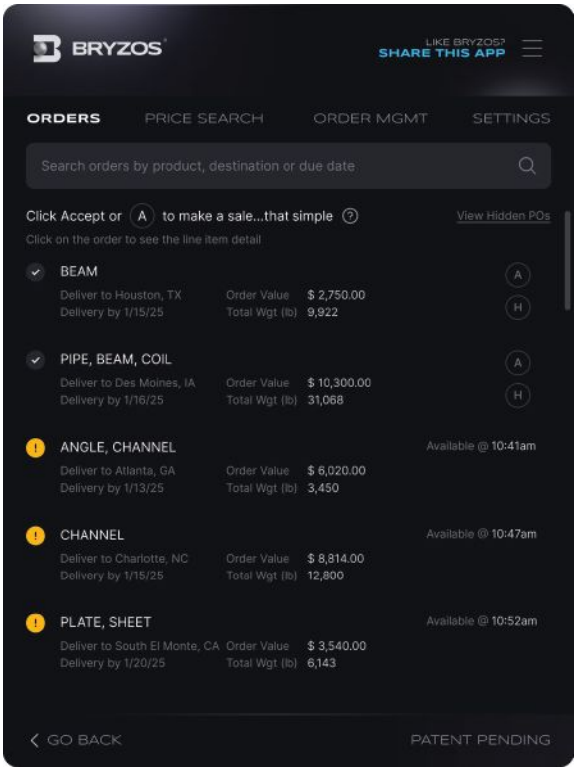
Bryzos has built the first instant pricing and procurement tool designed specifically for the metals industry. Aptly named Gone In Sixty Seconds, the tool lets you buy or sell commodity metals in less than a minute—no more back-and-forth quoting, no more waiting for phone calls or emails, and no more unnecessary time wasted on procurement.

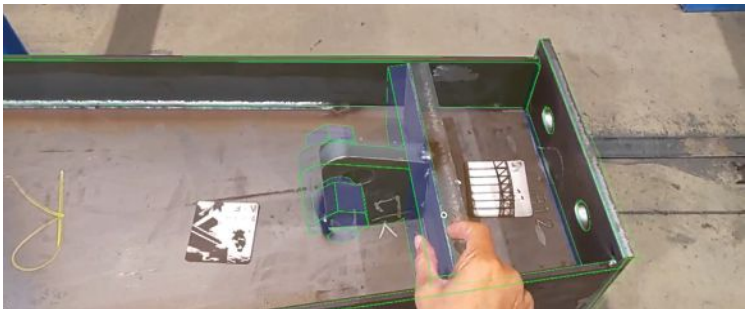
Gone In Sixty Seconds is the first of its kind, proudly built on speed, price transparency, and seamless transactions. With just a few clicks, you can search for carbon, stainless, and aluminum products and access real-time market prices. Type in any product description you normally use, and the fastest search engine will find what you need. The platform enables even the most reluctant technology adopters to effortlessly trade steel digitally.

A multi-hour or multi-day process can now be done in a few keystrokes. Buyers simply enter the products they need and their shipping destination, then click "Place Order." Sellers claim orders by actively monitoring new, available purchase orders waiting to be fulfilled within the app. Up-to-the-minute pricing information is available anytime with the price search feature.

Bryzos knows the metals industry runs on relationships and trust built over the years. That's why Bryzos connects buyers and suppliers from the top service centers in the U.S., along with local suppliers you already know. Bryzos' independent pricing engine ensures you always get the best, most accurate market price—no favoritism, no biases.

Gone In 60 Seconds is the fastest metal trading experience ever made. Bryzos is available for download at **www.bryzos.com** on Mac or Windows desktops and mobile devices through the Apple App Store and Google Play.





## (Augmented) Reality Check

The most important way to ensure efficient layout of complex assemblies is to catch mistakes before they reach the jobsite. FabStation's proprietary augmented reality (AR) overlay software for layout and inspection helps sniff out errors before they can doom a project schedule.

The AR software helps with rough fit and progress-checking for complex nodal assemblies, including columns and canopies of any shape. One fabricator customer, who noted that fitting larger pipe canopies normally takes several days, reported that they were able to reduce this process to mere hours by using AR software to rough in complex-compound angled parts.

Companies can also save daily by using AR for QC Inspections. One of FabStation's large customers tracks the savings from using AR to detect errors post-fit. After recording the data for one year, this customer saved more than $300,000 in rework using FabStation for inspection.

More than 150 FabStation customers worldwide have already enhanced their inspection speed by 50% and cut error rates dramatically. For more information, visit **www.fabstation.com**.


## Lightning-Fast Layout

The Lightning Rail Automated Layout System from Automated Layout Technology uses a simple DXF file exported from a fabricator's detailing and design software to eliminate the countless manual labor hours involved in laying out handrails, stair stringers, trusses, and more.

Compared to traditional methods, the Lightning Rail system draws a handrail on the work surface before the fabricator has their drawings, tape measure, and soap stone in hand to begin the layout process. The fast drawing saves an hour or more on every handrail and stair stringer they fabricate—an hour that can be used for productive, value-added processes. The system also results in a more accurate layout, drastically reducing rework and erection time. In addition, the layout will not move, flicker, shutter, or shake, and fabrication is still performed on a rigid steel frame table. The combination of time savings, error reduction, and enhanced ergonomics can help reduce handrail and stringer fabrication time by up to 50%. For more information, visit **www.automatedlayout.com**.

## Fully Stocked Suite

The IES BuildingSuite accelerates steel construction design by integrating structural analysis, foundation design, connection design, and custom shape creation into one streamlined workflow. Comprising VisualAnalysis, VisualFoundation, VAConnect, and ShapeBuilder, the suite simplifies complex tasks, enabling faster, more efficient project delivery.

The free VARevitLink utility facilitates bi-directional integration between Autodesk Revit and VisualAnalysis, supporting a seamless Building Information Modeling (BIM) process. Users can merge or create files in either program, ensuring synchronized models without duplicate work. VARevitLink runs as a Revit Add-In, eliminating the need for VisualAnalysis installation on the same machine.

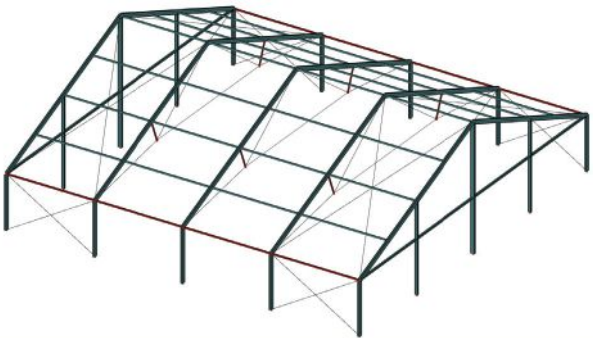
VisualAnalysis also integrates with VAConnect to streamline steel connection design. It exports forces from multiple load cases and joints, eliminating manual bookkeeping. VAConnect supports base plate, beam shear, and moment connections per the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22), ensuring code compliance without repetitive setup.

ShapeBuilder enhances the process by allowing custom steel shapes to be exported to VisualAnalysis for specialized design checks. Common steel profiles are preloaded, reducing the need for manual shape creation.

