Modern Steel Construction

August 2025

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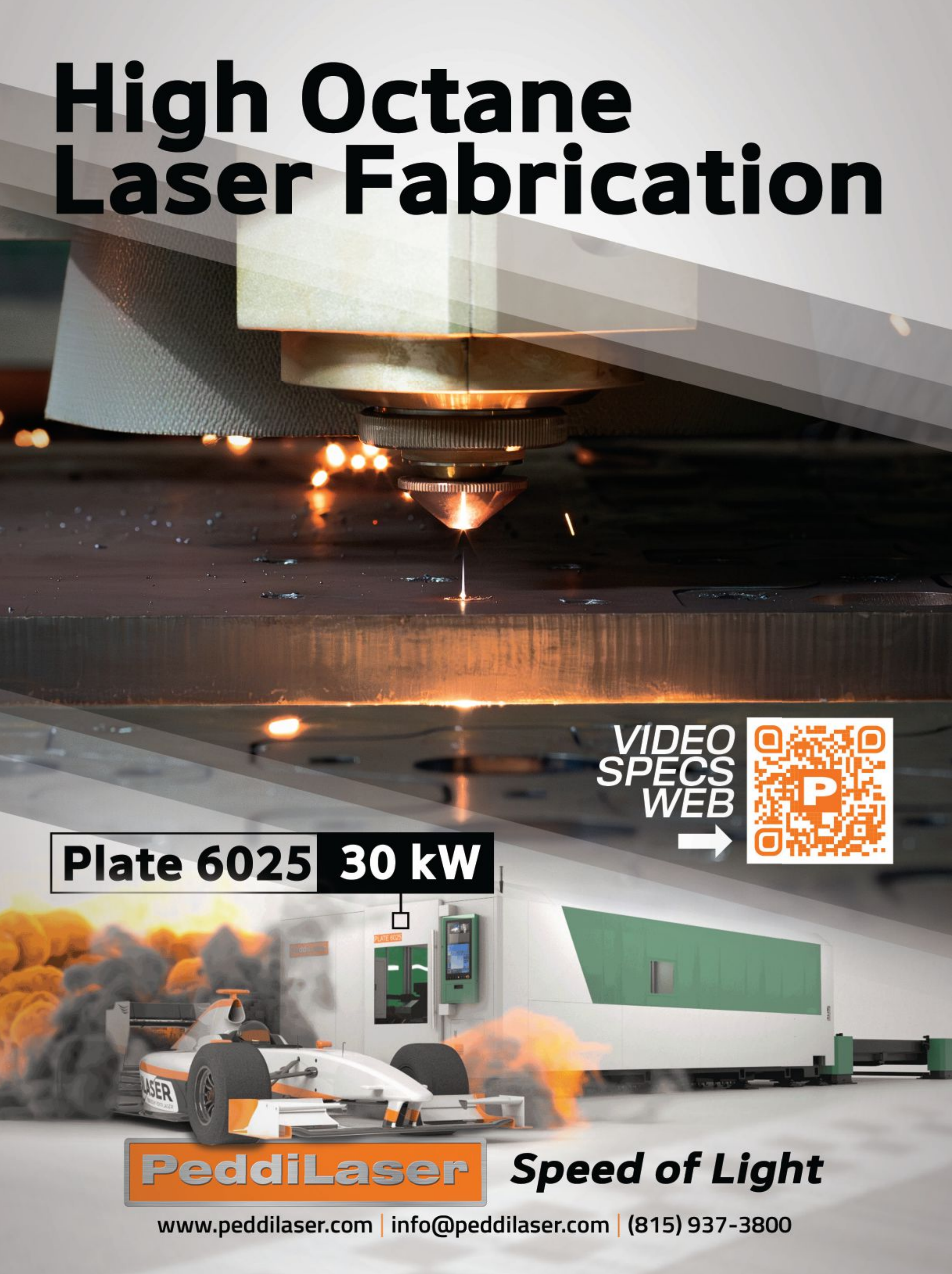
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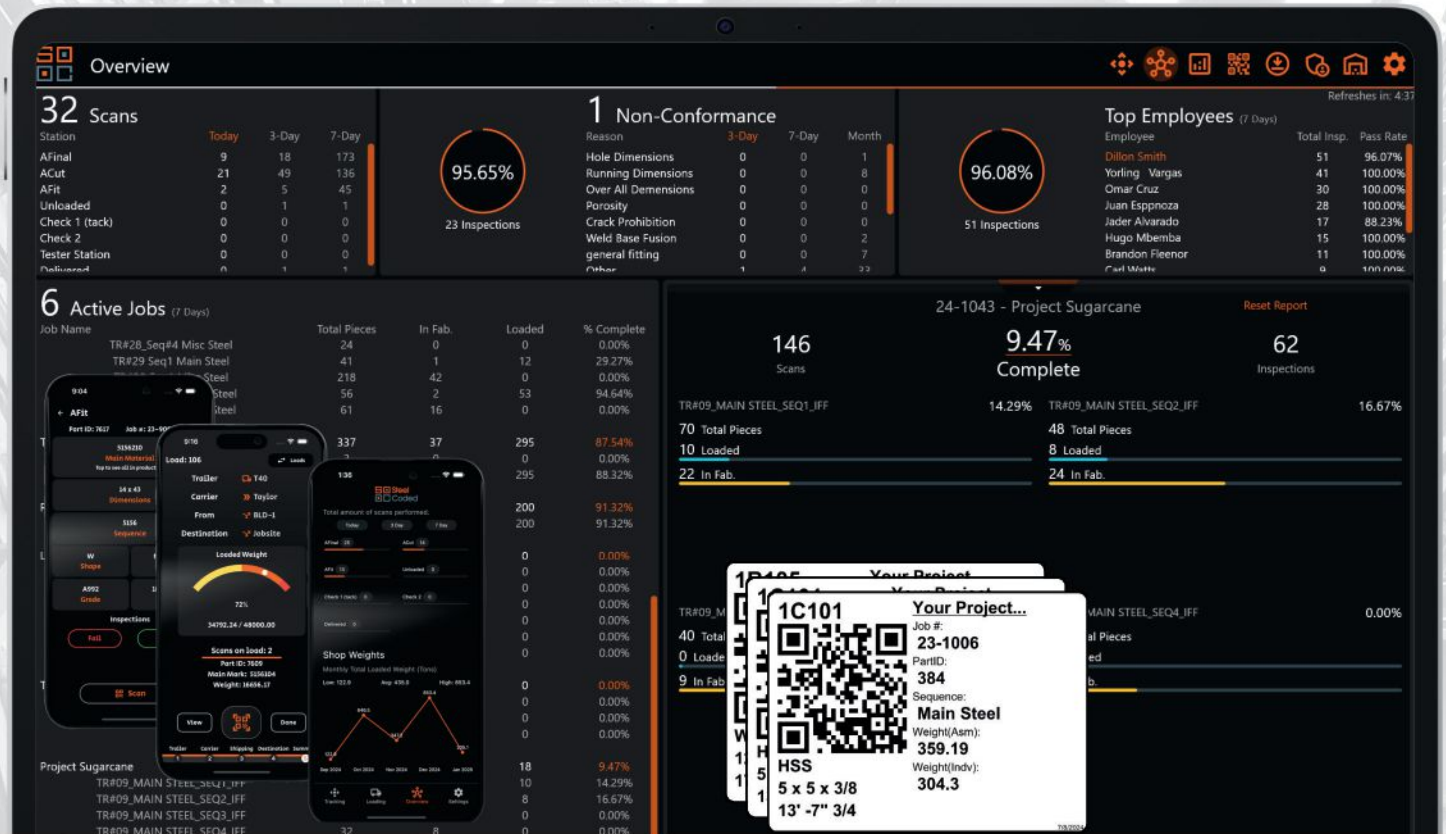

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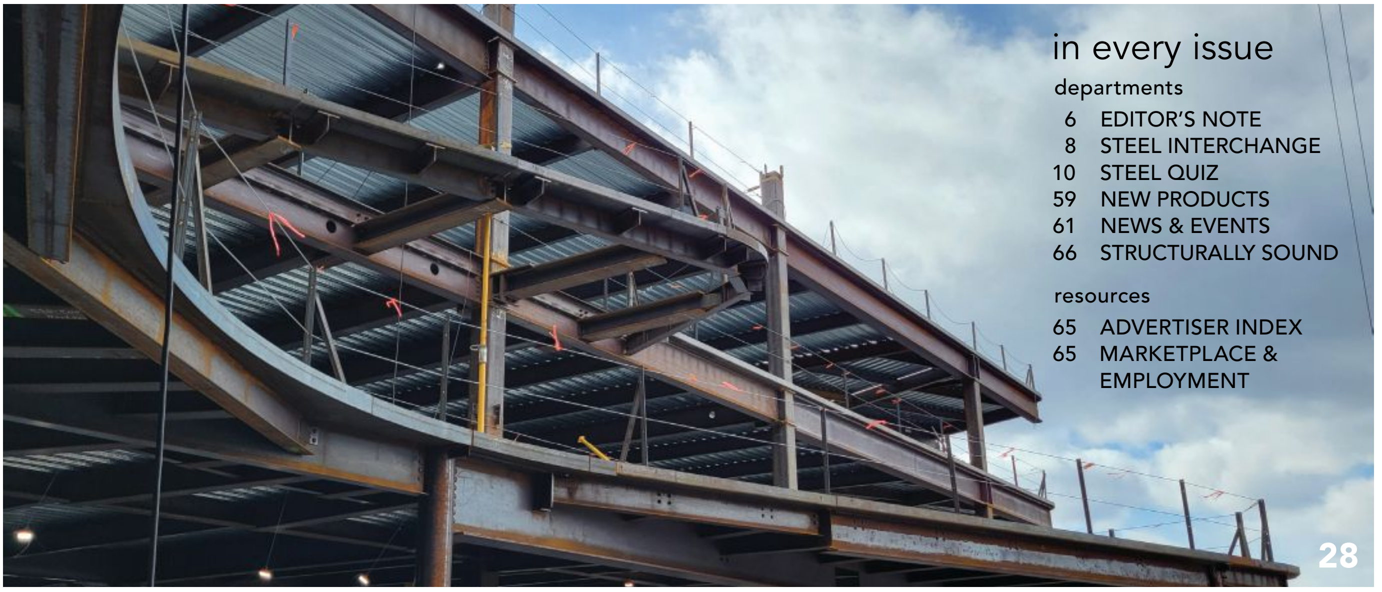

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columns

ON THE COVER: The Pittsburgh International Airport terminal roof is supported by 38 AESS tree columns, p. 22. (Image: Thornton Tomasetti)

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What's wrong with this picture?

If you're a regular reader of this column and magazine—and I certainly hope you are—you may have noticed I occasionally mention my alma mater, the University of Iowa.

So why on earth am I taking a selfie with Cy the Cyclone, the blazingly red and frantic-looking mascot of rival school Iowa State University instead of Herky the Hawk or even Hawkeye Elvis (Google him)? Did I lose a bet—or my mind? Did we engage in a beer pong match for state supremacy immediately following this photo? Did I jump on the Cyclone bandwagon after their football team (narrowly) beat Iowa last fall and won more than nine games in a season for the first time in school history—a feat the Hawkeyes have accomplished eight times this century?

No to all of these. The simple facts are that Iowa State a) is a great school and b) was a consummate host of the 2025 AISC/ASCE Student Steel Bridge Competition National Finals in late May. I don't have enough good things to say. They knocked it out of the park. The indoor facility for the main competition was an ideal venue, and things ran as efficiently as I've ever seen at a National Finals event. The quad where all 43 qualifying teams put their bridges on display for the aesthetics portion was idyllic, and the weather was perfect for a late spring day. On that note, if you ever visit the campus—perhaps with a family member looking to attend the school's civil engineering program—take a gander at the Marston Water Tower, the first elevated steel water tank built east of the Mississippi River, as well as the statue of Jack Trice, the student athlete for whom the school's football stadium is named; his story is tragic and moving.

It wasn't just the host that impressed but also all of the volunteers and sponsors—to whom I and AISC offer our sincere thanks and appreciation—and, of course, the hundreds of students who put countless hours of hard work into perfecting their bridges to ready them for the main event, as well as their cheering sections who traveled many, many miles to support them. The teams ranged from first-time qualifiers for the national finals to perennial favorites and champions, and from smaller, regional schools to massive flagship institutions.

In fact, one of my favorite moments from the competition—where I served as a bridge marshal, leading two teams through the competition—was seeing the University of Tennessee team cheering on its much smaller in-state neighbor, Lincoln Memorial University, whose team made the national finals for the first time, from the adjacent build lane. The build portion of the competition is always the most exciting thing to witness, and this year's fastest build time was just over four-and-a-half minutes, achieved by Penn State University, Harrisburg. That was the other team I had to honor to marshal, and it was amazing to see how quickly their bridge came together. I felt like I turned my back for a second, and then I looked back and it was done.

You can read all about the competition and the top teams in every category, and see plenty of photos, starting on page 40. We've also posted plenty more photos in the **Project Extras** section at **www.modernsteel.com** (scroll down until you see it).

If you're interested in attending, sponsoring, or volunteering for next year's SSBC National Finals, set to take place at the University of Texas, El Paso, or any of the regional competitions, visit **aisc.org/ssbc**. And congratulations to all of this year's participants!

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steel interchange

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

Alternate Bolt Dimensions

ASTM F3125 permits "dimensions which differ from the requirements of this specification, such as modified head geometry or special thread lengths that do not meet the requirements of section S1… when requested by the customer." Are bolts with alternate dimensions addressed in the *RCSC Specification for Structural Joints Using High-Strength Bolts*?

Yes, they would be considered "Alternative-Design Bolting Components, Assemblies, and Methods" as discussed in Section 2.12 of the *RCSC Specification*.

First, note that Table 2.4 provides "Dimensional Requirements for Bolting Components and Assemblies," and the explicit requirements provided in the *RCSC Specification* do not apply to bolts with alternate dimensions. They apply to bolts that are manufactured to meet ASME B18.2.6, meeting typical ASTM F3125 and F3148 dimensions.

Section 2.12 permits the use of alternative fasteners, though details concerning strength, installation, and inspection must be provided by other consensus standards or the manufacturer and approved by the engineer of record. Section 2.12.4 allows alternative-design bolting components or assemblies to differ from the dimensions specified in Section 2 of the *RCSC Specification* with some limitations, as listed in the section.

Larry Muir, PE

Built-Up Member Bolt Pretension Requirements

Section E6.1 in the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22) states, "The end connection shall be welded or connected by means of pretensioned bolts with Class A or Class B faying surfaces." Does this only apply to built-up members composed of two shapes connected by bolts, or does it also apply to members built-up from plates or shapes with open sides interconnected by bolted lacing and tie plates?

This requirement to pretension bolts with Class A or Class B faying surfaces applies to both cases.

Section J3.2(b) states, "Bolts in the following connections shall be pretensioned:

(3) End connections of built-up members composed of two shapes either interconnected by bolts, or with at least one open side interconnected by perforated cover plates or lacing with tie plates, as required in Section E6.1." As indicated in the commentary, for a built-up member to be effective as a structural member, the end connection must be welded or pretensioned with Class A or B faying surfaces.

Carlo Lini, SE, PE

16th Edition *Steel Construction Manual* Prying Equations

Is it correct to say that if Equations 9-25 and 9-26 in the 16th Edition AISC *Steel Construction Manual* are satisfied, then prying does not apply?

Two inequalities govern the prying action design and analysis methods as follows.

Connecting element: $$\frac{T_r}{T_c} \le (1+\delta\alpha)\left(\frac{t}{t_c}\right)^2 \qquad \textbf{(9-25)}$$

Bolts: $$\frac{T_r}{T_c} \le \frac{1+\delta\alpha}{1+\delta\alpha(1+\rho)} \qquad \textbf{(9-26)}$$

No, this is not the case. There is no implication that prying does not apply if the inequalities are satisfied. The *Manual* states these two inequalities (Eqs. 9-25 and 9-26) "govern the prying action design and analysis methods."

The *Manual* helps break these two inequalities down into three solution methods so the designer can choose a design method to either control bolt size or the connecting element thickness, or can choose an analysis method to determine the tensile strength of the connecting element based on known or controlled parameters.

- Solution Method 1: Design assuming no prying forces, which results in the smallest required bolt diameter.
- Solution Method 2: Design that results in the smallest required connecting element thickness.
- Solution Method 3: Analysis to find the tensile strength of the connecting element.

All three methods satisfy Eqs. 9-25 and 9-26; each method has specific constant and variable parameters of these inequalities. The engineer of record can choose Solution Method 1 and design assuming no prying forces, but Solution Methods 2 and 3 allow for designs that incorporate prying into the design.

Melissa Gradecki, SE, PE

Heat-Induced Camber Deformations and Repair

There are multiple beams on a project that have rippled webs. The required camber was applied using heat cambering. Could the rippled webs be due to the heat cambering process? Is cover plating the web on one side a viable repair?

It is difficult to predict the cause of the web deformation without a complete review of the cambering process. Heat-induced camber is discussed in Section 3.3 of AISC Design Guide 36: *Design Considerations for Camber* (download or order at **aisc.org/dg**).