VisualAnalysis exports geometry and reaction data directly to VisualFoundation, automating mat footing setup. Column locations and reaction forces from service load cases transfer instantly, reducing manual data entry. VisualFoundation performs tailored checks, saving additional engineering time.

Additionally, email-based technical support from professional engineers typically receives replies within two business hours. Direct access to experienced engineers minimizes project delays, ensuring users quickly overcome design challenges.

While exact time savings vary by project size and complexity, users commonly report significant reductions in manual setup, model synchronization, and design validation. Automated workflows, integrated tools, and expert support collectively enable faster project completion, making the IES BuildingSuite an essential asset for steel construction design professionals. For more information, visit **www.iesweb.com**.



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## Control Tension, Accelerate Bolting

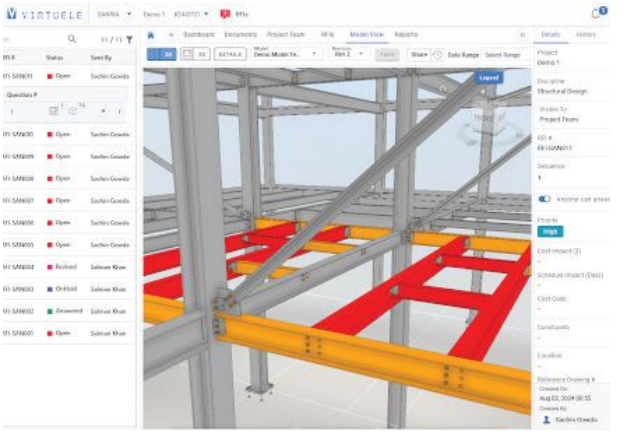
Options to reduce cost or time—often one in the same—on a project are prevalent within the fastener market. In Canada, Infasco structural bolts are usually supplied as a bolt, nut, and washer assembly. In the U.S., though, a bolt and nut combination is the prevalent product.

Infasco assemblies are preassembled and, in the case of galvanized products, come with a material test report with rotational capacity test results included. Without assemblies, the material test must be performed on-site for each lot of bolt, nut, and washer combination used—an expensive undertaking.

The faster and less expensive alternative is tension-control (TC) bolts. With TC bolts, a user must look at the total cost of bolting the connection rather than the cost of the fastener itself. Typically, installing hex bolts requires two ironworkers, one on the head of the bolt holding it from rotation and the second driving the nut. But the single-sided tightening aspect of TC bolts requires just a single ironworker for installation. Although the cost for a TC bolt is approximately 20% higher than the hex equivalent, Infasco studies have indicated the total cost of the bolting operation to be 50% less expensive.

TC bolts can typically be installed 33% to 50% faster than standard bolts, which adds the benefits of cranes being released sooner and the entire project being completed earlier. They're a simple system to use. Like any bolted connection, ironworkers snug-tighten all TC bolts, seat the shear wrench on the nut, and pull the trigger until the tip shears off. It's simple, quick, efficient, and, in most cases, foolproof. For more information, visit **www.infasco.com**.

## Modeling Made Easy



VIRTUELE is an innovative cloud platform for managing and authoring BIM data tailored for steel fabricators, detailers, and engineers that redefines collaboration. It has boosted productivity in steel detailing by up to 50%, cutting the time needed to develop a fully verified and integrated model while increasing precision and accelerating collaboration and data exchange. It's also an all-in-one solution for authoring, managing, and collaborating on RFIs, documents, and models. The platform can:

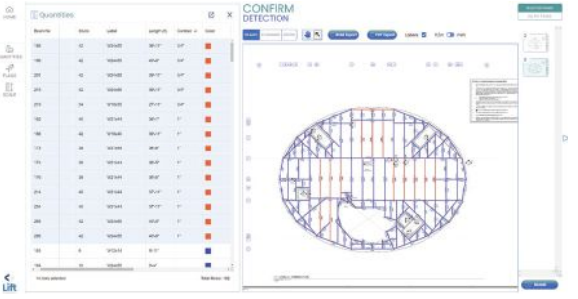
- save up to 50% on detailing time by automating the application and compliance with specific shop and detailing standards.
- verify and adjust incoming engineering models to provide significant time savings, enabling faster estimates and earlier detailing starts.
- unify project data in one accessible space, facilitating a common environment for seamless data flow across design, engineering, detailing, and fabrication. Fabricators can identify and resolve issues before they impact schedules, saving time and money.
- reduce the need for specialized training for costly BIM software and maximize your resources.
- enhance and optimize existing tools and workflows, allowing project teams to maximize their current software investments.

Users can upload all project documents, verify model quality and annotate drawings and models, create and manage RFIs, set up standards, and build connection libraries. VIRTUELE takes that information and creates a connected model aligned with your preferences, standards, and libraries—using your existing software. Scan the QR code to discover how VIRTUELE can help your next project.

## Take Off Toward Faster Takeoffs

Every hour spent on tedious takeoffs is an hour stolen from winning bids and growing your business. LIFT by sketchdeck.ai, an automated takeoff software, is transforming how America's top fabricators estimate steel with several powerful features:

- **Rapid document analysis:** Effortlessly process large, complex drawings in minutes
- **Smart categorization:** Automatically name and organize structural elements with precision
- **Instant BOM generation:** Create comprehensive Bills of Materials with a single click
- **Seamless tool integration:** Export project data directly to your favorite estimating platforms




Complete takeoffs in minutes, not days. Improve margins. Reduce errors. Increase bidding capacity. Embrace the future of structural steel estimation. LIFT can cut your takeoff time by up to 90%. Test it for free on your next bid at **sketchdeck.ai**.

## On a Roll

With its glistening, dragon-scale roof stretching across a wave-like structure, Google's Bay View building is as futuristic as it is functional. Designed with 90,000 uniquely shaped solar panels, the campus is also a statement on sustainable energy and groundbreaking design. It features a canopy made from 8⅝-in. tubes and 16-in. extra-heavy pipe, rolled by Chicago Metal Rolled Products (CMRP) in 2017.


In 2019, CMRP was approached by a different customer with the challenging task of rolling all the Unistrut P1000 tracks used to attach and hold the solar panels in place. While rolling Unistrut was within CMRP's capabilities, the project presented unique challenges that needed to be overcome to deliver a quality product on schedule.

The customer required each piece of Unistrut to be rolled, cut to size, and labeled in two places. The meticulous process needed to ensure that upon delivery, the track system could be installed quickly and efficiently. CMRP continuously rolled these components for almost three years, including during the COVID-19 pandemic, which introduced additional complexities. After the initial sample pieces were approved in July 2019, CMRP rolled more than 468 tons of Unistrut to complete the job.

The Google Bay View building stands as a remarkable blend of cutting-edge design and sustainability, with every detail meticulously crafted to support the future of both technology and energy conservation. CMRP's dedication, experience pushing through obstacles and ability to handle high volumes at a quick pace ensured the project stayed on track, ultimately contributing to the successful completion of a landmark building that exemplifies innovation at every level. Having a reliable partner for auxiliary project tasks like bending and rolling steel will keep your project on or ahead of schedule, even if obstacles arise. For more information about bender-roller services, visit **www.cmrp.com**.