Web cover plates may be appropriate if repairs are necessary. If plates are welded only on one side of the web, weld shrinkage distortion may cause a minor axis curvature (sweep) that exceeds the out-of-straightness tolerance in 2022 AISC *Code of Standard Practice* (download for free at **aisc.org/publications**) Section 11.2.2.1. Weld distortion is discussed in AISC Design Guide 21: *Welded Connections–A Primer for Engineers*, Chapter 7. Increasing the minor axis curvature reduces both the flexural buckling strength of compression members and the lateral-torsional buckling strength of flexural members. Therefore, one should be cautious because the repair can potentially reduce the strength more than the original condition.

For web local buckling, AISC Design Guide 33: *Curved Member Design* Section 5.5.1 has a simple analysis method that considers local out-of-plane distortions in the cross-sectional elements. In many cases, the local buckling strength is adequate even with large initial distortions.

Bo Dowswell, PE, PhD

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steel quiz

Curious about best practices for the design, detailing, and fabrication of steel bent caps? Check out the recently published AASHTO/NSBA G12.2-2024 *Guidelines for Steel Bent Caps*. Download a free copy at **aisc.org/gdocs** and test your knowledge with this month's quiz!

1 Two options for framing longitudinal girders to steel bent caps are depicted in Figures 1 and 2. Which of the following statements is true regarding these framing options?

a. The framing option in Figure 1 is not recommended.

b. The framing option in Figure 2 is not recommended.

c. Neither framing option is recommended.

d. Both framing options may be recommended for different project scenarios.

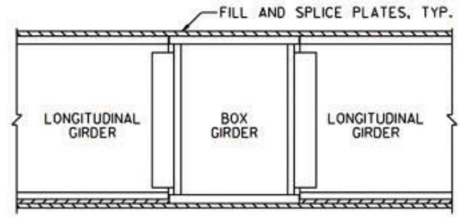


Fig. 1.

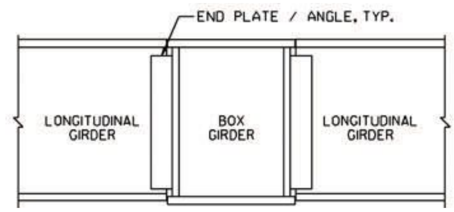


Fig. 2.

2 **True or False:** The ability of the superstructure to brace the straddle bent cap in a stacked longitudinal girder framing system depends in part on the stiffness of other bents supporting the same superstructure unit.

3 **True or False:** An integral longitudinal girder framing system allows longitudinal girders to be more easily skewed in reference to the bent cap compared to a stacked system.

4 **True or False:** New steel bent caps are encouraged to be designed as internally redundant members (IRMs).

5 **True or False:** A bent cap that is classified as an IRM could become a nonredundant steel tension member (NSTM) sometime in service.

6 **True or False:** Non-integral, stacked bent caps are better suited for Accelerated Bridge Construction (ABC) projects compared to integral bent caps.

7 **True or False:** Internal inspection of closed-section bent caps (i.e., boxes, twin and triple I-sections) is not required unless the exterior exhibits signs of distress.

TURN TO PAGE 12 FOR ANSWERS

Answers reference AASHTO/NSBA G12.2-2024 *Guidelines for Steel Bent Caps.*

1 **b.** Figure 1 shows an integral system, where longitudinal girders are rigidly connected to the bent cap with full moment connections. Figure 2 shows an end plate/end angle framing option, which provides only simple shear connections without moment continuity at the bent caps. End plate/end angle framing is simpler compared to the integral framing but does not provide system redundancy of longitudinal girders and is not recommended (Section 2.3).

2 **True.** The ability of the superstructure to provide lateral-torsional buckling restraint to the straddle bent cap in a stacked longitudinal girder framing system depends on the connectivity and articulation of the supported superstructure. For example, if fixed bearings are provided at the straddle bent cap but the superstructure unit is not restrained at other bents, the superstructure won't effectively brace the cap. Conversely, if fixed bearings are used at both the straddle bent and at another bent supporting the same continuous superstructure unit, the superstructure may brace the bent cap (Section 2.3).

3 **False**. A stacked longitudinal girder framing system allows longitudinal girders to be more easily skewed relative to the bent cap. Skewed integral bent caps are more complex, since the non-perpendicular alignment causes the longitudinal girder bending moment to be partially restrained by the primary bending stiffness of the bent cap, resulting in a significant moment transfer between the superstructure and the bent cap (Section 3.6).

4 **True.** Designing bent caps as internally redundant members (IRMs) is encouraged for increased redundancy, resiliency, and less rigorous inspection requirements compared to nonredundant steel tension members (NSTMs). As primary members without load path redundancy, they have traditionally been classified as NSTMs. If internal redundancy can be proven, the member can be classified as an IRM. The AASHTO *IRM Guide Specs* provide a framework for this design (Section 3.7.1).

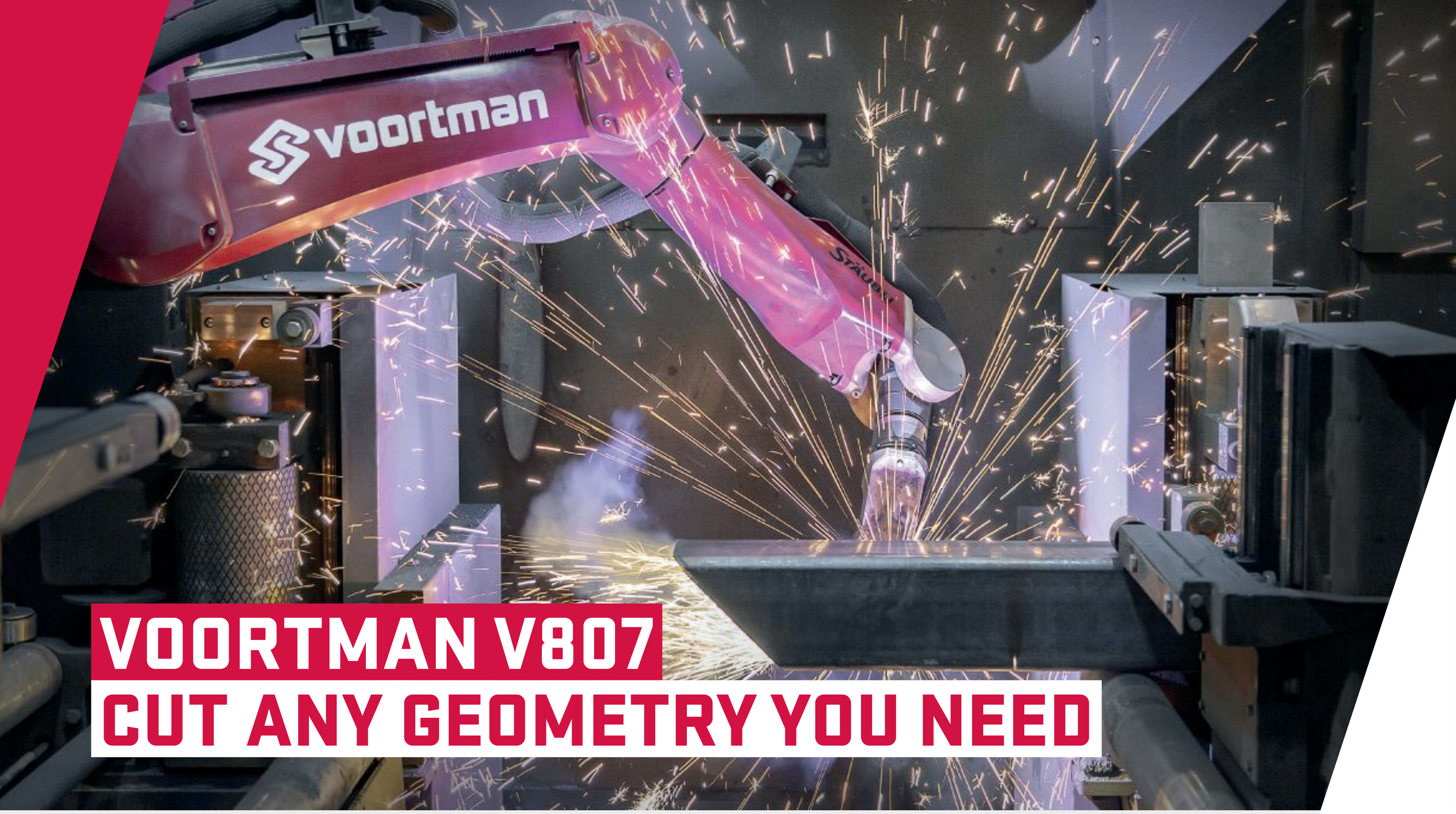
5 **True.** While a bent cap may be classified as an IRM when designed, bridge owners should recognize it could become an NSTM sometime in service. Failure to maintain the condition of the bridge or significant inspection findings left unrepaired may cause an IRM classification to be changed to an NSTM (Section 3.8).

6 **True.** Non-integral, stacked bent caps are preferred for ABC projects due to the simplified connections between the superstructure and the bent cap. When an integral bent cap is required, it is still possible to use ABC methods. One option is to detail a longitudinal beam splice near the bent cap (Section 5.5).

7 **False.** For twin I-section, triple I-section, and box section bent caps, the bent cap's interior areas should be inspected. The same inspection tools and documentation requirements for the bent cap exterior hold for the interior. When inspecting the interior of a box section bent cap, special attention should be given to examining welds in tension zones and any connections (Section 6).

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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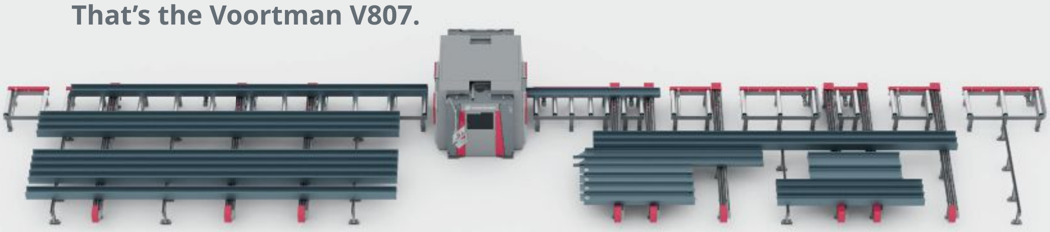

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Contain Your Reaction

BY RONALD JANOWIAK, SE, PE, AND TAHA AL-SHAWAF, PE, PHD

The updated AISC *Nuclear Specification* has more material, incorporates new research, and includes updates based on feedback.

THE NOTABLE UPDATES AND IMPROVEMENTS to the *Specification for Safety-Related Steel Structures for Nuclear Facilities* (ANSI/AISC N690-24) have a theme: additions and alterations. The newest version of AISC's go-to nuclear resource has a new appendix that better organizes important information, an updated appendix based on recent research, and altered testing requirements.

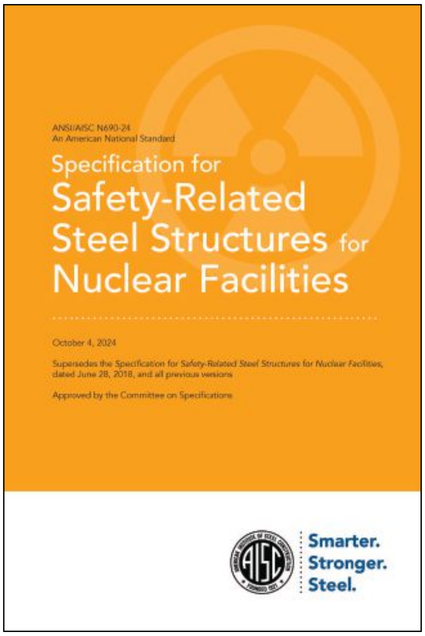
The 2024 *Nuclear Specification* (available at **aisc.org/standards**) supersedes the 2018 version. It is derived from the 2022 *Specification for Structural Steel Buildings* (ANSI/AISC 360) and only modifies specific portions of the *Specification* to make it applicable to the design, fabrication, and erection of safety-related steel structures for nuclear facilities. It also encompasses the latest research specific to nuclear facilities. The following is an overview of significant changes in the 2024 version.

Impactive and Impulsive

A new appendix in the *Nuclear Specification* was developed to address impactive and impulsive loadings. Much of the content was present in the previous edition, although it was scattered across various chapters. This new appendix addresses structural steel elements and steel-plate composite (SC) structures.

A user note at the beginning of the appendix describes the differences between impactive loads and impulsive loads, and examples of each are presented. Impactive load examples include tornado-borne missiles, whipping pipes, aircraft crashes, and other internal and external missiles. Impulsive load examples include jet impingement loads, external blast pressure, compartment pressurization, and jet shield reactions.

Analyses involving either impactive or impulsive loads traditionally involve the use of dynamic increase factors (DIF), which accounts for increase in nominal yield strength of the material for loading applied at high-strain rates. Previously, the *Nuclear Specification* only included DIF values in Appendix N9 for SC structures. With the creation of Appendix N10, the DIF values were moved to Section N10.1 where they are applicable for use with other structural elements instead of only SC structures. The DIF values in Table A-N10.1.1 were conservatively based upon



NEI 07-13, *Methodology for Performing Aircraft Impact Assessments for New Plant Designs*, Revision 8P.

To prevent local buckling of an element of a component under impactive or impulsive forces, the width-thickness (b/t) ratio shall not exceed those provided in the *Nuclear Specification*. As in past editions, these limits have been adapted from values used by the requirements of the *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341) for highly ductile members. The *Nuclear Specification* was updated based on the latest version of the *Seismic Provisions*, as provided in Table A-N10.2.1.

To ensure adequate ductility, design of structural steel elements and composite members for impactive and impulsive loads need to follow the material requirements of *Seismic Provisions* Section A3, and the general member and connection requirements of *Seismic Provisions* Sections D1 and D2 for highly ductile members, respectively.

Additionally, the *Nuclear Specification* allows that the load effects for impactive or impulsive forces can be determined using inelastic analysis. The design adequacy of structural elements subjected to these load effects is defined in the *Nuclear Specification* by using one of the three methods:

Target response remains elastic. Use the dynamic load factor (DLF) method to obtain the maximum elastic required strength while not exceeding the available strength and accounting for the material's DIF.

Target response is in the inelastic range. Use a simplified single-degree-of-freedom analysis of the component. The response of the component can be idealized as either bilinear or multilinear resistance function. The ductility ratio does not exceed permissible ductility ratio shown on Table A-N10.2.2.

Alternative inelastic analysis. Use a detailed nonlinear and inelastic finite element analysis to determine the maximum strain. The calculated maximum plastic strain shall not exceed 0.03 in./in.

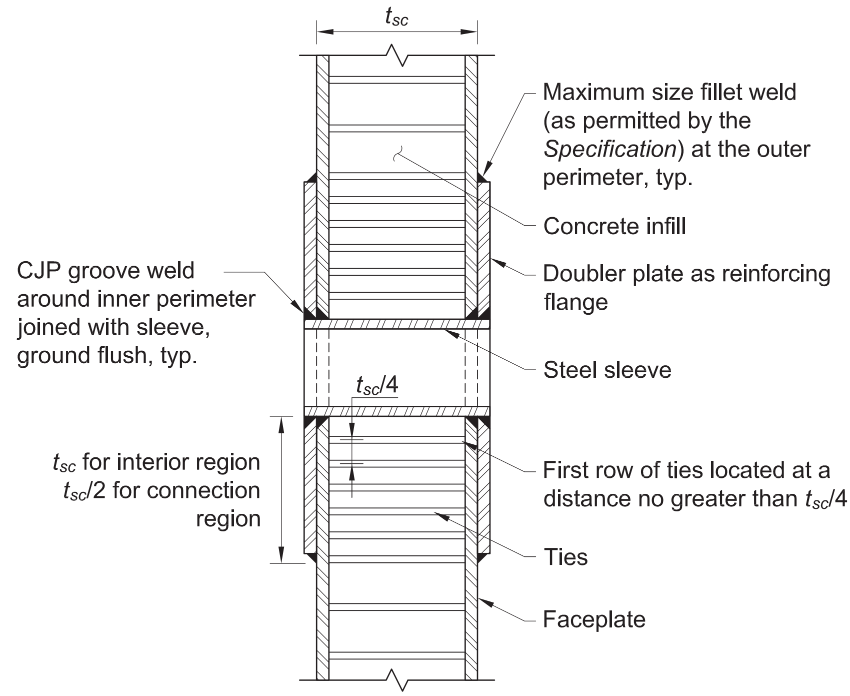


Fig. 1. Detailing around openings using a doubler plate as reinforcing flange.

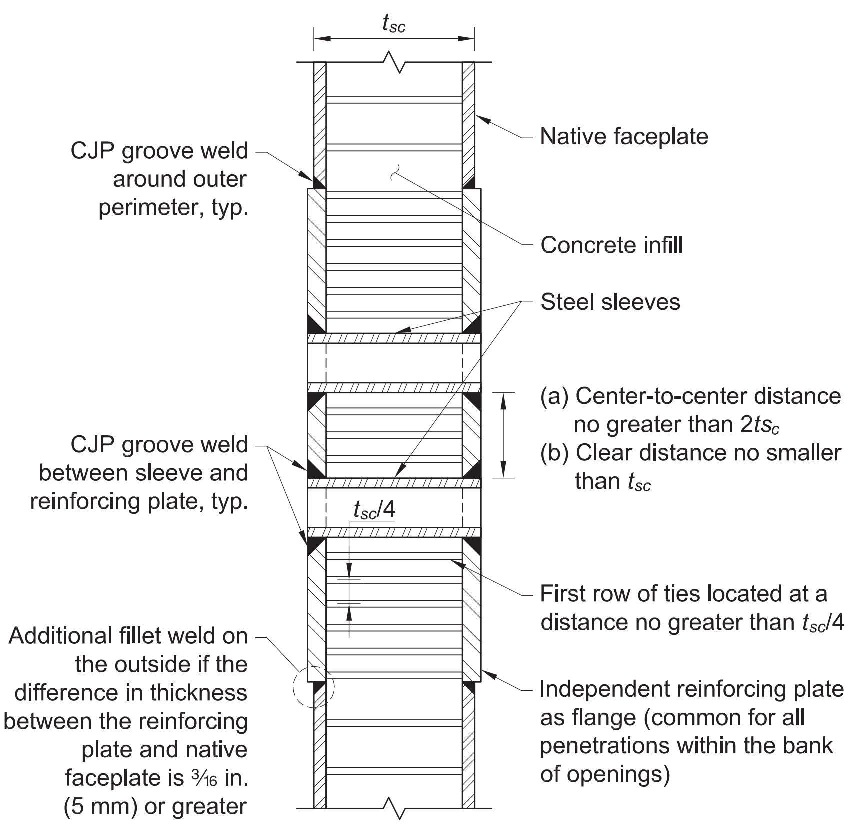


Fig. 2. Detailing around openings using an independent reinforcing plate as flange.