# Nothing But (Cable) Net

BY NIC GOLDSMITH, FAIA

There are many approaches to integrating tensile membranes and steel cable nets with steel frame structures—and all strive to merge functionality with aesthetics.

**STEEL STRUCTURES** and tensile membranes have long been wedded by their complementary functions in lightweight structures.

Traditionally, steel columns acted as the compression elements supporting tensile membranes, while steel perimeter cables act in tension, picked up by the fabric forces along their long spans.

Now, in tensile structures, steel can encompass steel cable nets and their clamping systems with integrated membranes or even rigid surfaces in tensile structures. The cable nets can take severely higher loading—especially snow loads—while having the flexibility of tensile structures to handle seismic and wind loading.

Like membranes, steel cable nets are generally doubly curved using their shape as a means of resisting applied loads. They can be saddle-shaped, volcano-shaped, or parabolic and create a different spatial system than conventional constructions. They project outwards or upwards using doubly curved geometry found more often in nature than architecture.

Several types of fabrics are used for tensile structures, and each has different material properties for joining them to steel supports. Fabrics must be placed in tension for strength, and their different properties require different approaches, but all the fabric materials need to have prestress applied after they're installed. Steel doesn't have this prestress requirement, so the interface between these two materials requires more involved detailing.

Jacking is another consideration. Steel columns are often designed with an understanding of jacking systems, which can add prestress to the fabrics during installation. Jacking can be done in a few ways, but the most common method is hydraulically with threaded connections. Much like fabrics, think of steel cable nets as a tensile membrane that also requires post-tensioning to add prestress for strength. Steel frames with fixed geometries require each attached tensile portion to have its own post-tensioning system. The steel frames, cable nets, and columns can use galvanized or stainless-steel materials, which impact cost and longevity. Generally, larger steel frames or masts (larger columns) are painted, while smaller elements are either galvanized or stainless.


Watt Lighting

## A Tale of Three Cable Nets

Three recent TYLin projects demonstrate the cable-net-to-steel marriage and show different approaches. The Sun Valley Pavilion in Sun Valley, Idaho, uses a steel truss frame structure in tension to support a cable net with wood and membrane cladding. The Redmond Technology Station pedestrian bridge in Redmond, Wash., is a fabric-covered pedestrian and bike bridge that uses a combination of frame and tensile elements to span 1,200 ft in length and 50 ft in width. The Domino Square cable net uses a clamped cable net with demountable mesh fabric, providing a shade cover for events in the new Domino Square in Williamsburg, Brooklyn.

The seasonal Sun Valley Music Pavilion, the local orcestra's main venue, is inspired by its natural setting and has become a community gathering place. The pavilion is inspired by two stone walls that come together to form a stage. The bowl-shaped acoustical performance space creates an intimacy in the music hall, while tunable acoustic panels create a ceiling reflector of orchestral sound. The roof over the orchestra is a lapped wood hyperbolic paraboloid enhancing the sound chamber.

The sky and mountain are captured by the free-flowing roof, comprised of a seasonal luminous tensile membrane covering 1,500 seats and a first-of-its-kind permanent steel cable net, with a wood structure covering the stage and support facilities. TYLin worked with a local architecture firm RLB to develop the new pavilion and integrate it into the Sun Valley campus.

The cable net consists of 1-in.-diameter galvanized steel cables with four-part cast clamps, which support galvanized "shoes"


Two Trees Development

holding up 3 in. by 5 in. Douglas Fir sleepers. Those sleepers support 1¼-in. Douglas Fir shiplap sections laid on the diagonal of the hypar surface. Insulation, waterproofing, and a copper standing seam top layer complete the construction. As a technological and structural accomplishment, the facility demonstrates how permanent and seasonal structures can be integrated into one cohesive design with an ambiance that captures an interior space and an outdoor room.

The Redmond Technology Station Bridge joins Microsoft's two campuses with a 1,100-ft span that crosses more than 20 lanes of roadway and two light rail tracks. It is billed as a greener, safer way to move the tech giant's employees and community from offices to the new Sound Transit station nearby.

The bridge's improved access to offices is one of Microsoft's lures for remote and hybrid employees to work in the office more regularly. Large connecting white canopies run the length of the bridge over State Route 520, protecting pedestrians and bikers from the elements. Microsoft paid for the construction of the bridge, which features a wide walking path and two bike lanes, benches and native northwest plantings along both sides. The bridge was designed by AECOM and engineered by Kiewit Engineering Group, and TYLin designed and engineered the enclosure.

The bridge uses a combination of framed steel arches, tensile columns, and tie down rings that double as water collectors in landscaped areas. Using a spun aluminum form to nest into the steel tie down rings created a seamless gutter that feeds a cluster of rotating downspouts. It was important that water didn't run off the canopy edge, so an EPDM gutter system was developed with downspouts and each arch taking the rainwater to a cistern for collection and irrigation of the plant material on the bridge.

The detailing integrates the water collection systems, the fabric tensioning system, the interior lighting systems, and the seated hangout areas that dot the covered pedestrian and bike lanes. The steel weight of the columns and arches is minimal, at under 10 lb. per sq. ft.

The Domino Square cable net is one part of a new development on the East River waterfront in Williamsburg, highlighted by an adaptive reuse of the old Domino Sugar factory and new residential towers. In the middle of both is a new public plaza designed for different seasonal events, from ice skating in the winter to public concerts and performances in the summer.

To accommodate all requirements of the plaza's many uses, TYLin's Lightweight Structures Group developed a stainless steel cable net suspended from three masts located at the edges of the park. The net acts as permanent infrastructure with seasonal mesh fabric panels that provide shading for the public during the summer. The Z-lock cable system with clamped nodes also supports the lighting and shows rigging for different events as needed. The 6-ft mesh grid accepts prefabricated fabric mesh panels that are installed each year in the spring and demounted in the late fall.

Each project demonstrates how to combine structural fabrics and steel in a different way, from a classic tensioned membrane to tensioned cable nets with rigid cladding. Generally, the steel weight for these lightweight structures is below 10 lb per sq. ft so the material and transportation costs are low in comparison to conventional construction, offer a more sustainable approach to building, and help balance architectural intent with structural efficiency. ■

*This article is a preview of the 2025 NASCC: The Steel Conference session "Marrying Membranes to Steel Structures." To learn more about this session and others, and to register for the conference, visit* ***aisc.org/nascc****. The conference takes place April 2 to 4, 2025 in Louisville, Ky.*

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# Schedule for Success

BY EDWARD SEGLIAS

Clear scheduling—sometimes aided by an expert—and defined impact of damages are two crucial pieces of a successful delay claim.

**PROJECT DELAYS** are a part of construction life. Often, these delays are manageable and have little to no impact on the project schedule or completion date. But occasionally, delays can have a material effect on the project and can sharply increase the fabricator's shop production costs. When delay red flags start to appear, the fabricator must measure the delay's impact on its shop production schedule and account for the financial impact to its operations.

Mere measurement is often not enough. Proper measurement that will win a delay claims takes care and requires several pieces. It's important to have clear, logical and up-to-date scheduling of work activities, including steel fabrication and delivery, to allow for the proper coordination and timing of all trade work. There are many project scheduling techniques, but a common thread across all of them is including sufficient detail for the fabricator to determine timelines and delivery dates.

There is typical contract language for asserting a delay claim, and fabricators face an evidentiary burden to prove the cause and effect of a delay's impact on their shop production schedule. Some contract notification provisions and conditions require documented presentations to establish a claim's merits and establish that the fabricator is not responsible for the delay.

One way to be well-prepared to file a delay claim is to hire an experienced scheduling consultant. These individuals are trained to identify project delays and how those delays have impacted, or will impact, the fabricator's past, present, and future shop production schedule. They can help identify why the steel fabricator is not responsible for the project delay, and may, in fact, be entitled to extra compensation for the scheduling impact to its work.

But the consultant's work does not stop there. Consultants are often an integral part of the claims team, which is generally a collaborative effort with the fabricator and its attorney. The consultant will help develop the claim presentation strategy and when necessary, testify in support of the claim. They are frequently the most knowledgeable and credible witness explaining entitlement and are skilled in persuading reluctant owners, engineers, and general contractors why the steel fabricator is entitled to recovery of delay damages.

A session at 2025 NASCC: The Steel Conference will include a case study that examines how a claims consultant analyzed project-delaying events and connected them to delays in the fabrication shop and steel deliveries to the field. The consultant's work provides a defense to a general contractor's delay claim and the basis for the fabricator's affirmative cost overrun claim against the general contractor. The case study will also highlight the advantages of engaging a claims consultant early on to help present the fabricator's case to the owner or general contractor why the fabricator was impacted and how those impacts are compensable and not the fabricator's fault.

Proving an impact to a production schedule is only step one of a successful delay claim. The second step requires proof of damages with reasonable certainty. Project delays translate to inefficiencies in the fabrication shop, and those inefficiencies can increase labor hours and shop overhead costs. To prove them, it's helpful to know inefficiency factors that courts and claims consultants have recognized as causing excessive labor hours to specialty trades, including steel fabricators. Scheduling consultants and attorneys can help find which factors are most applicable to a fabricator's claim.

There are several methodologies for documenting those inefficiencies and quantifying shop labor overruns and other overhead costs. For example, because fabricators typically schedule shop

time and work in advance for multiple projects, the financial consequences of delay and disruption affect fabricators differently than on-site contractors, whose crews generally only work on one project at a time. Thus, the application of traditional damages methodologies for measuring damages is not particularly useful in showing how the off-site work of a steel fabricator was impacted by delays.

Statutory remedies under the Uniform Commercial Code and a body of case law, though, recognize the unique circumstances steel fabricators face proving the impact to their shop overhead and costs. Those costs can include increased labor costs, handling costs, storage costs and transportation costs.

The fabricator will also face challenges in the presentation of its damages claim. Those challenges can run from cost coding items of work on each project to demonstrating inefficiencies that caused, or were primarily responsible for, the fabricator's excessive labor costs when measured against its expectation at the time of bid.

A damages claim will also need to satisfy any contractual provisions that otherwise may stand as a hurdle to entitlement. Notice requirements and other clauses can also affect how and when a claim for delay damages must be submitted. ■

*This article is a preview of the 2025 NASCC: The Steel Conference sessions "Delay Claims—Do I Need a Scheduling Consultant" and "The Inefficiency Claim: How to Get Paid When Schedule Impacts Cause Extra Man-hours." To learn more about these sessions and others, and to register for the conference, visit* ***aisc.org/nascc****. The conference takes place April 2 to 4, 2025 in Louisville, Ky.*

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AISC certification sets the quality standard for the structural steel industry and is the most recognized national quality certification program. It aims to confirm to owners, the design community, the construction industry, and public officials that certified participants, who adhere to program criteria, have the personnel, organization, experience, documented procedures, knowledge, equipment, and commitment to quality to perform fabrication, manufacturing, and/or erection. Find a certified company at **aisc.org/certification**.

The following U.S.-based companies were newly certified or renewed certification in at least one category November 1 to 30, 2024.

## Newly Certified Companies (November 2024)

All Things Metal, Phoenix
Griffing Welding, LLC, Waterbury, Conn.
James & Luther, Inc., Sunland Park, N.M.
Marquez Wrought Iron, Las Cruces, N.M.
The Metal Works Inc., Lexington, S.C.
Postel International Inc., Livingston, Texas
Steel Skies LLC, Hyde Park, Vt.
V&S Schuler Engineering, Inc., Middlefield, Wisc.