For impactive and impulsive targets consisting of steel plate, the required minimum thickness to prevent perforation under impactive loads is checked using project-specific test data or published formulas developed from validated test data. Local response evaluation of composite members subjected to impactive loads is based on project-specific test data or published formulas developed from validated test data. Local response evaluation for impulsive loads is not required because the characteristics of the applicable impulsive loads are such that they cannot cause perforation.

Specifically for SC structural elements, Appendix N10 also includes several formulas for local response evaluation of ductility requirements near and away from openings. These requirements are based on research performed at Purdue University.

Revisions and Provisions

Appendix N9: Steel Plate Composite (SC) Structural Elements incorporates changes based on recent structural research, lessons learned from field construction of nuclear power plants, and computational modeling. While the appendix's original focus was SC walls, it has been expanded to also address SC slabs and basemats. The revisions to the chapter include new design limits, new provisions on shear connectors and ties, and numerous detailing provisions.

New design limits. Enhancements to the design limits are associated with material properties. The maximum section thickness has been eliminated, the minimum thickness for SC exterior walls has been reduced from 18 in. to 15 in., and the minimum thickness for SC interior walls has also been reduced from 12 in. to 10 in. The maximum reinforcement ratio for the steel faceplates has doubled from 0.050 to 0.10, while the maximum specified minimum yield stress of these faceplates has increased from 65 ksi to 80 ksi. Finally, the maximum specified concrete compressive strength has increased from 8 ksi to 10 ksi.

These revisions were important to keep abreast of industry changes where higher-strength rebar and higher concrete compressive strengths were being used in reinforced concrete structures.

New provisions on shear connectors and ties. "Steel anchor" was the term used in earlier *Nuclear Specification* editions to describe the steel stud attached to the faceplate and anchored into the concrete. It has been replaced with "shear connector," which

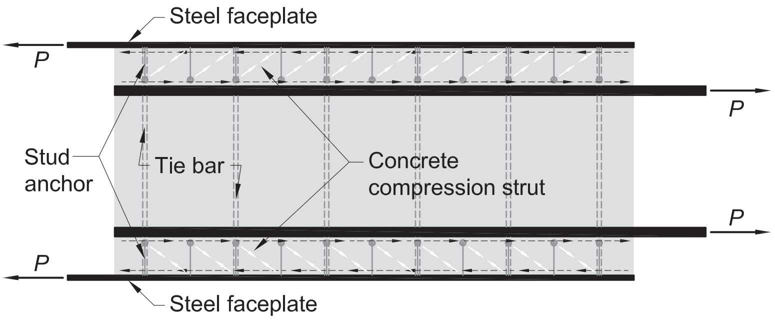


Fig. 3. Concrete compression struts in SC splices.

better describes its function. Additionally, a new definition for shear connectors was added to the glossary. User notes have been added to help the user navigate the requirements for shear connectors.

Ties are the structural components which connect opposite faceplates together forming the SC structural element. While older editions require steel anchors and ties in the design, the new edition allows for only ties. The ties have dual use: resist interfacial shear between the faceplate and concrete, and resist the out-of-plane shear and provide structural integrity.

Revisions to detailing provisions. A nuclear facility's walls have numerous openings to allow passage of process piping, ducts, and electrical conduits. The *Nuclear Specification* has detailing provisions for the treatment of these openings to ensure that the wall's structural capacity is maintained. A clarification in the 2024 edition has been provided to distinguish "small" openings from "large" openings. The Commentary has been expanded to illustrate two possibilities for reinforcing the wall at openings. (See Figures 1 and 2).

Section N9.4 has been expanded to provide provisions of lap-splicing of reinforcing bars with faceplates, a situation occurring when SC structural elements are connected to traditional reinforced concrete elements. The Commentary elaborates on this provision and provides Figure 3 as an example.

Changes to Impact Testing

The *Nuclear Specification* requires Charpy V-notch (CVN) testing only for structural components experiencing impulsive or impactive loads. Previous editions required the testing be conducted at a temperature at least 30 °F below the subject structural component's lowest anticipated service temperature. Feedback from end users and committee members alike challenged this conservative testing requirement, and the 2024 *Nuclear Specification* adjusted it.

Several factors were considered in the change. The first factor was environmental. For structural components within the facility, the ambient temperature would always be above 0 °F during facility operation. External structural components might be exposed to tornado-driven missiles, but those occur at temperatures greater than 0 °F. As a result, the lowest anticipated service temperature was set at 0 °F.

Another factor was the time for the structural component to experience the greatest load (or stress), defined as the loading response time. From a fracture mechanics perspective, a short response time is more critical than a longer response time, and the temperature of the structural component is a key factor.

The third factor, also a fracture mechanics principle involving the CVN fracture toughness, dealt with the temperature shift between the dynamic stress intensity factor and the static stress intensity factor. This relationship had been previously used for design of buildings subjected to seismic loads, for design of steel bridges affected by impact load of moving vehicles, as well as the welds associated with both.

Considering these three factors, together with historical test data, revised CVN testing requirements were established for 65 ksi steel. Historical testing showed that the required CVN values for lower strengths steels were enveloped by the higher strength steel. A required CVN value of 25 ft-lb was established. Consistent with past editions and ASTM testing requirements, this value is for the required average testing value of three CVN test specimens.

Dive In

The updated *Nuclear Specification* will enhance the capabilities of engineers who design advanced nuclear plants, including small modular reactors. Historically, several advancements in the *Nuclear Specification* have been adopted in commercial and industrial applications, such as SpeedCore design, a testament to its importance beyond its stated scope. To order the *Nuclear Specification* or obtain a free download, go to **aisc.org/standards**. ■

Ronald Janowiak is a consultant and retired senior staff engineer at Constellation Energy.
Taha Al-Shawaf is a technical consultant at Orano Federal Services LLC. They are the chair and vice chair, respectively, of the AISC Task Committee on Nuclear Facilities Design.
Sanjeev Malushte, SE, PE, PhD, of Purdue University also contributed to this article.

Inspired by Surroundings

INTERVIEW BY GEOFF WEISENBERGER

Urban living has shaped architect Ho-gyeum Kim since his childhood, and his experience in New York sparked an award-winning design concept.

GROWING UP in large East Asia cities helped shape Ho-gyeum Kim's understanding of urban spaces, which lent itself to a career in architecture. His experience living in New York sparked an ambitious concept that won AISC's 2025 Forge Prize.

Kim, a project architect with CZS in New York, created a steel design concept that turned underused yards behind traditional Brooklyn rowhouses into more housing—without altering the neighborhood's character or its livability. He frequently noticed the yards' lack of use when walking around his own Brooklyn neighborhood. He created a concept called Growing Rowhouses to find a better use for them and provide one solution to the city's housing demand.

Kim spoke with *Modern Steel Construction* about his background, architecture career, the Growing Rowhouses concept, and more. (Read more about the concept on page 50).

Where are you from and where did you grow up?

I was born in Seoul, Korea, and spent my early years in what I'd call a developing satellite city integrated into the greater Seoul area. It was trying to be a city and was not quite a suburb. In hindsight, living there made me aware of how urban growth takes shape. When I was about seven, my family relocated to Bangkok, Thailand, for my father's work. That's where I spent most of my childhood until I was 13, when I transferred to an international school where the main language was English. I was living in a completely different culture, absorbing the new language, and constantly adjusting to a new context, city, and friends. Looking back, that was also formative in ways I didn't understand until much later.

Eventually, we returned to Seoul for the rest of my teenage years. I went to university and completed mandatory military service, stationed in a U.S. territory on a U.S. base. We were an augmentation to the U.S. Army doing liaison work for the Korean Army and the U.S. Army. Then, I graduated and started my first job in architecture. The constant shifting, geographically and intellectually, helped me build a sense of resilience and openness to the complexity of the urban environment.

What steered you to the architecture track?

My first exposure to architecture was when I went to Hongik University, which, at the time, was the only architecture program in Korea associated with an art school. Back then, most architecture programs were housed in engineering departments. The courses reflected that and were largely technical. At Hongik, architecture was more of an artistic and spatial practice, and that gave me a broader and more conceptual foundation for approaching architecture.

From there, I got a job at one of Korea's largest firms in a specialized division called the designers pool. All the members had a lot of design talent, and their entire job was focused on design competitions throughout the year. That environment gave me a crash course in everything from concept development to high-stakes presentation strategy.

My time there was right in the aftermath of the U.S. financial crisis. East Asia wasn't hit that hard, and that led to an influx of talent from the U.S. Recent grads from top Ivy League schools were struggling to get a job in the U.S., so they came to Korea and joined our team. I worked with people who brought incredible digital skills and had the best technique for narrative forms and adding data sets to architecture. I hadn't seen anything like it before.

That kind of cross-pollination was inspiring and helped us with multiple competitions. It introduced me to new design tools to shape complex geometries that could be transformed into architectural forms. The collaboration steered me to a graduate degree at Columbia University, and I've been in New York since.

What's your most memorable project so far?

There's one that really resonated with me on a personal level. It was a new school campus in Hanoi, Vietnam. The school, called Dwight School, started on the Upper West Side in New York. It's a K-through-12 international school, exactly like the one I attended as an expat in Bangkok. I had an immediate emotional connection to the project.

We were working with a tight urban site that didn't have room for a vast campus. We had to stack the spaces vertically with classrooms, circulation, recreation space, and assembly areas woven together. I leaned heavily on my memory from my time in Bangkok running through the outdoor area at recess and how light filtered in. That lived experience became a design tool for laying out the program and weaving the classrooms with outdoor spaces.

How did you find out about the Forge Prize and what compelled you to submit?

I've followed the Forge Prize since its inception in 2018 and seen numerous inspiring projects. What stood out to me most was its open-endedness. Unlike most design competitions, there isn't a specific brief or list of constraints. In the end, it comes down to one question: What can steel do?

The competition has a lot of freedom, but at the same time, it's daunting because it's easy to get overwhelmed without parameters. That's why I reframed the question slightly to think about what only steel can do, and that helped me shift the focus. In my day job, I've used steel to resolve extreme design challenges like spanning a 270-ft canopy without intermediate columns or creating a 90-ft-span bridge connecting two towers.

I've often used slanted columns, and only steel can merge them into a single point of contact and resolve the gravity load. Steel has always been something that unlocks possibilities that aren't doable with other materials. I was also grappling with a design question that led to the Growing Rowhouses concept that won the Forge Prize. How can we create housing that doesn't occupy the ground and hovers and adapts instead? I felt like steel was the only answer, and the Forge Prize gave me a perfect platform to pursue that idea with more rigor and imagination.

What went into the Growing Rowhouses design?

The idea came from personal experience. I live on a corner lot in Brooklyn on one of the few blocks without a rear yard. I've spent a lot of time observing the neighboring lots with one. I was envious of those, but after years of observing and looking down from my terrace, I realized those yards—precious bits of urban open space—were really underused. There was an occasional barbecue in the summer and some people who grew vegetable plants, but that's it. For the most part, they're empty.

The rear yard is intended for a single household to enjoy, but over time, the rowhouses have been divided, and ownership has become fragmented. The rear yard becomes nobody's and everybody's at the same time. The lack of ownership doesn't incentivize use. I wondered how that void could be occupied and reclaimed and if we could build above it. That would eventually add housing without sacrificing daylight, air, and neighborhood character because the housing is not occupying the ground. It's hovering.

Growing Rowhouses is a modular steel superstructure touching the ground only at the center line of the block. The elevated frame houses duplex residences. It's not a replacement for anything, but it's an overlay from what's already there. Eventually, I imagined a framework for a bottom-up densification that didn't incorporate demolition. It's inserting potential into the fabric without tearing the fabric apart.

What was your experience working with the steel fabricator and did you learn anything that surprised you?

I was paired with Ralph Barone at Barone Steel. The experience was incredibly valuable because, as architects, we often sketch ideas assuming they can be built. Fabrication introduces another layer of intelligence, and the dialogue between the architect and the fabricator pushes the project to be more precise and more realistic. That exchange sharpened the vision.

What do you like about New York after living in dense cities most of your life?

What I like most about New York is how the city engages the waterfront. I notice it most when I play pickup soccer on defunct piers that have been transformed into fields where anyone can play soccer or other sports. When you're on those fields, you have the lower Manhattan skyline behind you or the Williamsburg Bridge overhead, which is a bit surreal when you're sprinting down the sidelines and you see Manhattan as the backdrop. The only catch is if your shot on goal is too wide and goes over the net, you might have to dive into the East River to pick up the ball. ■

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

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The Superpower of Curiosity

BY RYAN CURTIS, PE

Engineers are curious people at their core, and embracing and promoting a culture of curiosity can take your firm and projects to new levels.

IN THE EVER-EVOLVING WORLD of engineering and innovation, high-level curiosity often opens unimaginable doors.

When YouTube-famous engineer and inventor Mark Rober entered college as an engineering student, I would venture he never envisioned a career path that includes time at NASA working on the Curiosity Mars rover, a stint on Apple's special projects team, engineering and constructing glitter-bomb packages to fend off porch pirates, starting a YouTube channel that has surpassed 60 million followers, and launching CrunchLabs, a STEM-based educational technology company.

It's a standout résumé, and I feel confident claiming curiosity propelled him. A constantly curious mentality can propel you in your engineering career, and engineering firm leaders can elevate their company by driving a culture that encourages and rewards curiosity.

Curious from the Start

As found in Warren Berger's book "A More Beautiful Question", Harvard-based child psychologist Paul Harris reported that between the ages of two and five, a child asks approximately 40,000 questions. And sometimes, curiosity remains strong throughout childhood.

As a young child, I desperately wanted to understand how the world worked. I spent countless nights in my early teens with my nose buried in encyclopedias, learning about the different fields of engineering. I would ask my parents if I could take a television apart only to see the inner working components. It was obvious that curiosity was a strong element of my DNA. I entered high school learning basic curriculum and took STEM classes, where I explored hand drafting, AutoCAD, and how to use computers to illustrate conceptual isometric drawings. All eventually led to drafting and creating physical models of residential construction projects.

I enrolled in the architectural engineering program at the University of Nebraska to expand my understanding of statics, elastic bodies, math, sciences, and, eventually, how to design a building. Once in the workforce, I collaborated with diverse teams of clients, architects, and mechanical and electrical engineers working together to synthesize the way building systems make structures safe and habitable. My appetite to work hard, provide excellent client service, and remain curious has led me to work on challenging projects, implement innovative solutions, and tackle various leadership positions.

Mentorship Matters

I have felt curiosity was my superpower since I was young. But it's also possible to strengthen and grow curiosity as an adult, and mentors and influences are a major part of that growth.

The best mentors in my career have never claimed to have it all figured out. Rather, they approached conversations with a mindset that they have so much to learn. They recognized that knowledge is a two-way street and they could learn from their mentee as well. There is an incredible difference between those two viewpoints and the types of people who hold them.

My mentors range from vice presidents to senior structural engineers who have spent over 40 years in the industry. I was drawn to them because of the culture of learning and skill enhancement they created. I naturally gravitated to them because the learning environment was fun and challenging. When collaborating with these leaders, I understood that their passion for learning led to a passion for teaching. It taught me that learning and teaching were complementary, not independent, which birthed a culture of psychological acceptance and a true open-door approachability.

We learn by asking questions. Most times, when I hear someone preface a question by apologizing for a "dumb question," many people in the room turn out to have the same question. It's always good to ask, and company leaders should make employees feel comfortable asking what's on their minds.

Becoming Curious

Curiosity is a natural human trait—embrace it. It's no accident that curiosity coupled with a strong work ethic often yields an accelerated career trajectory. I recently heard the saying that anything above zero compounds, and it stuck with me. When one project assignment is not understood, ask for clarity. When an analysis method seems too complicated, ask for directions on how to best break down the analysis into simpler components. When a contractor questions specific details on a drawing or submittal package, ask for preferred alternatives and why they are more desirable.

The key link to all these scenarios is dedicating time to ask, clarify, and understand everything around you. Curiosity and the feeling of learning something new are an elixir for the soul. Some people—typically engineers—are naturally more curious than others, but I believe curiosity can be learned.

An Especially Curious Crowd

I have noticed many recent college graduates ask questions about employment opportunities during their job interviews that differ greatly from entry-level candidates' questions 20 years ago. Back then,

new graduates asked about salary, where they would sit in the building, and inquired about financial benefits such as a 401k match. Recently, they ask questions like how new hires entering the workforce can change the world.