## Certification Renewals (November 2024)

A. Lucas & Sons Steel, Peoria, Ill.
ADF International Inc., Great Falls, Mont.
Affton Fabricating & Welding Co., Inc., Sauget, Ill.
Alberici Constructors, Inc., St. Louis
Albert Freytag Inc., Minster, Ohio
Alfredo's Iron Works, Inc., Cortland, Ill.
Allen Builders LLC, Colorado Springs, Colo.
All-Trade Construction Company Inc., Palmerton, Pa.
Amscot Structural Products Corporation, Dover, N.J.
Apel Steel Corporation, Cullman, Ala.
ARC Steel Enterprises, LLC, Winnsboro, S.C.
AspiredX, Dalton, Ohio
Avenue Fabricating, Inc., Batavia, Ohio
B&B Iron Works, Inc., Clifton, N.J.
Baker Industrial Fabrication, Frederick, Colo.
Banker Steel Co. LLC, Orlando, Fla.
Banker Steel NJ, LLC, South Plainfield, N.J.
Battle Born Steel LLC, Las Vegas
BCS Fabrication, Loveland, Colo.
Bear Ridge Machine & Fabrication, Frackville, Pa.
BendTec, LLC, Duluth, Minn.
Berlin Steel/Pillar Enterprise Ltd., White Post, Va.
Berlin Steel Construction Company, Kensington, Conn.
Berlin Steel/FEI Ltd., Natural Bridge Station, Va.
Blouin Steel Fabricators, Inc., Northfield, N.H.
Blue Atlantic Fabricators, LLC, East Boston, Mass.
BOSS Steel Inc, Lawrence, Mass.
Bountiful Enterprises, Humansville, Mo.
Bracken Construction Company, Inc., Columbus, Miss.
Brookfield Fabricating Corporation, Brookfield, Mo.
Building Erection Services Co., Kansas City, Mo.
Building Zone Industries, Kanarraville, Utah
C.A. Hull, Commerce Charter Township, Mich.
CT&S Metalworks, Irving, Texas
Canam Bridges US Inc., Claremont, N.H.
Charleston Steel, Dunbar, W.V.
Chicago Steel Construction, LLC., Merrillville, Ind.
Citadel Steel Erectors Inc., Apex, N.C.
Clausen Structures, Inc., Lockport, Ill.
Columbia Machine Works, Inc., Columbia, Tenn.
Commercial Contracting Corporation, Auburn Hills, Mich.
Construction Resources Group, Russellville, Ark.
County Fabricators, LLC, Pleasantville, N.Y.
Covington Machine and Welding, Inc., Annapolis, Md.
CSE, Inc., Madison Heights, Va.
Cutting Edge Welding and Fabricating, Inc., Saint Augustine, Fla.
Dean Steel Erection Company, Inc., Rockingham, Va.
DeAngelis Iron Work, Inc., South Easton, Mass.
DeLong's, Inc., Jefferson City, Mo.
DeLong's, Inc., Sedalia, Mo.
Delta Steel Inc., Saginaw, Mich.
Delvania Industrial Fabrication Inc., Pine Forge, Pa.
Drake-Williams Steel Inc., Aurora, Colo.
Duo-Gard Industries, Plymouth, Mich.
Dura-Bond Steel Corporation, Export, Pa.
E&H Steel Corporation, Midland City, Ala.
E&R Erectors, Inc., Bensalem, Pa.
Elite Welding & Industrial Services LLC, Millwood, Ky.
Ellis Steel Company, Inc., West Point, Miss.
EMIT Technologies, Inc., Greeley, Colo.
Endres Manufacturing Company, Waunakee, Wisc.
Engineered Building Products, Inc., Bloomfield, Conn.
Engineered Steel Products, LLC, Sophia, N.C.
Environmental Air Systems, LLC, High Point, N.C.
Erectors Plus Inc., Ozark, Mo.
ESI Steel & Fabrication, Salem, Ill.
EW Corporation Industrial Fabricators, El Centro, Calif.
Excel Bridge Manufacturing, Olancha, Calif.
Extreme Steel, Inc., Winchester, Va.
Fabcor, Inc., Jessup, Pa.
Forest City Erectors, Inc., Twinsburg, Ohio
Forney Welding Inc., Albuquerque, N.M.
Foster Steel LLC, New Orleans
Fought & Company, Tigard, Ore.
Front Range Steel, Inc., Wellington, Colo.
Future Fabricating, Warren, Mich.
G&G Steel, Inc., Cordova, Ala.
G&G Steel, Inc., Russellville, Ala.
Gabriel Steel Erectors, Inc., Montgomery, N.Y.
General Foundries Inc., North Brunswick, N.J.
Gerace Construction Company, Inc., Midland, Mich.
Germantown Iron & Steel Corporation, Jackson, Wisc.
Golden State Bridge, Inc., Benicia, Calif.
GP East Steel Co., Wareham, Mass.
Hallmark Iron Works, Inc., Newington, Va.
Hanley Steel, Inc., Peoria, Ill.
Haven Steel Erectors Inc., Hamden, Conn.
HHI Corporation, Ogden, Utah
Highland Steel, LLC, Harmony, N.J.
Highway Safety LLC, Glastonbury, Conn.
Hillsdale Fabricators, an Alberici Enterprise, St. Louis
Howard W. Pence Inc., Elizabethtown, Ky.
Hubbard & Drake General/Mech Cont. Inc., Decatur, Ala.
Huntington Steel & Supply Company, Huntington, W.V.
Hursh Iron Works, Center City, Minn.
Imperial Construction Associates, Inc., Joliet, Ill.
Imperial Iron Works Inc., Mahwah, N.J.
Independence Erectors, Chester, Pa.
Indiana Bridge, Inc., Muncie, Ind.
Industrial Door Contractors, Inc., Columbia, Tenn.

Industrial First, Inc., Cleveland
Integrated Structures Corp. Erector, Bellport, N.Y.
Iowa Specialties Inc., Cedar Rapids, Iowa
IPC Lydon, LLC, Avon, Mass.
J&M Steel Erectors, LLC, Middlefield, Conn.
J.B. Steel & Precast, Inc., Loganville, Ga.
J.D. Eckman, Inc., Atglen, Pa.
James A. McBrady, Inc., Scarborough, Maine
JGM Fabricators & Constructors, LLC, Coatesville, Pa.
JGM Fabricators & Constructors, LLC, Sinking Spring, Pa.
Kansas City Steel Werx, Inc., Kansas City, Mo.
Kard Welding, Inc., Minster, Ohio
KDM Steelworks Inc., Loveland, Colo.
Kelley Steel Erectors, Inc., Bedford, Ohio
Kenvil United Corp., Mine Hill, N.J.
Kinsley Steel, Inc., York, Pa.
Kraemer Brothers, LLC., Plain, Wisc.
Kraemer North America, LLC, Plain, Wisc.
KWH Constructors, Inc., Issaquah, Wash.
L&L Construction, Inc., Quakertown, Pa.
L&M Fabrication & Machine, Inc., Bath, Pa.
L. Liberato Steel Fabricating Co., Inc., Spring City, Pa.
Landscape Structures Inc./SkyWays Division, Dallas
Liberty Erection Inc., Independence, Mo.
Lico Steel, Inc., Kansas City, Mo.
M.S. Iron Works Inc., Rock Tavern, N.Y.
Mac Products Inc, Kearny, N.J.
Martin Steel Fabrication Inc., Mascoutah, Ill.
McGregor Industries, Inc., Dunmore, Pa.
Mechanical & Industrial Steel Services, Inc., Channahon, Ill.
Merrill Steel, Springfield, Mo.
Metal Arts, LLC, Wichita, Kan.
Metal Solutions, Ault, Colo.
Metro Steel Fabricating, Inc., Denver
Mid-Park Highway, Leitchfield, Ky.
Millennium Steel Inc., Fishers, Ind.
Missouri Fabricators, Fulton, Mo.
Mohawk Metal, Eugene, Ore.
Mull Iron, Rittman, Ohio
Nan, Inc., Honolulu
National Erector's Group, LLC, Norfolk, Va.
National Metals, LLC, Deforest, Wisc.
New Horizon Steel, LLC, Chicago
Norco Manufacturing, Inc., Caledonia, Wisc.
North Alabama Fabricating Company, Cullman, Ala.
North Alabama Fabricating Company, Inc., Glen Allen, Ala.
Northwest Steel Erection Inc., Des Moines, Iowa
Northwest Steel Fab, Inc., Deer Park, Wash.
Nova Group, Inc., Napa, Calif.
NUCOR Skyline Steel, Luka, Miss.
Nucor Vulcraft, Fort Payne, Ala.
Ohio Structures, Inc., Berlin Center, Ohio
Orange County Ironworks, LLC, Montgomery, N.Y.
O'Rourke & Sons, Inc., West Chester, Pa.
Osborne Welding, Inc., Portsmouth, Va.
PCL Civil Constructors, Inc., Tampa
Pelet Welding, Inc., Coatesville, Pa.
Penn Steel Fabrication, Inc., Bristol, Pa.
Performance Contractors, Inc., Irvington, Ala.
Petersen Inc., Ogden, Utah
Petersen Inc., Pocatello, Idaho.
Phoenix Manufacturing, LLC, Glasgow, Mo.
Pioneer Pipe Inc., Marietta, Ohio
Pleasant Mount Welding, Inc., Carbondale, Pa.
Precision Welding & Fabrication Inc., Westbrook, Maine
Premier Fabrication LLC, Congerville, Ill.
Pro Manufacturing, Albert Lea, Minn.
PSP Industries, Fulton, Miss.
PSP Industries/Monotech of Mississippi, Luka, Miss.
QSR Steel Corporation, Hartford, Conn.
Qualico Steel Co., Inc., Webb, Ala.
Quinco Contracting and Maintenance, Inc., Sellersville, Pa.
R&D Steel Erectors LLC, Starke, Fla.
R.T.I. Fabrication, Inc., Plains, Mont.
Railroad Construction, Paterson, N.J.
Red Cedar Steel Erectors, Inc., Mequon, Wisc.
Regional Steel Products, Inc., Semmes, Ala.
Rens Welding & Fabricating, Inc., Taunton, Mass.
RK Specialties, Inc., Henderson, Colo.
Rohn Products LLC, Peoria, Ill.
Roma Steel Erection, Inc, Camden, N.J.
Rozell Industries, Inc., Queensbury, N.Y.
S.A. Halac Iron Works, Inc., Sterling, Va.
S.O.S. Steel Co., Inc., Santa Clara, Calif.
Sabre Industries, Bossier City, La.
Safety Guard Steel Fabricating, Pittsburgh
Schmidt Steel, Elgin, Ill.
Scougal Rubber Corporation, McCarran, Nev.
Skyhook Erecting, Humansville, Mo.
SL Chasse Steel, Hudson, N.H.
SL Chasse Steel, Hudson, New Hampshire
Snyder Engineering, Inc., Columbia, Mo.
SOFCO Erectors, Inc., Cincinnati
Somerset Steel Erection Company, Inc., Stoystown, Pa.
Sophia Technifab Services, Inc., Sophia, W.V.
SOS Steel Co., Inc., Santa Clara, Calif.
Soucy Industries Inc., Pelham, N.H.
Southern Spear Ironworks, LLC, Chattanooga, Tenn.
Southern Structural Steel Inc, Smithfield, Va.
Southwest Ironwork, Inc., Albuquerque, N.M.
Standard Iron Works, Scranton, Pa.
Stateline Fabricators LLC, Harmony, N.J.
Steel Fab Enterprises, Inc., Lancaster, Pa.
Stone Steel, LLC, Cookeville, Tenn.
Stonebridge Inc., South Plainfield, N.J.
Structural Rubber Products, Springfield, Ill.
Structural Steel & Plate Fabrication, Inc., North Salt Lake, Utah
Stud Welding, Inc., Centerville, Tenn.
Stupp Bridge Company, Bowling Green, Ky.
Suffolk Iron Works Inc., Suffolk, Va.
Superior Steel, Inc., Knoxville, Tenn.
Swanson Steel Erectors Inc., Honolulu
SWF Industrial, Wrightsville, Pa.
Thomas Lindstrom & Co, Inc., Cinnaminson, N.J.
Thompson Construction Group, Inc., Sumter, S.C.
Tidewater Crane & Contracting, Virginia Beach, Va.
Tippen Steel Services, Boyd, Texas
Tipton Structural Fabrication, Inc., Tipton, Iowa
Titan Industries, Inc., Deer Creek, Ill.
Tomrook Steel, Bardstown, Ky.
Top Flight Steel, Inc., Rhome, Texas
Total Welding, Inc., Bennett, Colo.
Trans Bay Steel Corp., Albany, Calif.
Troy Industrial Solutions, Brewer, Maine
TrueNorth Steel, Fargo, N.D.
TrueNorth Steel, Lubbock, Texas
TrueNorth Steel, Mandan, N.D.
TrueNorth Steel, West Fargo, N.D.
Tuscarora Rigging Inc, Huntingdon, Pa.
Tymetal Corp, Greenwich, N.Y.
U.S. Bridge, Cambridge, Ohio
United Ironworkers, Inc., Steeleville, Ill.
United Steel, Inc., East Hartford, Conn.
United Weld Services, LLC, York, Pa.
Universal Steel, Inc., Lithonia, Ga.
Unlimited Steel, Inc., Draper, Utah
Valley Mechanical, Inc., Rossville, Ga.
Valmont Industries, Inc., Claremore, Okla.
Valmont Industries, Inc., Jasper, Tenn.
W&W | AFCO Steel, Greeley, Colo.
Weaver Steel Construction, LLC, St. Peters, Mo.
Weir Welding Company, Bethlehem, Pa.
Williams Steel Co., Jackson, Tenn.
WMK, Kalispell, Mont.
Wylie Steel Fabricators, Inc., Springfield, Tenn.
Zalk Josephs Fabricators, LLC, Stoughton, Wisc.
Zimkor LLC, Littleton, Colo.
Zimmerman Metals, Inc., Denver

IN MEMORIAM

## AISC Remembers Fabrication Industry Icon Barry Barger

Barry Barger, an AISC Special Achievement Award winner and five-decade fabrication industry veteran, died November 21 at age 79.

Barger spent 40 years at Southern Iron Works, Inc. in Springfield, Va., and retired as the company's senior vice president of operations. He began his career at Fred S. Gichner Iron Works and moved to Jarvis Steel Company before taking a job at Southern Iron Works. He was a prominent figure in the steel industry and sat on several AISC committees, including stints as vice chair of the Committee on Manuals and Textbooks and the Committee on the Code of Standard Practice. He earned his AISC Special Achievement award in 2002 for his role in developing the 2000 AISC *Code of Standard Practice for Steel Buildings and Bridges*.

"Barry had a passion for our industry, and it led him to contribute generously of his knowledge and wisdom," said AISC president Charles J. Carter, SE, PE, PhD. "He knew the technical and the commercial—a rare combination—and made the AISC *Steel Construction Manual* and the *Code* better for having him as a committee member for both."

Barger was born in Hagerstown, Md., and completed his bachelor's degree in structural engineering at Johns Hopkins University. He was preceded in death by his wife, Linda, and his parents, Virginia and John Barger. He is survived by his children, Lori (Jeff), Sheri (Kurt), and his grandchildren, Kelly (Chase), Madison, Sarah (Asher), and Alexandra. He is also survived by his brother, Darryl, sister-in-law, Donna, and their children, Jessica and DJ.

IN MEMORIAM

## AISC Remembers Prominent Engineer Ed Grebe

Ed Grebe, a prominent part of the steel design community for more than 50 years, died October 29. He was 93.

Grebe was a constant presence at NASCC: The Steel Conference and attended more than 50 iterations of the event.

"Ed's blessing was his dedication and staying power," AISC senior director of engineering Tom Schlafly said. "I used his services a few times and he was accurate and aware and provided reliable solutions. He was always a joy to speak to and somebody to look forward to seeing at every conference for many years."

Grebe began his career at Wisconsin Bridge and Iron Company, where he worked for more than 25 years and became its chief engineer. He left to establish his own engineering firm, Edward A. Grebe, PE, which he ran until retiring at age 88. He served as the engineer of record on projects across the country. He was a Life Member of the American Society of Civil Engineers and the National Society of Professional Engineers.

"I've missed seeing Ed for a few years now at the conference," said AISC president Charles J. Carter, SE, PE, PhD. "I believe the last one he attended was in St. Louis. He rarely missed it. Even long into his retirement, he valued the chance to see people, see what's new, and learn.