Gen Z is considered the first generation to have largely grown up using the internet, modern technology, and social media. They are more connected through social media than any prior workforce. As a result, our incoming industry talent has a global perspective on their goals when they begin their career. They typically aspire to use their Monday through Friday workplace as an agent of change to improve society.

Rather than resisting this youthful mindset and sharing "back in my days" stories, try to embrace this ethos. Encourage your younger staff that, as designers, engineers, architects, and creators, we create and impact the built environment in which we all live, work, and play.

Final Charge

As a mentor, explore your staff's interest in new technology in our everyday practices. As AI and other digital design practices proliferate, embrace those teammates whose interest naturally lie in those areas. Early adopters often become innovators.

During interviews, scan candidates for curiosity in their workplace experiences and special interests. Special interests and community involvement are typically where young professionals' biggest passions exist. Take the time to seek out how to encourage those passions. What makes them tick may be the secret to strengthening your team's culture.

In performance reviews, be intentional in encouraging a team culture that is widely open to effective communication, innovative ideas, and useful collaboration. As a leader, don't be afraid to let pauses in conversation resolve themselves instead of filling the void with your voice.

Seek diversity in teams. Different educational, life, and vocational experiences offer new lenses while bringing varying perspectives in which we can see challenges and opportunities. Our role is to embrace both.

Lastly, leaders create leaders. By cultivating a culture of curiosity within your team, you will set up an environment for future leaders to thrive. ■

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Tree columns and an organically formed roof are the steel backbone of Pittsburgh's new airport terminal that will transform passenger experience.

Rooted in Innovation

BY
KAREN GROSSETT, SE, PE,
TOM POULOS, SE, PE, AND
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Gensler and HDR in association with luis vidal + architects

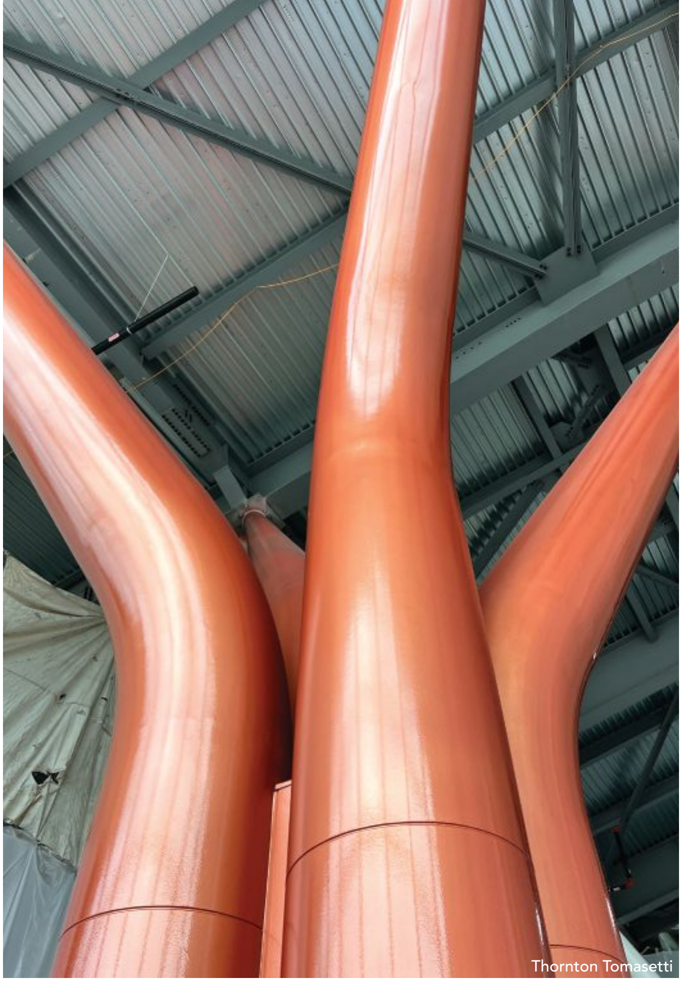
PITTSBURGH IS SOON TO WELCOME a striking addition: a new terminal at Pittsburgh International Airport. With its exposed steel tree columns, unique architectural roof form, and challenging site conditions over active tunnels, the 800,000-sq.-ft, three-story steel structure showcases how collaborative design and innovative thinking can deliver elegance and efficiency on even the most challenging of projects.

The new terminal is an architectural statement and a crucial efficiency boost for the airport that meets the market's current needs. The $1.7 billion project consists of a new pre-security building and a multi-modal complex focused on the Pittsburgh passenger rather than a single airline. It replaces the old landside terminal, which is located a half-mile from the passenger gates and connected to them by an automated people mover (APM). The new building is immediately adjacent to the existing concourses, providing better connectivity for passengers and eliminating the APM. The Allegheny County Airport Authority estimates the project is generating about $2.5 billion in economic activity for the region, including more than 14,00 jobs.

The terminal's distinctive rolling roofline is inspired by the region's topography. The roof is supported by 38 architecturally exposed structural steel (AESS) Category 1 tree columns spaced up to 120 ft apart, creating a vast entry point for travelers (learn more about AESS at **aisc.org/AESS**). The roof cantilevers roughly 60 ft beyond the building façade, sheltering the curbside drop-off area and visually linking the structure to the adjacent landscape. The new terminal includes four outdoor terraces—two landside and two airside, a rarity for U.S. airports—offering further views of the surrounding topography.

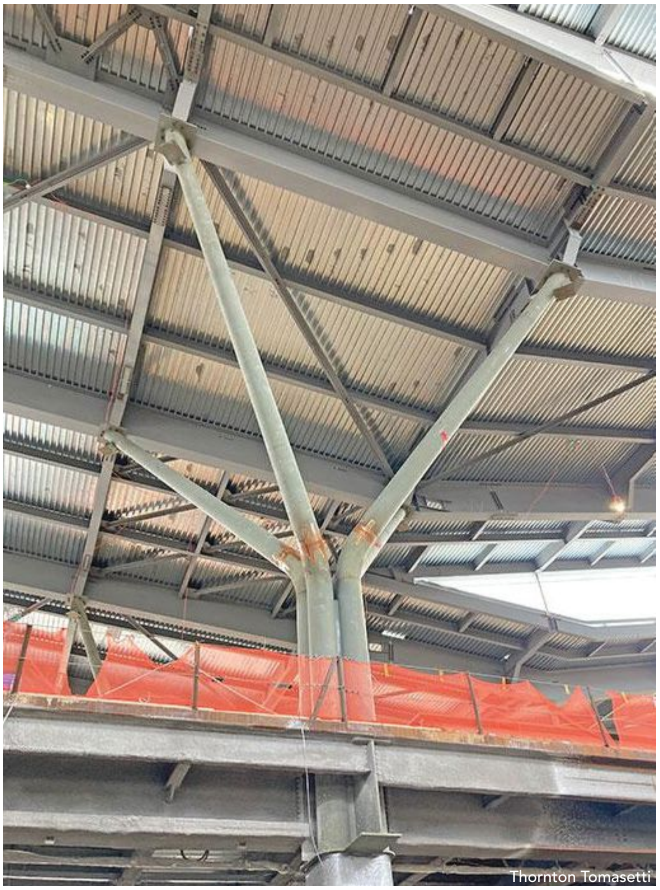
Building Above Constraints

The new terminal presented a major design challenge with its location directly above the APM and utility tunnels. These tunnels are critical to the current function of the airport and were required



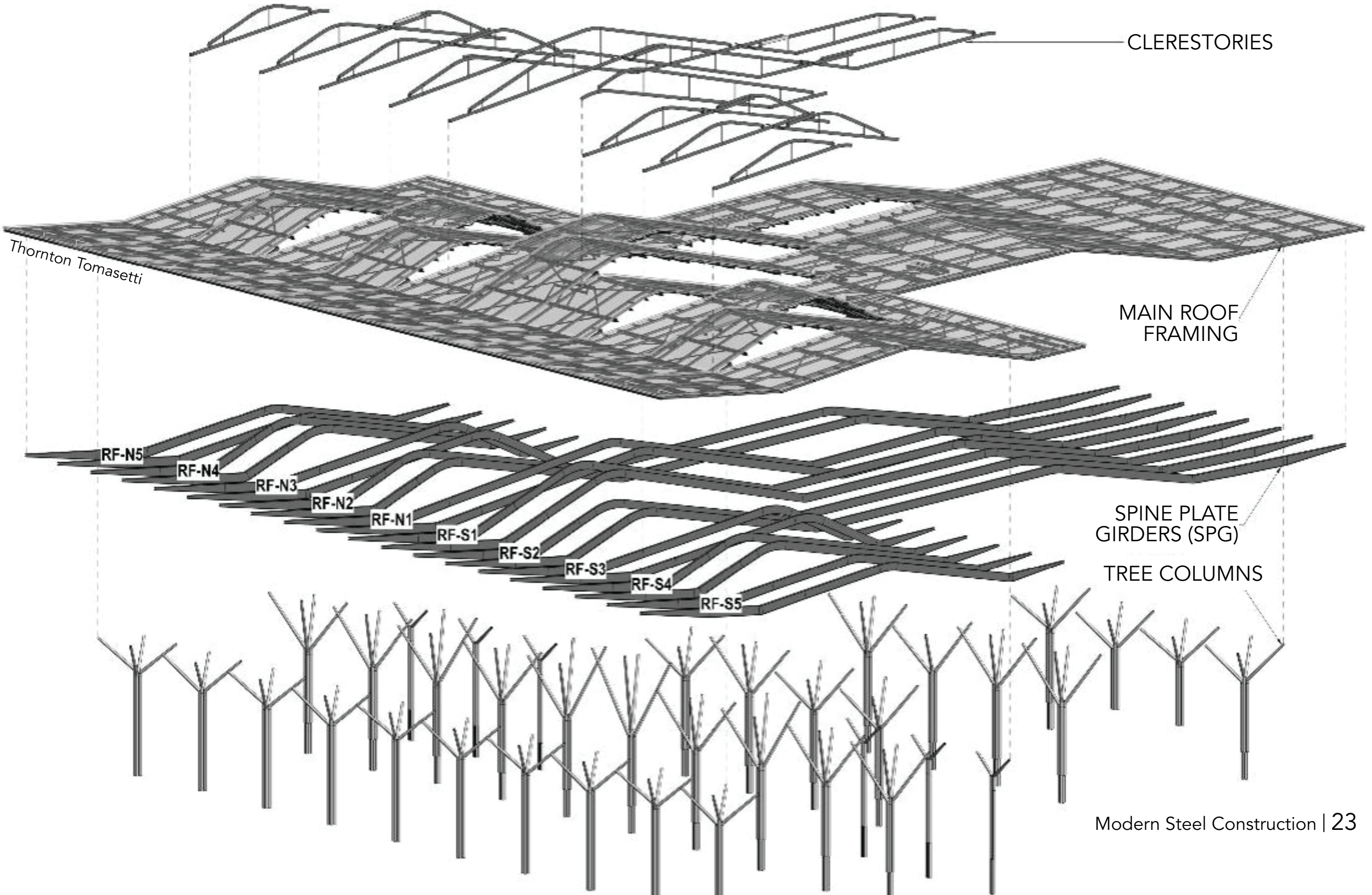
left: A tree column with a finished coating.

below: The tree columns are spaced as far as 120 ft apart.



opposite page: A rendering showing the terminal roof and the AESS Category 1 tree columns that support it.

below: HSS tree columns support custom plate girder spine elements. Both create moment frames in the east-west direction. The spine elements support conventional roof framing.



The roof cantilevers 60 ft over the road and is inspired by the region's topography.

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to remain fully operational during construction. The design solution to accommodate the tunnels is a structural slab at grade supported by a series of long-span grade beams—extending as long as 70 ft—that in turn support the loads from the grade level and serve as transfer girders for the building columns above.

Due to the heavy column loads and limited depth between the top-of-tunnel and top-of-slab elevation, up to 5-ft-deep embedded 50 ksi wide-flange steel plate girders were introduced at many locations. These plate girders were designed compositely with the surrounding concrete to maximize their efficiency.

The size and length of the plate material required for the plate girders, up to 4 in. thick and 52 in. wide, necessitated the introduction of splices. Several of the girders were multi-span members to take advantage of continuity and enhance structural performance. The Thornton Tomasetti design team and steel fabricator, Sippel Steel Fab in Ambridge, Pa., collaborated to determine splice locations that would minimize demand to allow the splices as bolted connections rather than field-welded connections. The resulting connections used 1⅛ in. A490-SC-B bolts in double shear.

Consistency Among Variation

The sculptural and structural tree columns are composed of four 20-in. round steel sections, press-brake formed from 1½ in. plate and bundled into a trunk that is 44 in. by 44 in. out-to-out. These sections then diverge to form four branches that taper from 20-in. to 14-in. diameter sections. However, the tree columns' key component is the transition "elbow." Although the tree columns' geometries are unique from location to location and branch to branch, this small "elbow" segment is made up of the same 20-in. round section, which is bent at a constant 5-ft radius. The length is then dictated by the distance needed to achieve the intended angle of each specific location. This repetition enabled efficient fabrication while preserving the organic visual.

Fire protection of these columns was achieved not through traditional prescriptive approaches, but via performance-based fire engineering. In this approach, fire conditions are simulated to evaluate the actual structural performance in the event of a fire.

Provisions were made so the structure can remain stable under fire conditions. In this case, each tree column was filled with concrete up to the roof such that the concrete could act together with the steel to carry the temporary loading condition, should the fire reduce the steel's strength. Varying levels of reinforcement were provided within the trunk and some branches of the columns, depending on the degree of loading. In some of the heaviest loaded cases, small W10 built up wide-flange sections are embedded within the round sections to provide additional strength.

The structural concrete methodology allowed for a smooth paint finish in lieu of the orange peel appearance typically associated with intumescent coatings. Not only does this provide an architecturally pleasing aesthetic, but eliminating intumescent paint saved more than $1 million in construction costs.

Procurement and fabrication of the tree columns involved an elaborate supply chain, which included multiple vendors and unique challenges at each step. One example is the joint preparation at the elbow-to-trunk CJP weld. The induction bending process for the elbows creates wall thickening at the intrados and wall thinning at the extrados. A uniform wall thickness is required to fit backing for the CJP weld. To address the varying wall thickness, the internal surface at the extrados was face welded after bending and the entire elbow was sent to a machine shop, where the ends were face-milled and backing groove-cut using a CNC controlled five-axis machining center.

Assembling the tree columns was a multi-step process, starting with CJP welding the trunk section to the elbow. Afterward, any rebar or embedded wide-flange material was installed. Next, two of these "hockey stick" sections, made up of one trunk section connected to one elbow section, were connected with a stitch plate into "dumbells." Electrical conduits were then placed in the inner void to allow for lighting to be installed after erection was complete. The last step in the shop was to assemble two "dumbells" together and complete all AESS requirements. The branches, formed using a press brake and flat trapezoidal plates, were attached to the lower column section in the field. This approach of field-attaching the branches helped with shipping and ensuring proper positioning within construction tolerances.

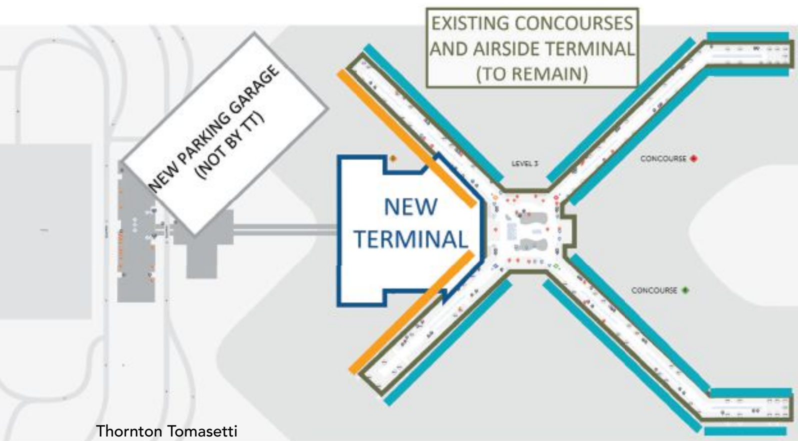
A Hierarchy of Elements

Like the columns, the roof system is built around efficiency and repetition. Primary 5-ft-deep "spine" plate girders—spanning up to 120 ft—rest on the branch tips, which have a 30 ft spread. They support conventional wide-flange framing and double angle diaphragm bracing, which is strategically oriented to coincide with the roof curvature.

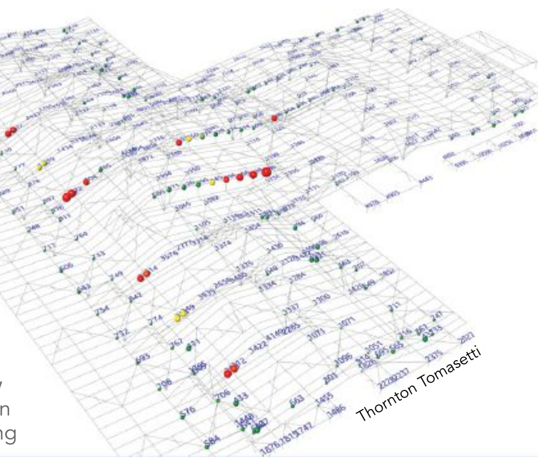
Each pair of spine girders over a given roof column (a ribbon) works as a moment frame for lateral support in the east-west direction, transferring lateral forces to lower-level braced frames. Similarly, in the north-south direction, moment frame action is used in areas where ribbons run coplanar. In other cases where the ribbons separate to form clerestories, each tree column works as a cantilever column.

Because the diaphragm is discontinuous at clerestories, special attention was given to ensure allowable drifts were achieved. A custom Grasshopper script automated the drift process due to the number of unique areas. Additionally, where ribbons crossed and intersected, special detailing allowed load transfer and ensured geometric compatibility.

Parametric tools and automation aided in many aspects of the design of this project, including generation of the roof framing layout. With the framing strategy defined, the roof framing was generated by starting with an architectural roof surface defined in Rhino. A Grasshopper script then applied the structural layout onto the architectural profile. The resulting configuration was converted via Konstru into a structural analysis model and then pushed to Revit for documentation.



Thornton Tomasetti



right: A visualization of the building deformations.

below: The new terminal location eliminated a long walk to gates.

Thornton Tomasetti

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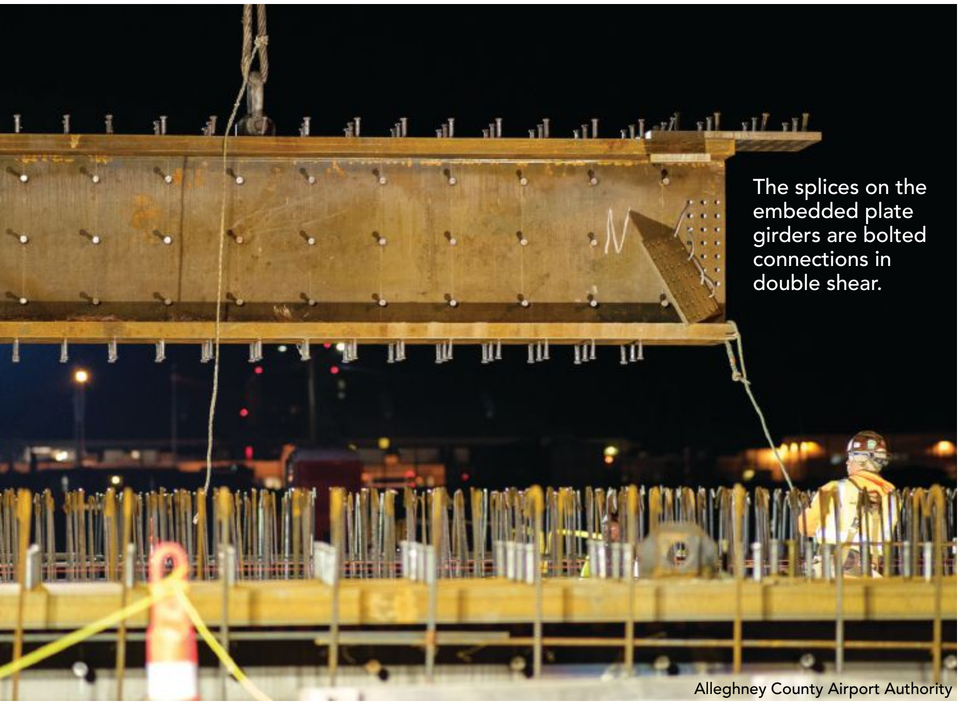

The splices on the embedded plate girders are bolted connections in double shear.

Alleghney County Airport Authority

Using parametric modeling methods allowed for rapid iteration during early design phases and enabled the design team to generate a Tekla model of the building, which was delivered with 100% construction documents. Creating the Tekla model ensured proper communication of the complex 3D structural geometry rather than solely relying on 2D drawings.

Erection Process

The erection procedure needed to address multiple competing objectives. The position tolerance and the erection sequence required by the structural design necessitated adjustment of the bearing elevations after roof erection and prior to welding the branch to the elbow. The elbow-to-branch CJP joint required close control of the final joint geometry.

These considerations were addressed by using a steel falsework system that provided

An embedded 50 ksi plate girder being set into place.

Alleghney County Airport Authority

The project uses 15,200 tons of structural steel.

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safe temporary support of the branches while permitting for field adjustment of the top-of-branch elevation. Roof girders and beams were pre-assembled on the ground and installed on branches supported by the shoring system. After completing the roof erection on the shoring system—prior to tensioning the bolted connections and completing the field welds—the top-of-branch elevations were surveyed and adjusted.

The branch sections of the tree columns were field-spliced to the trunk section at the elbow by all-around CJP welds. The finished weld was exposed to view and was subject to AESS Category 1 requirements. Due to the weld quality, productivity, and aesthetic challenges, the erector elected to use a shielded flux core welding system that required tenting of intersections to provide a controlled welding environment.

After the shoring system was removed, the actual building deflections at specified control points were surveyed. These deflections were compared to deformations predicted by the structural analysis to confirm the performance of the completed structure.

The terminal project cost $1.7 billion and used 15,200 tons of structural steel. When it opens in fall 2025, the new terminal will offer passengers an improved experience and a more efficient journey to and from their gates. It is more than a functional upgrade, though. It's a display of innovative and thoughtful structural design realized through creative thinking, technology-driven workflows, and close collaboration across the entire design and construction teams. ■

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Allegheny County Airport Authority

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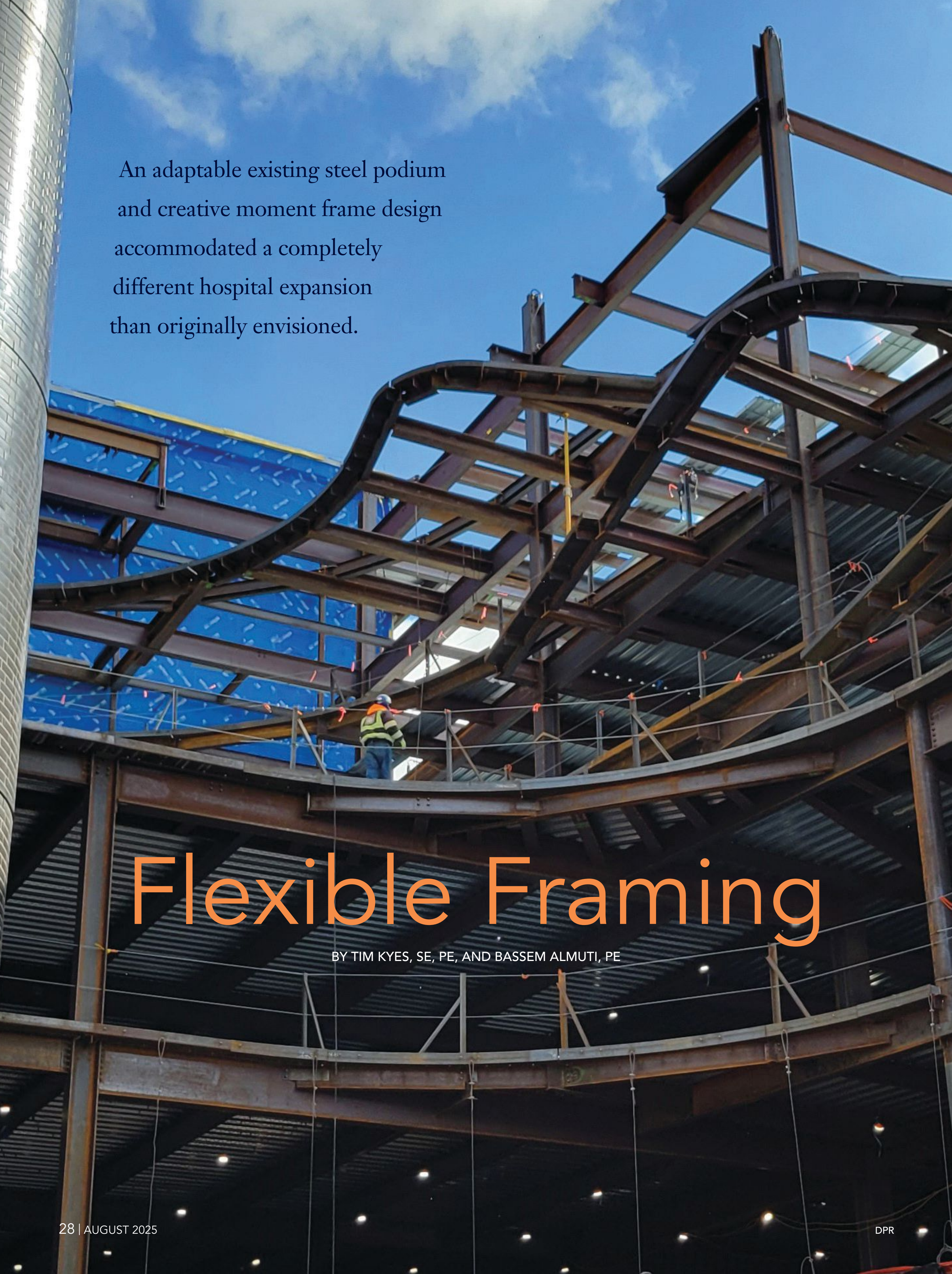
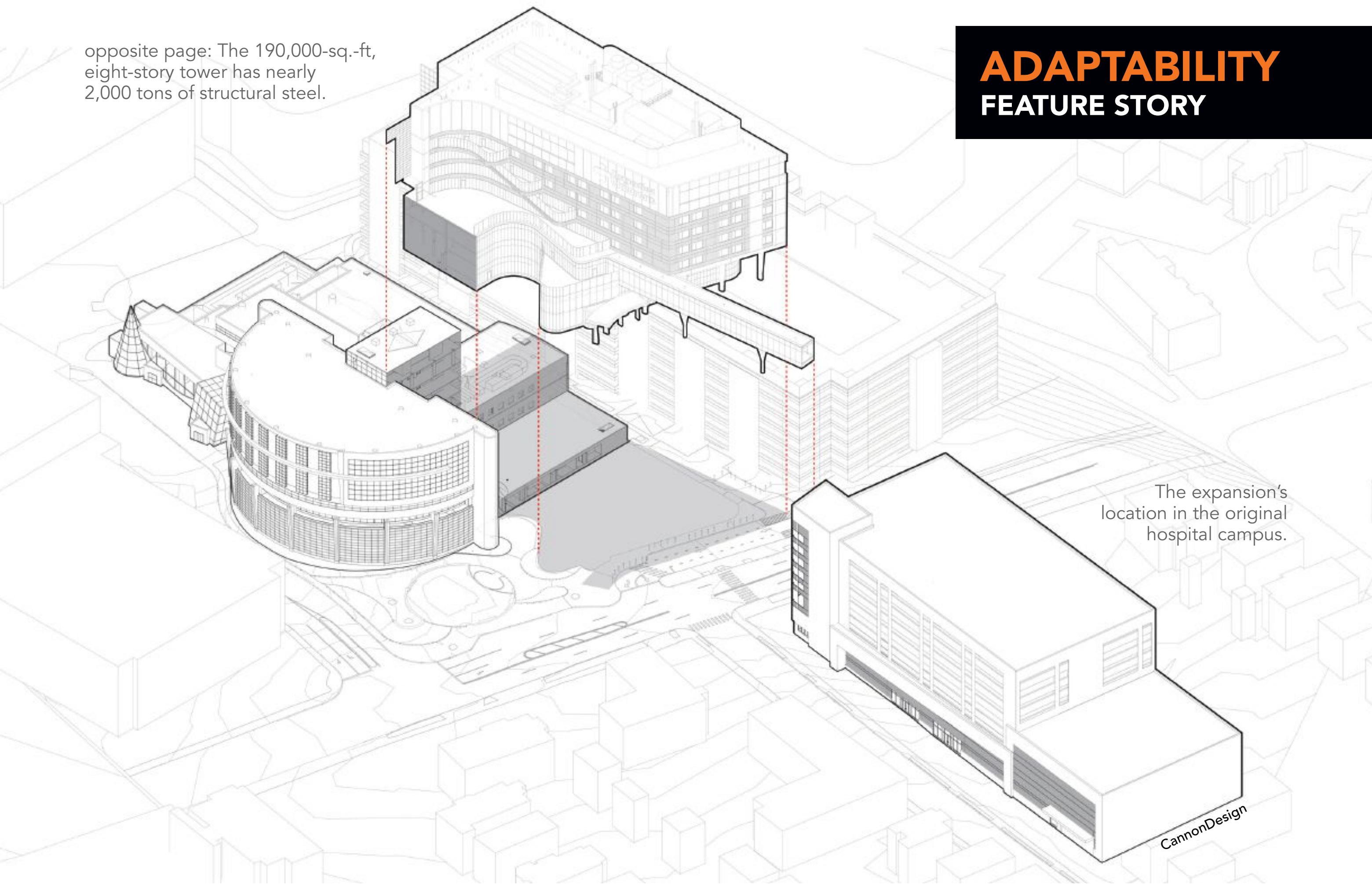


An adaptable existing steel podium and creative moment frame design accommodated a completely different hospital expansion than originally envisioned.

Flexible Framing

BY TIM KYES, SE, PE, AND BASSEM ALMUTI, PE opposite page: The 190,000-sq.-ft, eight-story tower has nearly 2,000 tons of structural steel.



The expansion's location in the original hospital campus.

CONNECTICUT CHILDREN'S MEDICAL CENTER in Hartford was built in the early 1990s with a steel podium that could accommodate future expansion. When expansion design began nearly 30 years later, though, healthcare delivery advancements had made the forecasted addition plan impractical.

That was only a hurdle to expanding, not a deterrent. A structural steel podium's adaptable nature and creative moment frame and diaphragm design achieved the modern expansion within the pre-existing conditions. The result is a 190,000-sq.-ft clinical tower that rises eight stories above the existing campus.

The original hospital building has a rectangular vertical circulation core that rises from the center of the four-story podium and serves a three-story semicircular bed tower offset to the north. Its designers envisioned a matching bed tower constructed above the podium's southern section, forming an elongated circle around the core.

Instead, the expansion has a western portion supported at grade, while the eastern section rises above the south half of the stepped podium. The tower has a conventional rectilinear form instead of the anticipated semicircular expansion, ensuring future flexibility and adaptability. Most notably, it includes a 14-bed acuity unit that can flex to accommodate any level of patient demand.

Modifications and Moment Frames

After establishing the new tower's massing based on programmatic requirements, evaluating the lateral force resisting system became the first structural engineering priority. The original hospital, designed in accordance with BOCA 1990, used steel moment frames in each principal direction. Integrating this lateral force resisting system into the clinical tower required careful consideration to ensure structural integrity between new and existing portions. While the moment frames in the podium's southern half were designed to extend vertically into the new patient tower, the new structure's proposed shape introduced significantly greater wind exposure than the original design considered.

Design of the new lateral force resisting system began by verifying the existing moment frame beams and columns using RISA 3D and RAM Structural System, the latter of which was used to design the original hospital's primary structure. After developing a comprehensive understanding of the existing structural capacities, the analytical models were expanded to include the new clinical tower. New bays of two-way moment frames were then strategically located in the western portion of the tower to avoid overstressing the existing structure. Within each new moment frame, beam and column sizes were optimized to maintain deflection compatibility.

Working closely with construction manager DPR and steel fabricator Shepard Steel, structural engineer CannonDesign evaluated several options for the steel moment frames, including conventional wide-flange beams and columns, SidePlate by MiTek, and ConnXTech. A conventional moment frame system with wide-flange beams and HSS columns was the most economical and efficient option for the vertical expansion. The eight-story western half of the addition incorporates 12 jumbo ASTM A500 Grade C HSS16×16×⅞ columns with through-plate moment connections to wide-flange beams in each direction.

above: An HSS column through-plate moment connection.

left: The connection to the existing building.

DPR

The podium's stepped floors provided an opportunity to connect large portions of the new and existing diaphragms between the second and sixth floors. Collector beams, in conjunction with post-installed reinforcing bars, transfer diaphragm forces between the structures. When required, existing beam-to-column connections were modified in the field to facilitate the transfer of axial forces.