"I remember when we started making stickers with numbers so NASCC attendees could display how many years they had attended on their name badges. We made Nos. 1 through 24 and then had a 25+, thinking anyone who had been to 25 or more would just use that one. When I first ran into Ed that year, I saw he had put three stickers on his name badge: 25+, 25+, and 4. That's the kind of engineer Ed was."

Grebe graduated from Marquette University with a bachelor's in engineering and holds a master's in civil engineering from the University of Wisconsin. He is survived by his wife, Callie, three sons, eight grandchildren, and six great-grandchildren. He is further survived by his brother, Dick, sister-in-law, Marge, and numerous nieces, nephews, grand-nieces, and grand-nephews.

## People & Companies

**FabArc Steel Supply, Inc.**, Alabama's largest steel subcontractor and an AISC full member fabrication facility, has transitioned to 100% employee ownership by establishing an Employee Stock Ownership Plan (ESOP). The company has appointed **Tom Adams** as chair, CEO, and President to guide its future direction. The ESOP will provide FabArc Steel Supply employees with a financial stake in the company's success while promoting long-term stability. Over time, company stock will be allocated to both current and future employees, assisting with retirement planning and aligning employees' interests with FabArc Steel Supply's goals. This ownership model strengthens employee engagement and enhances the company's promise to delivering superior service and exceptional results for its clients.

Adams brings more than 40 years of experience in steel and bridge fabrication. He joined the company in 2012 and has been instrumental in shaping its reputation for quality and innovation. In his new role, Adams will oversee the company's strategy, focusing on driving continued growth and improving operational efficiency.

NASCC: The Steel Conference is a prime opportunity for students to connect with steel industry professionals and employers. In addition to 300-plus technical sessions, a giant exhibit hall, and unmatched networking opportunities, The Steel Conference offers programming specifically for university-level students.

Registration for The Steel Conference is FREE for AISC student members, and student members may even qualify for up to $175 in travel reimbursement. Apply for student membership (application is free) and learn about all student offerings at **aisc.org/nasccedu**. Don't miss the Students Connecting with Industry Sessions and other student benefits: register for The Steel Conference—held April 2 to 4, 2025 in Louisville, Ky.—at **aisc.org/nascc**.

**AWARDS**

## University of Texas Professor Earns AISC's Top Educator Honor

Professor Emeritus Karl H. Frank, PE, PhD, became a legend during his 36 years at the University of Texas at Austin—and his impact continues today. AISC is proud to present him its most prestigious honor for educators: the 2025 Geerhard Haaijer Award for Excellence in Education, an award given only nine prior times since 1999.

Frank has made enormous contributions to structural stability, durability of steel structures, connections, fabrication, added stay cables, and inspection. His committee work, consulting, and continuing education for practicing engineers continue to shape the future of American infrastructure—and that's not including the impact that ripples out from his work advising or mentoring many of today's leaders in steel bridge design, fabrication, and research.

"It's not an overstatement to say that today's steel bridge industry is what it is thanks to Karl, his research, and the engineers he inspired along the way," said AISC President Charles J. Carter, SE, PE, PhD. "AISC rarely presents the Haaijer Award, and it's hard to think of anyone more deserving than Karl Frank."

During his tenure at UT Austin, Frank directed the Ferguson Structural Engineering Laboratory and the Maglev Guideway Research Center. He is a nationally recognized leader in structural mechanics, and his own research largely focused on fatigue and fracture behavior.

Frank has served on many committees within the American Society of Civil Engineers (ASCE), the Research Council on Structural Connections, the Transportation Research Board, the American Welding Society, and the American Railway Engineering and Maintenance-of-Way Association. His numerous honors include the International Bridge Conference's 2019 John A. Roebling Medal, a 2011 AISC Lifetime Achievement Award, and ASCE's 1981 Raymond C. Reese Research Prize and 1999 J. James R. Croes Medal.

Frank is a registered professional engineer in Texas. He holds a bachelor's degree from the University of California at Davis and a doctorate and a master's degree from Lehigh University. AISC will present Frank the award in Louisville, Ky., on April 2, 2025, at the opening session of NASCC: The Steel Conference.

**SEAA**

## Registration Open for SEAA Convention and Trade Show

The Steel Erectors Association of America (SEAA) will host its 52nd Convention and Trade Show from May 6 to 9 in Pittsburgh, Pa., at The Landing Hotel at Rivers Casino. The event will bring together industry professionals for networking, education, and exciting excursions.

"Our annual convention is an unmatched opportunity for networking, learning, and industry engagement for steel construction business owners and managers," SEAA executive director Pete Gum said. "We encourage members to register early, as hotel space is limited and high demand is expected with major events happening in Pittsburgh."


This year's convention has several bonus opportunities for networking on top of the usual receptions and peer group discussions. Full access registration includes a sightseeing cruise on the Gateway Princess, a paddle wheel riverboat on May 6 and tickets to see the Pittsburgh Pirates play the Atlanta Braves on May 9 at PNC Park, named by *USA Today* as the best ballpark in Major League Baseball.

Attendees can look forward to education sessions designed to address key issues affecting construction processes and safety as well as gain insights into new tools and tech and tips for better business management. Keynote speaker Matt Eversmann, First Sergeant (Ret.), will deliver a powerful presentation titled "Strategic Shock: Leadership Lessons from Black Hawk Down," sharing insights into navigating unpredictability and leading through challenges.

The convention will also feature panel discussions with award winning member companies and peer-led small group discussions on bidding for projects, risk management, and social media.

The trade show, held Wednesday night and Thursday morning, will feature about 70 exhibitors featuring the latest safety gear, software, and other solutions for steel erectors. Exhibitors receive two full access registrations (valued at $1,700) per booth and are encouraged to participate in networking activities throughout the week. Exhibitor registration includes the riverboat cruise, president's dinner, and baseball game.

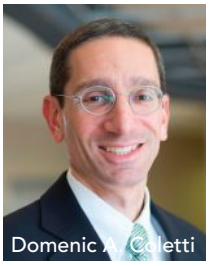
Excursions include the George R. Pocock Memorial Golf Tournament at Quicksilver Golf Club, and a Pickleball Tournament at LevelUp Pickleball Club.

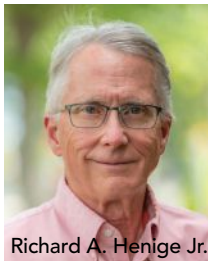
Discounts on registration are available until February 28. For full event details and to register, visit **www.seaa.net**.

AWARDS

# AISC to Honor 13 Outstanding Designers, Industry Professionals, and Educators


J. Kenneth Charles


Domenic A. Coletti

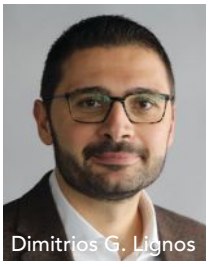

Richard A. Henige Jr.