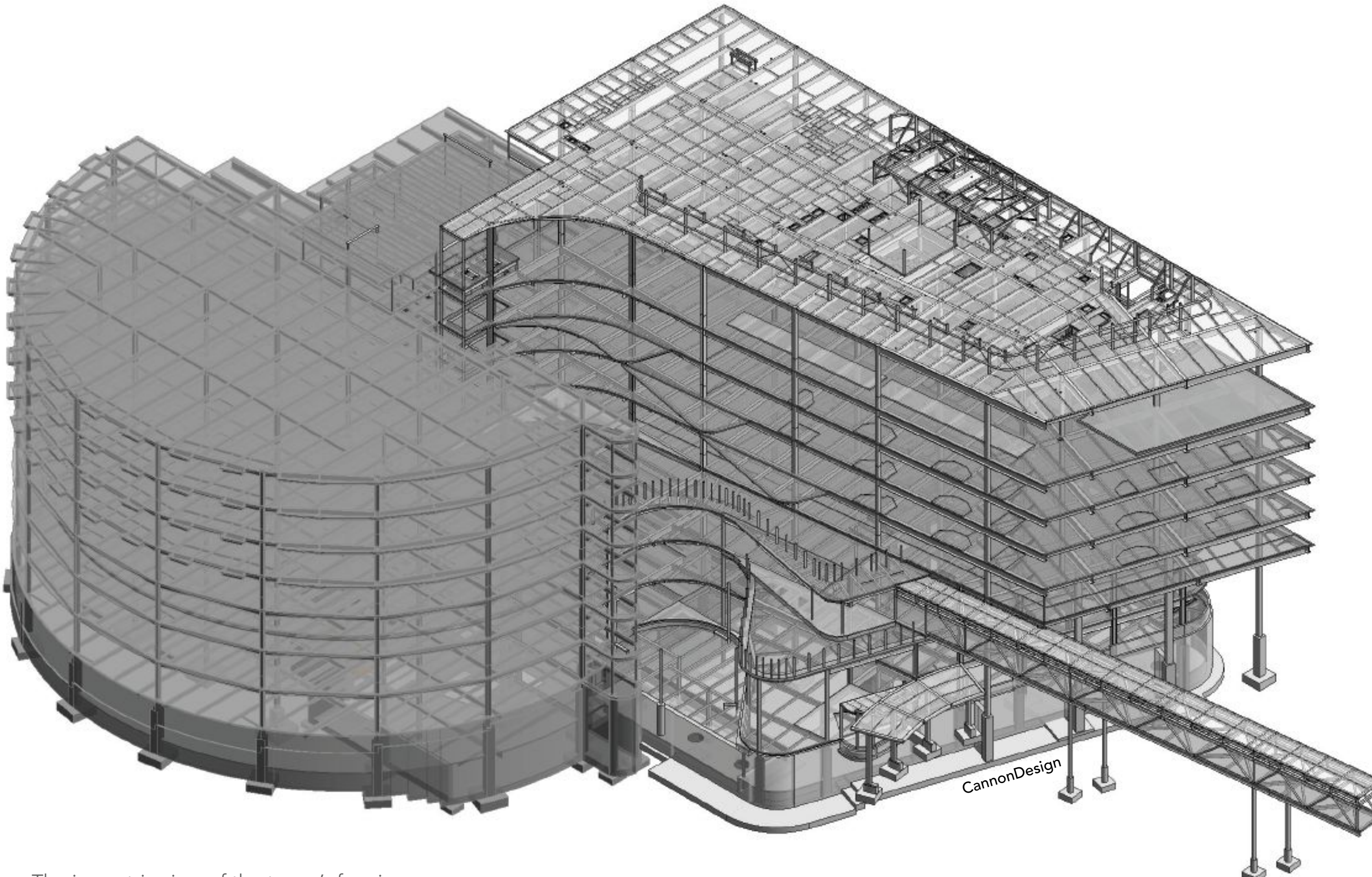
The new tower is connected to the existing seventh and eighth floors only at the narrow vertical circulation core, significantly limiting the possibility of lateral force transfer at these levels. Rather than connect the diaphragms through the core, the tower incorporates joints that allow the buildings to move independently.

Adaptations and Additions

Steel framing is often chosen as a structural system for healthcare facilities due to its adaptability, accommodating modifications to meet evolving requirements throughout the lifespan of the building. The team fully leveraged steel's adaptability throughout the vertical expansion's design and construction to minimize any potential disturbances to clinical operations.

Initial studies identified the need for two additional elevators to serve the tower and proposed expanding the vertical circulation core through several podium levels.

DPR



The isometric view of the tower's framing.

Between the first and third floors, each new elevator shaft cuts through the existing composite slab between framing members. These structural modifications offered an opportunity to add a new column adjacent to elevator shafts that extends into the tower above. Supported by a new foundation within the basement, the column is comprised of HSS10×10×½ installed between each existing W30 floor beam.

Additional columns were threaded through the existing structure where a three-story atrium was infilled and converted into clinical space. Where necessary, beams and girders surrounding the former atrium were strengthened to carry the new floor loads by adding flange reinforcing plates.

Maintaining uninterrupted hospital operations during construction required careful consideration during the design phase. Where floors of the new and existing structures meet, stub outriggers matching the size of the new beams were first attached to the existing columns. This approach enabled the application of temporary waterproofing to protect occupied interior areas until the balance of the steel framing could be spliced to the stub beams and the new tower was fully enclosed.

Constraints and Cantilevers

The limited land availability, which drove the broader vertical expansion strategy, similarly influenced the design of the new tower's western elevation. Here, the practical need to accommodate a patient drop-off area outside the first-floor lobby became the impetus for the building's most compelling design feature. The top five floors extend 30 ft beyond the face of the three lower levels and over the drop-off area, providing space for vehicle circulation and shelter from the elements. Each floor incorporates a 20-ft-long cantilever comprised of W40 beams that pass through spliced HSS16 columns. Below the fifth floor, HSS22×22×⅞ columns rise unsupported 40 ft above grade, creating an arcade between the road and the lobby.

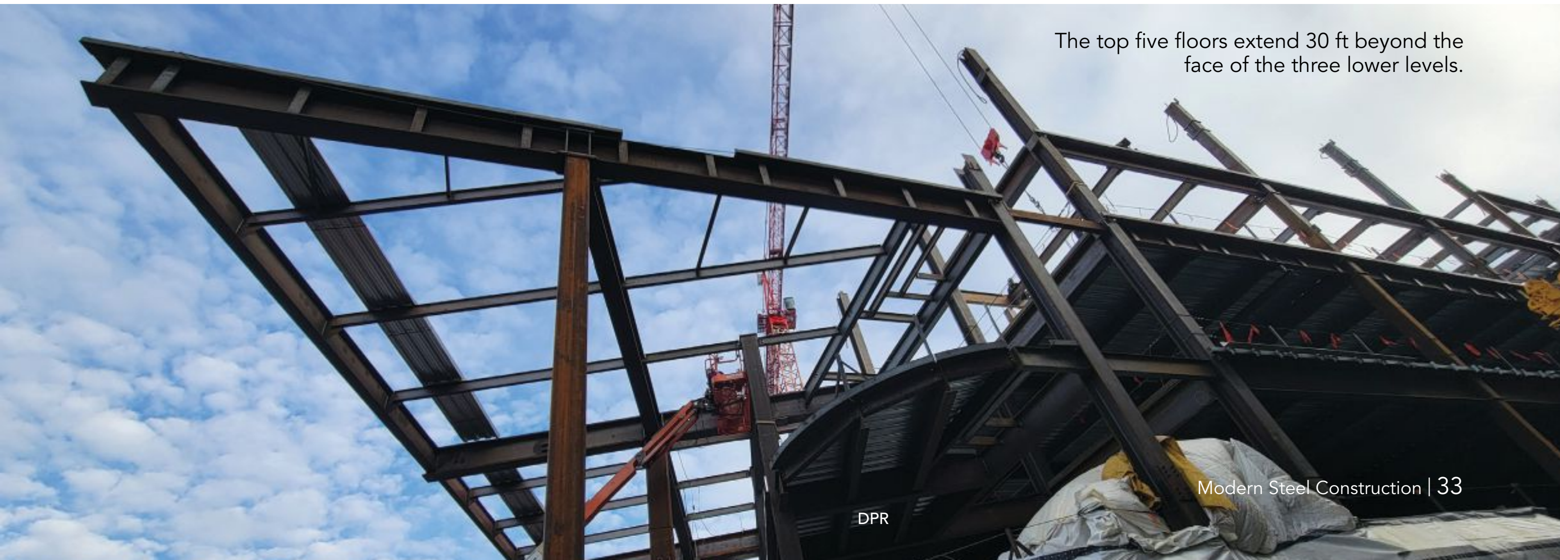
A similarly dramatic design feature is stepped cantilevered terraces on the building's north side, which provide each inpatient floor with an outdoor landscaped space for fresh air and respite. Each curved floorplate extension is supported by transfer girders and cantilevered beams set 1 ft, 5 in. below the primary floor framing to accommodate roofing and precast pavers.

Designing the stepped terraces presented a unique challenge because of the limited depth available for the structure and strict deflection limits imposed by the unitized curtain wall façade. Above the fifth floor, ASTM A992 W18×211 floor beams are haunched to provide continuity, with W12×152 members below the terrace that cantilever up to 16 ft beyond the spandrel beams. Further connecting the building to nature, the tower's glass and metal palette transforms from mostly green hues at the landscaped terraces to blue shades as the building reaches upward.

Each inpatient floor has cantilevered outdoor terraces.

DPR

The cantilevered terrace framing.



The top five floors extend 30 ft beyond the face of the three lower levels.

DPR

The pedestrian bridge to a parking structure has story-high box trusses, the longest of which spans 70 ft.

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4	Flat Bar The Easy Way	INSIDE DIA.	36" x 12" Flat
5	Square Bar	INSIDE DIA.	18" Square
6	Beam The Easy Way (Y-Y Axis)	MEAN DIA.	44" x 335#, 36" x 925#
7	Beam The Hard Way (X-X Axis)	INSIDE DIA.	44" x 285#
8	Channel Flanges In	OUTSIDE DIA.	All Sizes
9	Channel Flanges Out	INSIDE DIA.	All Sizes
10	Channel The Hard Way (X-X Axis)	INSIDE DIA.	All Sizes
11	Tee Stem In	OUTSIDE DIA.	22" x 142$^1/_2$# Tee
12	Tee Stem Out	INSIDE DIA.	22" x 142$^1/_2$# Tee
13	Tee Stem Up	MEAN DIA.	22" x 142$^1/_2$# Tee
14	Angle Heel In	INSIDE DIA.	8" x 8" x 1" Angle
15	Angle Heel Out	OUTSIDE DIA.	8" x 8" x 1" Angle
16	Angle Heel Up	MEAN DIA.	8" x 8"x1" Angle
17	Square Tube	INSIDE DIA.	24" x $^1/_2$" Tube
18	Rectangular Tube The Easy Way (Y-Y Axis)	INSIDE DIA.	20" x 12" x $^5/_8$" Tube
19	Rectangular Tube The Hard Way (X-X Axis)	INSIDE DIA.	20" x 12" x $^5/_8$" Tube
20	Square Tube Diagonally	MEAN DIA.	12" x $^5/_8$" Square Tube
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The pedestrian bridge is 150 ft long and has a top chord exposed to view.

CannonDesign

Creating Connections

The symbolic associations embodied in the building's architectural expression are mirrored by the physical connections that occur at each level, most notably at the fourth floor, where a 150-ft-long pedestrian bridge provides access to a parking structure on the opposite side of a four-lane road.

This signature design element is comprised of story-high box trusses, the longest of which spans 70 ft across the right-of-way below. The top chord, which is exposed to view, incorporates W14×74 sections, while the bottom chord is located below the floor and is composed of W18×86 members. Each 6-in.-diameter diagonal HSS web element is directly welded to the chords, and all surfaces exposed to view were prepared with AESS Level 3 requirements. Two pairs of HSS14 columns provide gravity support, while lateral loads are transferred to the tower structure and the garage through the truss chords. W10×39 diaphragm bracing is provided over the bridge's full length at the floor and roof levels.

Evolving for the Future

The Connecticut Children's expansion demonstrates how innovation and 1,922 tons of structural steel and steel's inherent flexibility can transform constraints into design opportunities. Each unique feature shows technical excellence and compassionate care can be mutually reinforcing goals, and the project creates exceptional value from every square foot and construction dollar by turning structural necessities into healing assets.

When it opens in late 2025, the new tower will have 50 private neonatal intensive care rooms, a fetal care center with holistic labor and delivery services, and an advanced gene therapy unit for bone marrow and liquid radiation treatments. It will also offer patients and their families a broad range of specialty care services to meet the needs of Connecticut's children for generations to come. ■

Owner
Connecticut Children's Medical Center

Construction Manager
DPR

Architect and Structural Engineer
CannonDesign

Fabricator, Detailer, and Erector
Shepard Steel Co. Inc.

Tim Kyes (**tkyes@cannondesign.com**) and **Bassem Almuti** (**balmuti@cannondesign.com**) are structural engineers at CannonDesign in the Boston office.

Sparking Interest

BY KATE DUBY

Student welding competitions are an easy and effective way to boost the fabrication industry, as demonstrated by one regional fabricator association.

AMID AN ONGOING NATIONWIDE LABOR SHORTAGE, American steel fabricators are finding creative ways to inspire and recruit a new generation of skilled tradespeople. The Steel Fabricators of New England's (SFNE) win-win idea is a welding competition partnership that gives high school students exposure to careers in steel and gives local employers a chance to connect with their future workforce.

On May 16, more than two dozen students from nine high schools across New Hampshire competed in the fifth annual New Hampshire State Welding Competition, a collaborative effort between SFNE, AISC, and sponsoring organizations.

This year's competition, held at Manchester Community College, raised more than $21,000 for the career and technical education (CTE) programs that have helped each competitor hone their skills—and introduced them to potential employers and mentors in the process.

"We all look forward to it every year," said Steve Chasse, president of SFNE and AISC member fabricator SL Chasse Steel. "It's great to see all the teachers from the CTE programs, and it's rewarding to see the future welders of America competing and showing us what they can do."

SFNE represents more than 75 steel fabricators and erectors across the Northeast. Chasse says welding competitions like this help employers not only identify future hires, but also energize the broader community.

"A lot of people say kids nowadays don't want to work," Chasse said. "That's not at all what I see. These kids do want to work, they're very good at what they do, and it's important for us to help them."

One of those students is Aidan Tanguay, a Pinkerton Academy (Derry, N.H.) student and second-time state competitor. He has already found work as a welder-fabricator for SL Chasse, fabricating railings, structural beams, and stainless steel components.

"I love welding—there's always a new challenge to it," Tanguay said. "I started when I was a kid doing welding projects around the house with my dad, and I just grew a passion for it."

Though Tanguay didn't place in this year's statewide competition, he still has eyes on a valuable prize: mastering stick welding at the level of precision he has achieved in tungsten inert gas (TIG) and metal inert gas (MIG) welding. He and the other competitors had four hours to complete their assigned MIG, TIG, and stick welding processes, all taking home sponsor-donated tools and equipment at the end of the day. The top three welders received individual prizes and plaques of recognition for their CTE programs.

These programs are designed to offer ambitious students like Tanguay pathways to long-term, lucrative careers, providing co-curricular technical training in a variety of career fields. More than 7.5 million high school students are enrolled in CTE programs nationwide, and many trades-focused programs—like Pinkerton Academy's welding program—are experiencing enrollment growth.


FIFTH ANNUAL
NH WELDING COMPETITION


SkillsUSA

"We have a huge waiting list to get into our program," said Pinkerton Academy welding instructor Ashley LeClair. "There were close to 60 kids who didn't get in this year. I think not having to go to a four-year college to build a career is a big thing for kids. There's not such a stigma anymore, and the trades pay well."

Third-place winner James Karafelis raised $2,144 for the CTE program at Alvirne High School (Hudson, N.H.), second-place winner Cole Eaton raised $3,216 for Pinkerton Academy, and top competitor Brayden Laflamme raised $5,361 for John Stark High School (Weare, N.H.).

Laflamme, a member of John Stark's 2025 graduating class, has been welding since he was 12 years old. Competing alongside the best junior welders in his home state has not only proved personally rewarding—it has helped propel him into a career he's passionate about. At only 17, Laflamme is the proprietor of his own mobile welding and fabrication company.

"I just picked up a torch one day, and my mentor taught me how to use it," Laflamme said. "I've been in love with welding ever since. It's really cool to be 17 and own my own business successfully, especially when I see other kids my age not knowing what they want to do in life. In five years, I hope to have employees, possibly a shop of my own, and a steady income."

The additional six participating schools—Berlin High School, Dover High School, Sugar River High School, Portsmouth High School, Seacoast High School, and Mount Washington High School—will receive cash prizes of $1,786 to go toward their CTE programs.

AISC can help any regional fabricator organization, educator, or member fabricator interested in hosting a welding competition and partnering with local CTE programs. Go to **aisc.org/weldingcompetition** to learn more and start the hosting process. ■

Kate Duby (duby@aisc.org) is AISC's communications content specialist.

Student Steel Bridge Competition

THANK YOU TO ALL OF OUR AMAZING SSBC VOLUNTEERS!

To everyone who judged, supported, and cheered on this year's competition—thank you. With more than 200 teams this year, we couldn't have done it without you.

Your time, expertise, and enthusiasm made this a rewarding and memorable experience for thousands of student engineers across the country. We are truly grateful for all that you do.

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Fantastic Five

BY PATRICK ENGEL

The 2025 Student Steel Bridge Competition put the University of Florida's latest winning formula on display and showcased stories of grit and dedication.

IN ITS LATEST JOURNEY to an SSBC National Finals first-place finish, the University of Florida steel bridge team concocted a smokescreen.

The team did not want to spoil its complex and innovative two-builder, zero-barge construction strategy before the national finals, so it used a backup plan at the Southeast Regional competition in March that kept the secret and bested the other 10 contestants.

"At regionals, we built with three people, but that was to not give away our plan for nationals," said Damian Blanco, the team's co-project manager and one of the builders.

Florida unveiled that plan at the national finals, hosted by Iowa State University on May 31, and it launched the team into the same spot as the last four years: John M. Parucki National Champion. Florida's five straight first-place finishes broke its own record, and its seven overall are the most in SSBC history. This latest winning bridge had been in the works since September.

The 2025 SSBC construction task was to build a pedestrian bridge over a 13-ft river and inaccessible sandbar. It expanded on last year's conditions, which had an 8-ft river and no island. Florida began its 2025 design by experimenting on last year's bridge, which most members of the 2025 team worked on a year ago.

"With the rules being similar, minus the clear span, we knew we'd be able to take what we learned about design, assembly, and connections from last year's bridge and apply it," Blanco said.

The river width was larger than 2024, which made passing a completed span across it more risky and difficult. Most teams at this year's national finals used at least one barge—a student allowed to stand in the river for double the cost of a regular builder—to overcome the distance. But Florida had no interest.

"Our mentality is that if we wanted to be competitive, we couldn't use a barge," co-project manager Emma Robert said.

The University of Florida, led by project managers Emma Robert (front, second from left) and Damian Blanco (front, second from right) is the SSBC John M. Parucki National Champion for the fifth straight year.

above: Florida assembled its bridge in less than 10 minutes with only two builders.

below: Lafayette College was the national runner up and used a building strategy similar to Florida's.

Host school Iowa State had a common construction approach: two builders and two barges.

Instead, Florida's final choreographed plan had two builders—one on each side of the river—using temporary shoring as a staging area at the piers. It was an example of a real-life method called bridge launching, where bridge superstructures are erected by progressively pushing the bridge into its final position from one side. It's used on sites with access constraints or where traditional falsework is impractical. Bridge launching is typically done with a jack, but in this case, the builders acted as the jacks pushing the trusses into position as they were progressively built.

"We're so grateful for this competition because of how much you learn from doing it," Blanco said.

The temporary shoring was dismantled and removed once the bridge could support itself. It counted as a tool rather than a member, meaning it did not need to be part of the final bridge. It had to be strong enough to support the permanent stringers' weight but easy to take apart.

It turned out Florida had a tight margin for error. Runner-up Lafayette College also developed a two-builder, zero-barge construction plan with temporary shoring and built its bridge in just over eight minutes. Florida needed 9:37, but first-place finishes in efficiency and stiffness and top-three finishes in three other categories propelled its total score to the top. Virginia Tech finished in third place and won the aesthetics category.

Florida's reward for winning is $8,000 in scholarships. Lafayette earned $6,000 in scholarships, and Virginia Tech $4,000.

All told, 43 teams competed in the 2025 SSBC National Finals. Over the school year, they had to design, fabricate, and build a 1:10 scale bridge over the river and island. This year's restrictions included a height limit and a minimum clearance. All 43 teams were top finishers at 20 regional competitions.

The University of Texas at El Paso will host the 2026 SSBC National Finals May 22 and 23.

Starting from Scratch

There are first-time participants at SSBC National Finals each year. Lincoln Memorial University, though, is a special kind of new and had an impressively fast start. This year was its first with an SSBC team. Three years earlier, it didn't even have an engineering school.

"We haven't even graduated anyone from the engineering school," team member Waylon Ball said. "We had never done this before. The school has never done this before. To be here is just really cool."

At the start of the academic year, Lincoln Memorial School of Engineering dean Ryan Overton, PhD, floated the idea of a steel bridge team to his students. Four wanted the challenge, which wasn't just designing and building. They had to recruit team members, start an ASCE Student Chapter on campus, find equipment and shop space, and learn to weld.

"We took it and ran with it," Ball said.

Their design phase had a side project: finding a place to fabricate and build their final design concept.

Lincoln Memorial's engineering school is in an old medical health sciences classroom building. The steel bridge team leaned into that reuse idea in their search for a fabrication space. They knew Lincoln Memorial's veterinary program, one of the school's flagship offerings, had built a new space and vacated an old one slated for demolition.

"We're close with the maintenance department, and they said the vet school was moving out of a building," Ball said. "They suggested we ask for it and said they'd put in a good word. We went through the whole process and took over the building."

AISC

Bob Shaw

The University of Alaska, Fairbanks earned its fourth straight top-five finish.

They weren't done borrowing and reusing.

"We had to build our shop," team member Parker Meldrum said. "We would go to farmer's auctions to find welding tables, toolboxes, and things like that. We were looking in and next to dumpsters getting plywood to make work benches."

The students built their bridge mainly from locally sourced steel. They had to find two section sizes, because deflection differences in their final design required the bridge's longer side to be thicker than the short side. Material arrived not long before their regional competition.

"Three weeks before regionals, we finally got the metal in, and then it was go time," Meldrum said.

After the Mid-South Regional competition, they received an invitation to the national finals, where they placed 32nd. The SSBC Rules Committee also selected them as the recipient of the Robert E. Shaw Jr. Spirit of the Competition Award for their positivity and encouragement to each other and their professionalism and appreciation to volunteers. But perhaps the bigger victory was the support and momentum they built on campus throughout the year within the 60-person engineering school and eight-person senior-to-be class. A few more students joined the four founding team members during the year. Meldrum and Ball will be back to lead them in the 2026 competition before they leave as part of the engineering school's first graduating class.

"We're looking forward to next year," Meldrum said, "because we have a lot of people interested."

Another Top-Five Fairbanks Finish

A perennial national finals participant is perhaps the most geographically isolated university in the SSBC competition field. And its location is no barrier to placing in the top 10 consistently.

The University of Alaska, Fairbanks (UAF) placed fourth this year, its third straight top-five finish at the national finals. It has qualified for the national finals every year since 2019 and placed in the top 10 each time, highlighted by a national runner-up finish in 2022. It routinely resides in the standings next to schools with larger engineering programs and more resources. Its steel bridge team is smaller than many, which means most members put in more hours throughout the year than their counterparts at other universities.

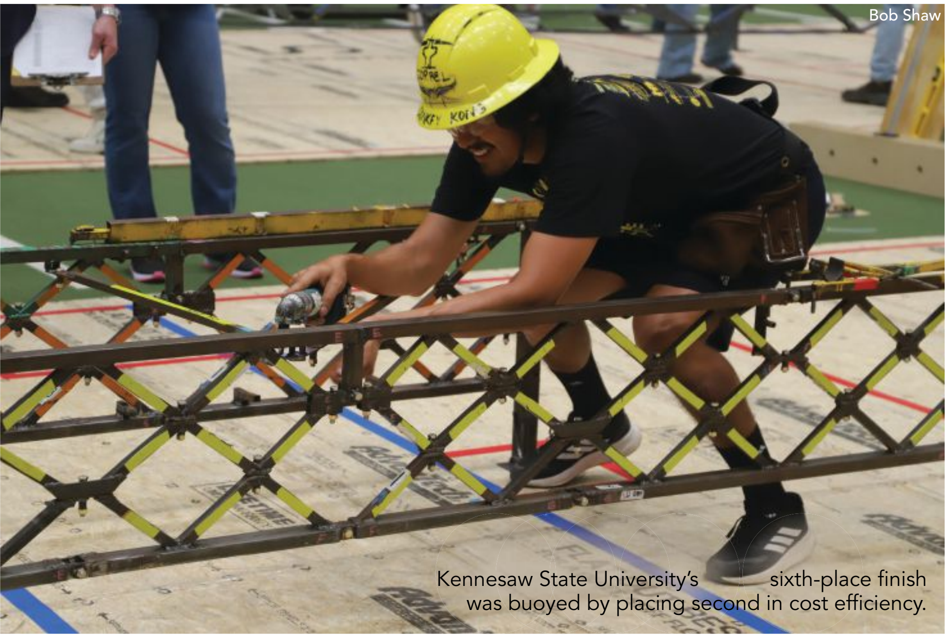
"The people who are in this have to be really in this to get the project done on time," team member Lucas Gomes said. "There's a lot of work to do."

The buy-in has been present for nearly 30 years. UAF formed a team in 1993, just one year after the first SSBC national competition. The team has competed since, save for a hiatus in the late 1990s and early 2000s.

Strong relationships with steel suppliers have made sourcing material to a remote location manageable. One local distributor is a key partner, Gomes said. Lightweight aircraft steel is part of the school's bridge most years, and the team has a reliable provider that delivers material on time and enjoys helping an SSBC entrant.

Bob Shaw

University of Wisconsin-Platteville placed second in stiffness.



Bob Shaw

Kennesaw State University's sixth-place finish was buoyed by placing second in cost efficiency.

Bob Shaw

Worcester Polytechnic Institute had the closest cost estimate of any team.

2025 Winners

The results of the 2025 SSBC National Finals:

John M. Parucki National Champion
University of Florida

Overall
Lafayette College (2nd)
Virginia Tech (3rd)

Construction Speed
Pennsylvania State University, Harrisburg (4:55)
University of California, Davis (6:00)
University of Alaska, Fairbanks (6:55)

Lightness
Universidad Autónoma del Estado de México
University of Florida
Virginia Tech

Aesthetics
Virginia Tech
Université Laval
Universidad Autónoma del Estado de México

Stiffness
University of Florida
University of Wisconsin-Platteville
Virginia Tech

Cost Estimate
Worcester Polytechnic Institute
Kennesaw State University
University of Florida

Economy
Lafayette College
University of Florida
Pennsylvania State University, Harrisburg

Efficiency
University of Florida
Virginia Tech
University of Alaska, Fairbanks

Team Engagement Award
University of California, San Diego

Robert E. Shaw Jr. Spirit of the Competition Award
Lincoln Memorial University

Frank J. Hatfield Ingenuity Award
Kennesaw State University

John M. Yadlosky Most Improved Team Award
Clemson University

Video Award
New York University
Universidad Nacional Autónoma de México
University of British Columbia

above: UC Irvine and Hemet Adult School partnered to make UC Irvine's bridge a reality.

right: Joshua O'Neal (right) working with his Hemet Adult School students and UC Irvine steel bridge team members.

below: Vocal cheering sections are an SSBC tradition.

Just as importantly, dedicated faculty advisers have helped it remain competitive and a draw for students. Adjunct instructor Wilhelm Muench teaches team members how to weld the bridge members and other necessary machine skills. The school has an on-campus fabrication space, with a lathe and two milling machines. They do not have CNC machine access.

"His expertise and teaching make the team work," Gomes said. "We'd be nowhere near as good without his help."

An adviser's impact is bigger when aiding eager and dedicated students. SSBC is part of the UAF engineering school's fabric, and the opportunity to create something tangible is the magnet that hasn't stopped pulling students in each year.

"It's just a really cool project and an opportunity to make a real thing that works," Gomes said. "You don't get to do that a lot in classes. From start to finish, we design and create this engineering project, and the people who get into it love doing it. Only certain types of people will be super into this, but we have just enough."

A Promising Partnership

New campus safety rules and restrictions limited the University of California Irvine steel bridge team's access to its on-site welding shop. Liability concerns with college students fabricating at off-campus locations left them needing welders. An AISC member fabricator helped them find both—even though neither solution was at its shop.

The UC Irvine students partnered with nearby Hemet Adult School, which offers a welding program for high school students, to fabricate their bridge pieces. The Hemet students and their instructor, Joshua O'Neal, did all the fabrication work. The link between them was Neil Aldridge, a product expeditor at AISC member Muhlhauser Steel in Murrieta, Calif. Aldridge saw an AISC email encouraging fabricators to get involved with a local SSBC team, submitted his information, and was connected with UC Irvine. He and O'Neal had a prior relationship, and he paired the two groups. He was not merely fixing UC Irvine's problem.

"Hopefully, this is something where you learn from them as much as they learn from you," Aldridge said, recalling his pitch to SSBC project manager Jaw Lat Naw Sutnau. "It's two very different groups coming together to make something work."

Both sides quickly knew they had found a reliable partner.

"After the first meeting with Josh, I was struck by how he was ready to go, energetic, and super excited about it," said Joel Lanning, UC Irvine's faculty adviser. "I knew it would be just fine."

above: The University of North Dakota swung a constructed member across the river to avoid using a barge.

left: Bridges go to load testing after they're assembled.

The result was UC Irvine producing a bridge in time for the SSBC Pacific Southwest Regional competition in early April. Although UC Irvine did not qualify for the national finals, they found a rewarding and eye-opening partnership for both sides that will continue into 2026, and likely beyond. The UC Irvine students gained an appreciation for how interacting with a fabricator can help and learned firsthand the importance of considering fabrication work during design. Meanwhile, the Hemet students created a real-life structure that invigorated passion for their curriculum and for working in the steel industry.

When most Hemet students enroll, they see the program as a path to a stable job that presented itself when other options weren't clear or appealing. Welding itself—and why people take pride in it—is foreign to them. A partnership with engineers and creating something tangible fostered that sense of pride in a way that lessons from a structured curriculum can't. The Hemet students were going beyond learning how to use a tool and where to place it.

"This is actual work now where they see what lines mean, learn how to take dimensions and do an orthographic projection, and understand drawings" O'Neal said. "It changed a lot of their minds about what they thought was possible with welding. Most of them thought maybe they'd go on a construction crew and erect steel."

UC Irvine's bridge team is comprised of engineering students, and almost all had zero prior welding experience or familiarity. Having another party fabricate their design was a real-time lesson in designing for weldability and constructability.

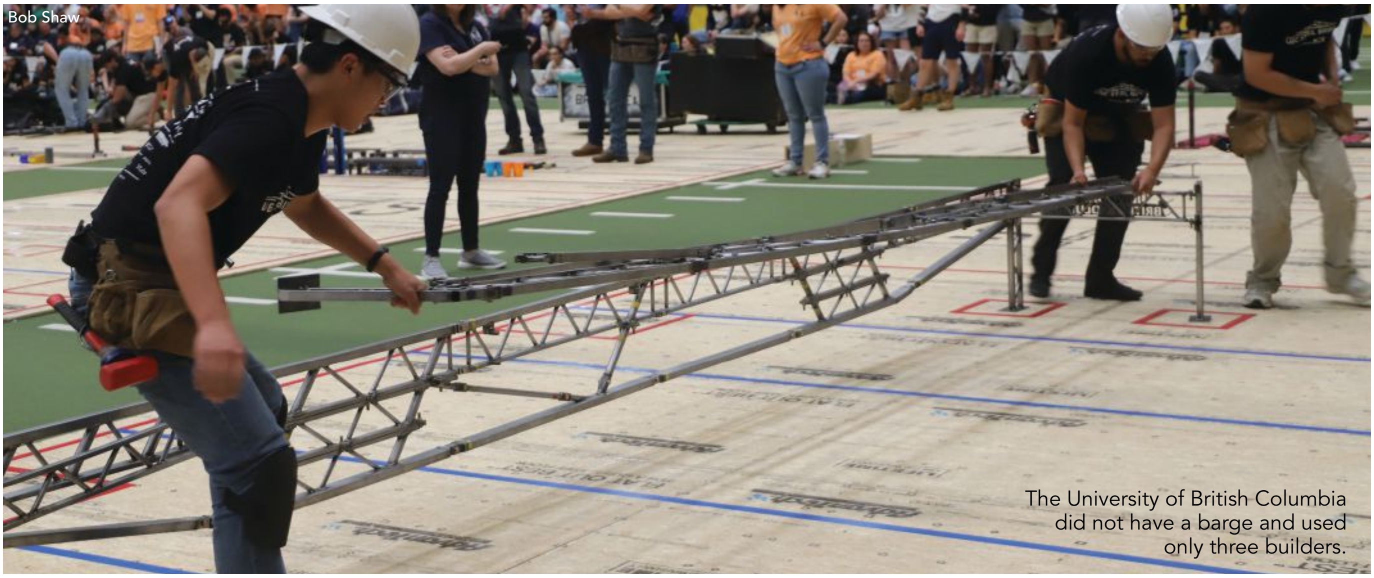
"Something can be cool on paper and in a model, but you can see how difficult it is in real life," Aldridge said. "They all got it. It was a nice practical experience they got to see. You created this drawing and model, it's your idea and concept, but you're handing it to someone unfamiliar with it, and they run into problems. They were like, 'Oh yeah, we see it.' That's what this whole thing is about. They were sitting in the classrooms at Hemet with their laptops, redoing drawings. They could see the problem, fix it, and try it again."

Added O'Neal: "They learned that it could look good on paper, but it doesn't always jive with real life. There were some offset angles they had on one side of the truss. On paper, the angles didn't line up when we built it in real life. They saw how it came together and were blown away. We can draw something, but how do we get it to work?"

UC Irvine and Hemet worked together for about four months, with UC Irvine usually going to Hemet once a week, to refine the

Bob Shaw

The University at Buffalo is an SSBC National Finals mainstay.


Bob Shaw

The University of British Columbia did not have a barge and used only three builders.

bridge design to a constructable product that met the 2025 SSBC rules. Hemet's spring break was during the regional competition, so the students did not attend, but excitement erupted when O'Neal showed them photos of the completed bridge.

"They were like, 'We did that!'" O'Neal said. "They were flipping out and pumped."

Several UC Irvine SSBC team members will return as seniors next year and work with a new class of Hemet students. Year two of their partnership won't just provide fabrication help. O'Neal is aiming for Hemet and UC Irvine to have a pre-design meeting so fabrication goes even smoother and his students feel even more involved.