Judy Liu

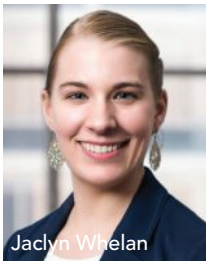

John W. O'Quinn


Amit H. Varma

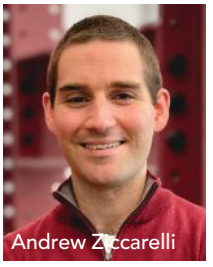

Karl E. Barth


Dimitrios G. Lignos


Mark Waggoner


Jaclyn Whelan


Andrew Sen


Andrew Ziccarelli

AISC is honoring 13 designers, industry professionals, and educators for their extraordinary contributions to the steel industry. Twelve AISC annual awards will be presented at the NASCC: The Steel Conference opening session on April 2 in Louisville, Ky., and as mentioned on Page 63, **Karl H. Frank, PE, PhD**, will receive the Geerhard Haaijer Award for Excellence in Education at the same time.

### Lifetime Achievement Awards

AISC's Lifetime Achievement Awards recognize living individuals who have made a difference in the success of AISC and the structural steel industry.

- **J. Kenneth Charles**, managing director, Steel Joist Institute and Steel Deck Institute, for advancing the use of steel, working tirelessly to provide education and guidance to engineers and contractors, and serving on the NASCC: The Steel Conference planning committee
- **Domenic A. Coletti, PE**, principal professional associate, HDR, for his leadership in the bridge industry for more than three decades, and seminal work on the AASHTO/NSBA Steel Bridge Collaboration "Guidelines for Steel Girder Bridge Analysis" 1st and 2nd Editions
- **Richard A. Henige Jr., SE, PE**, principal, LeMessurier Consultants, for being one of the nation's leaders in both seismic and stability design of steel structures over the course of 43 years in the industry
- **Judy Liu, PhD**, professor, Oregon State University, for her teaching and mentorship of students and other faculty as well as leadership and service on AISC technical and education committees
- **John W. O'Quinn**, president, High Steel Structures, for his contributions to the bridge industry during the past four decades, including helping chart a successful path forward for the National Steel Bridge Alliance and serving as a media spokesperson for the bridge industry
- **Amit H. Varma, PhD**, the Karl H. Kettelhut Professor in the Lyles School of Civil & Construction Engineering, Purdue University, for his research and contributions in steel-concrete composite construction, fire design, and nuclear structures, as well as leadership and service on several AISC committees

### Special Achievement Awards

These awards recognize individuals who have demonstrated notable singular or multiple achievements in structural steel design, construction, research, or education.

- **Karl E. Barth, PhD**, associate professor, West Virginia University, for his leadership in developing the press brake tub girder system for bridge construction
- **Dimitrios G. Lignos, PEng, PhD, M.SSRC**, professor of civil engineering, École Polytechnique Fédérale de Lausanne, for his efforts in creating RESSLab Hub, an open-access database and models used in the design and assessment of steel and composite structures
- **Mark Waggoner, PE**, managing principal, Walter P Moore, for his outstanding work on innovative long-span roof design
- **Jaclyn Whelan, PE**, project manager–design, Conrail, for leading the joint AREMA/NSBA task group that developed the AREMA/NSBA *Constructability Guide for Steel Railroad Bridges*

### Terry Peshia Early Career Faculty Awards

These awards are named for the late president of Garbe Iron Works in Aurora, Ill., who served with great distinction in many industry leadership roles and on the AISC Board of Directors. They recognize young professors who demonstrate promise in structural steel research, teaching, and other industry contributions.

- **Andrew Sen, PhD**, assistant professor, Marquette University, the principal investigator of National Science Foundation projects seeking to transform concentrically braced frame design practice in high-seismic regions to ensure the resiliency, versatility, and longevity of steel building infrastructure while balancing practical economic constraints
- **Andrew Ziccarelli, PhD**, assistant professor, North Carolina State University, for research that focuses on using advanced structural analysis techniques to increase understanding of the fundamental behavior of steel components at extreme limit states. The research will allow the steel industry to develop more reliable design provisions and provide engineers with tools to more accurately assess the capacity of steel structures

## advertiser index

# Continuing Education Central

**DO SINGLE ANGLES** in flexure get you bent out of shape? AISC has a solution to make it easier and more enjoyable for early career engineers who encounter them in projects.

Single angles in flexure is a challenging topic and an often-used technique that has been around almost as long as structural steel. It will be addressed in the April 15 AISC Night School session led by Louis F. Geschwindner, PE, PhD, AISC's former vice president of engineering and research and professor emeritus of architectural engineering at Penn State. It's also one of eight topics covered in the Night School course "Steel Design After College."

The course presents common design topics in real-world design that young engineers may not have learned in college classes. Starting February 18, the course brings participants up to speed on useful steel design topics engineers typically learn in their first few years on the job. Instead of learning on the job over five to ten years, let AISC's experts teach you in one concise course.

University professors do an incredible job giving fledgling engineers a solid grounding in how steel behaves and introducing the *Specification for Structural Steel Buildings* (ANSI/AISC 360-22) and 16th Edition AISC *Steel Construction Manual*. But there's only so much that professors can squeeze into a syllabus, as many engineers discover when they begin their first job. Geschwindner and other industry experts will pick up where those dedicated professors left off. The eight Night School sessions cover:

- Base plates and anchor rods
- Lateral load considerations for design of steel members
- Design of cantilever and overhanging beams as well as single angles in flexure
- Composite beams
- Load path
- Connection design
- Verifying computer analysis results

Night School enrollees can earn up to 12 PDHs, and the program's flexible registration option allows participants to view session recordings for weeks after the live air date if the 7:00 p.m. Eastern Time live broadcast time does not fit their schedule. Register for Night School, AISC's daytime webinars, and other continuing education resources at **aisc.org/learning**.

NASCC: The Steel Conference is another prime opportunity for engineers, fabricators, and other construction professionals to learn about anything and everything related to structural steel. Attendees at this year's conference—held April 2 to 4 in Louisville, Ky.—can add up to 16 PDHs, while those who register for online attendance can earn up to 13. Register for the conference at **aisc.org/nascc**, and register early for the best pricing. Want to see what The Steel Conference is all about? Session recordings from previous conferences are also available at **aisc.org/learning**. ■

# Covered—like a blanket of snow.

## AISC Continuing Education

In February, we'll have you knee-deep in knowledge and PDHs with two daytime webinars and the start of a Night School course. So grab that shovel and pile up some PDHs!

## Live Webinars

NSBA Webinar:
Built-Up Press Brake-Formed Tub Girders
presented by Ashley Thrall
February 4 | 1.5 PDHs

Weld Inspection:
What Matters and What Doesn't
presented by Duane Miller
February 6 | 1.5 PDHs

## Night School Course

Steel Design After College
up to 12 PDHs

2/18: Base Plates and Anchor Rods
–Adam Friedman

2/25: Lateral Load Considerations for Design of Steel Members
–Emily Guglielmo

3/4: Design of Cantilever and Overhanging Beams
–Bo Dowswell

3/11: Practical Composite Beam Design
–Susan Burmeister

3/18: Load Path of Steel-Framed Buildings
–Susender Muthukumar

3/25: Connection Design
–Mara Braselton

4/15: Design of Single Angles in Flexure
–Louis F. Geschwindner

4/22: Computer Analysis Verification
–Clifford Schwinger

**aisc.org/learning**

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