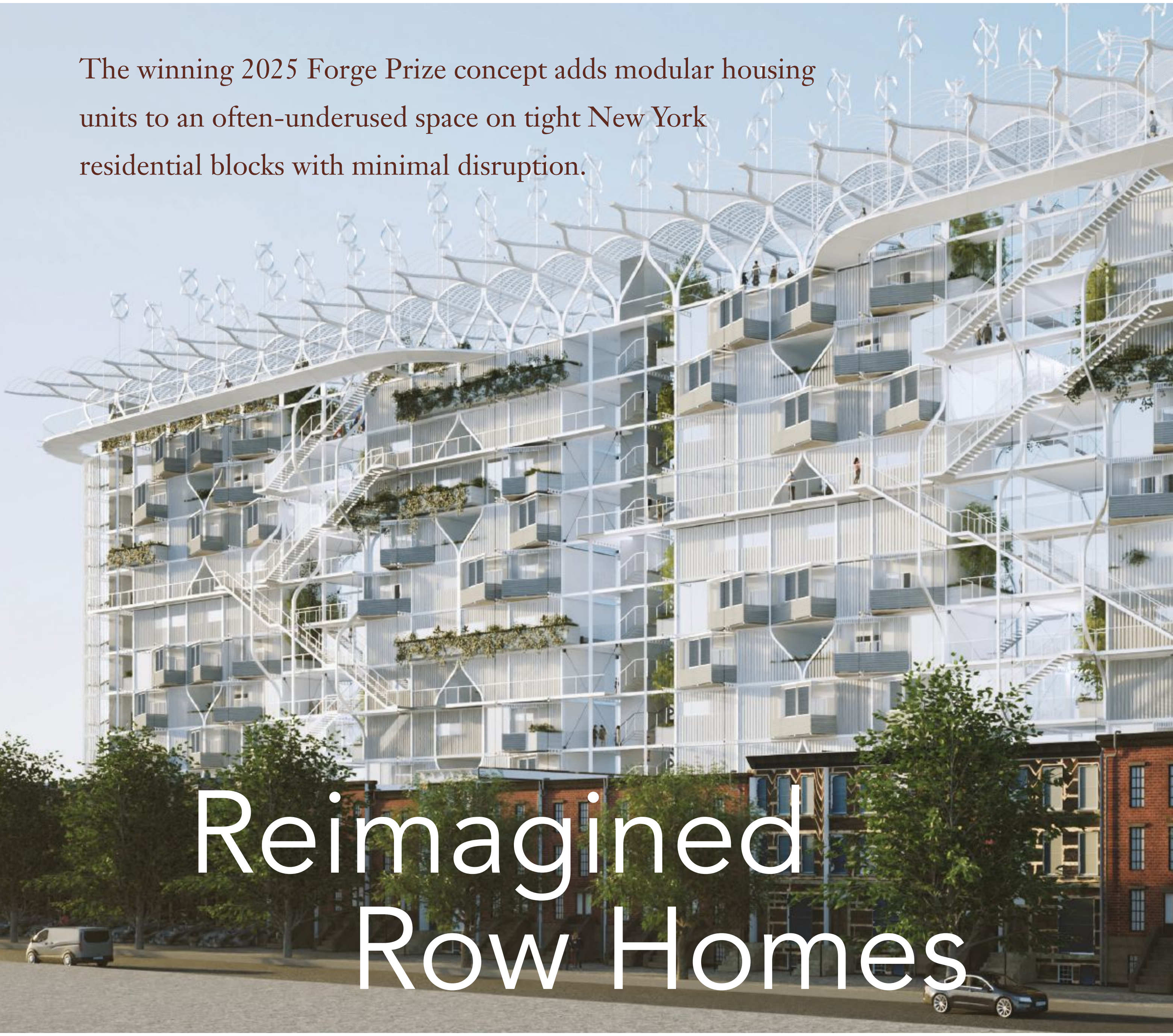
O'Neal also hopes the students can do 100% of the fabrication work. Although learning to fabricate is part of the SSBC experience and teaches team members lessons, Lanning felt that watching fabrication work and collaborating with a fabricator taught them more and is relevant preparation for structural engineering jobs. He and the students will gladly watch and learn.

"They still experienced thinking through the fabrication process, seeing how difficult it is, and knowing they have to take special care when they're putting a design on paper for someone else to build," Lanning said. "In a lot of ways, they learned the same lessons I hope they learn when they fabricate themselves. I saw that progression throughout the year. It might have even been better than when they do it themselves." ■

Patrick Engel (**engel@aisc.org**) is the associate editor of *Modern Steel Construction*.

The winning 2025 Forge Prize concept adds modular housing units to an often-underused space on tight New York residential blocks with minimal disruption.

Reimagined Row Homes



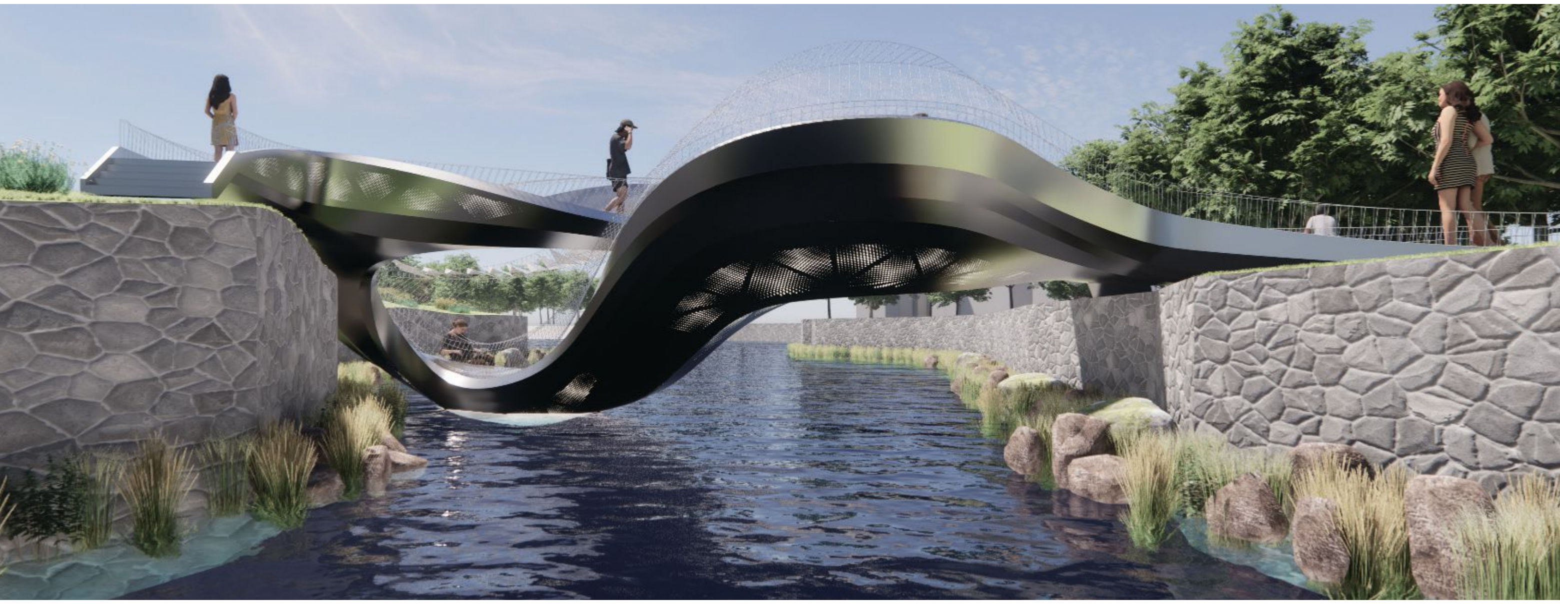
CREATIVITY WITH UNDERUSED SPACE in an urban area is a smart strategy for adding housing stock in places that don't appear to have room for it. One design concept pushed convention by adding housing to a typical (and tight) New York City townhome block while increasing its livability. That bold idea earned first place in AISC's 2025 Forge Prize.

Architect Ho-gyeum Kim of CZS saw the potential for townhomes' yards to help meet New York's housing demands. A modular system based on the average rowhouse lot width could bring duplex units with semi-private outdoor areas. The Forge Prize's second phase requires entrants to partner with an AISC member steel fabricator to optimize the design. Kim partnered with Ralph Barone of AISC full-member fabricator Barone Steel in Brooklyn, N.Y.

Kim's design concept, Growing Rowhouses, approaches frequently unused and neglected rowhouse rear yards as a single lot. The modular system uses an 18-ft grid, keeping with average rowhouse lot width. The height of the new rowhouses can change as dictated by allowable zoning.

The concept requires minimal foundations, leaving the existing rowhouses untouched, and structural steel helped achieve it. Steel cables on either side of the central structural core stabilize the building's lateral movement.

The vertical community consists of duplex units with semi-private outdoor yards. Outdoor communal spaces include a rooftop terrace and a running track. Curved hollow structural sections create a cohesive look across external stairs, roof structures, and trellis extensions—a detail that also allows for mass production.



"It's a robustly developed proposal with a timely architectural premise and a clear idea about how and why steel will be used to support the concept," said Forge Prize juror Matthew Marani, special sections editor for *Architectural Record*. "It has a well-considered implementation strategy, including coordination with zoning and planning constraints, market demands, and erection efficiencies. It also fits neatly into new approaches to zoning within the Department of City Planning, specifically the larger City of Yes policies."

Kim earned a $10,000 grand prize by taking first place. His design was one of three Forge Prize finalists and earned the top honor over runner-up "Transforming Galvanized Sheetmetal Waste Streams into a Modular Living Wall Planter System" from Texas A&M University architecture professor Ahmed Ali, PhD. It involves folding and assembling steel elements that would normally be cleaned and recycled.

The third-place concept, "Pedestrian Bridge of Echo Lake," came from Kaikang Shen of Abramson Architects in Los Angeles. It encourages park visitors to engage with the water in new ways.

AISC established the Forge Prize in 2018 to recognize visionary emerging architects, architecture educators, and graduate students for design concepts that embrace innovations in steel as a primary structural component. University of Arkansas associate professor (and 2024 Forge Prize winner) Emily Baker and Payette associate principal and director of fabrication Parke MacDowell, AIA, joined Marani on the 2025 Forge Prize jury.

Read on to learn about all three Forge Prize finalists.

WINNER

Growing Rowhouses

New York

Ho-gyeum Kim, CZS

AISC member fabricator partner:
Ralph Barone, vice president,
Barone Steel Fabricators

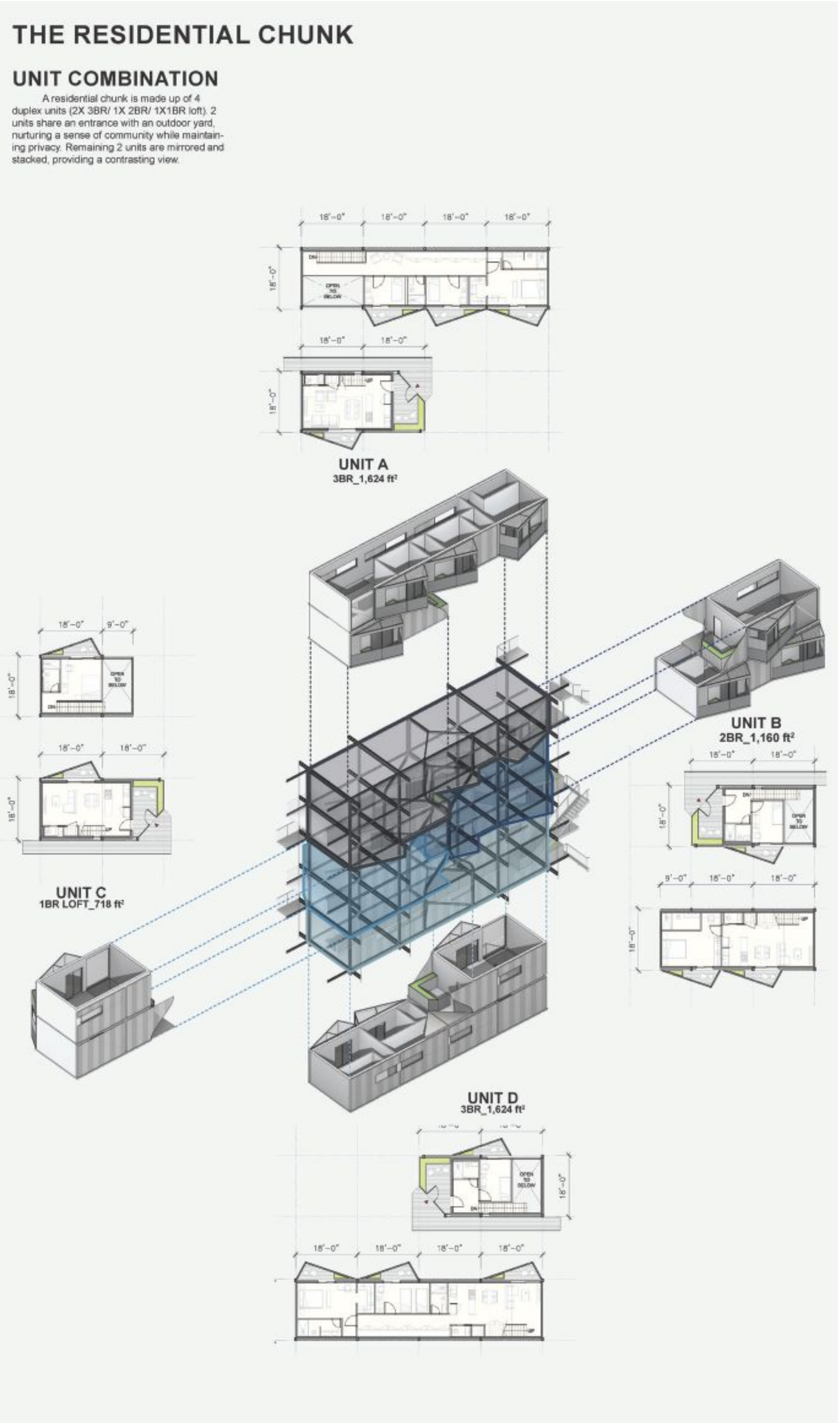
New York City's current housing strategies—ground-up condos, NYC Housing Authority (NYCHA) interventions, and office-to-residential conversions—have significantly contributed to its housing stock. However, these approaches cannot meet the city's escalating demand because of limited zoning availability for high-density residential areas, NYCHA projects, and commercial zones. Growing Rowhouses explores an alternative: leveraging rowhouse blocks in other zones to alleviate housing pressure.

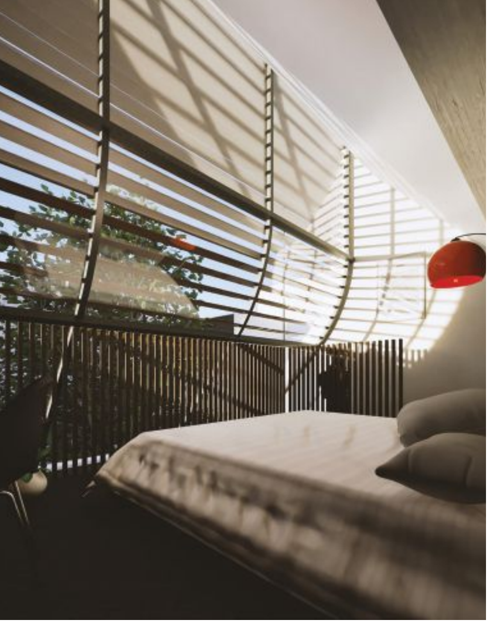
Typical rowhouse blocks consist of narrow attached two-to-five-story dwellings in relatively low-density zones. Despite their modest individual capacities, the combined area of rowhouse blocks holds significant untapped potential. By reimagining the rowhouse block as a collective lot, underused rear yards can transform into vibrant, higher-density residential spaces. It's a new way to add multi-family housing outside of areas with empty lots or zoning that permits tall buildings.

Rear yards were originally intended for single-family use. Now, they are often underused or unused because many rowhouses are multi-family dwellings. In owner-occupied units, access is exclusive; in rentals, rear yards are neglected to avoid maintenance. Growing Rowhouses proposes ways to unlock their potential.

A typical rowhouse block (200 ft by 700 ft) includes a central rear yard area approximately 90 ft wide. To maximize space usage while minimizing disruption, the project introduces modular structure systems based on an 18-ft grid (the average rowhouse lot width). These modules consist of three predefined frames, aggregated vertically and horizontally, and elevated to minimize ground impact.

Rowhouses are preserved by aligning modules along the block's centerline, encroaching only 9 ft on each side from the rear lot lines. Minimal foundations along the block centerline keep the construction field within the boundaries of the rear yard, leaving existing rowhouses untouched.





In higher-density scenarios, modules are inserted into the block without demolishing rowhouses. Rear yards become hubs for prefabricated construction with minimal impact on existing structures. Once the structure is built, existing rowhouses may function as homes or are adapted for commercial purposes.

For accessory dwelling units, curved built-up members are flipped to occupy the rear yard at ground level with direct access from individual lots. Upper floors can be accessed via the rear lot, increasing the property value for individual owners. For blocks under Landmarks Preservation Compliance oversight, module scale and placement are reduced to align with preservation requirements.

Residential units have a cluster of four duplex units featuring semi-private outdoor yards. The outdoor spaces include rooftop terraces and rentable neighborhood programs open to rowhouse block residents, fostering community while enhancing livability.

Steel is the most viable solution to achieve the minimal touchdown in the centerline of the blocks. A prefabricated, modular construction system takes full advantage of steel's unique potential to facilitate economical, rapid erection, and steel's unique recyclability and circular supply chain add a layer of sustainability while preserving the existing rowhouses.

The design has three predefined frames. Frame 1 contains the dwelling units, Frame 2 is the structural module's endpoint that adds a distinctive entry experience, and Frame 3 provides circulation and integrates the communal spaces.

Up to five modules (each 108 ft wide) can fit within a typical rowhouse block. Modules can expand vertically to accommodate higher density while preserving existing rowhouses.

Tie-down cables counteract overturning moments at ground-level HSS columns along the short direction. Tie-beams reinforce pile-cap foundations against moment shear along the long direction. X-bracing and core shear walls manage lateral forces along the module's length. Curved HSS members are used across external stairs, roof structures, and trellis extensions, creating a cohesive architectural language across all levels. Their design allows for mass production, optimizing cost-efficiency while maintaining design consistency.

FIRST RUNNER-UP

Transforming Galvanized Sheetmetal Waste Streams into a Modular Living Wall Planter System

College Station, Texas

Ahmed Ali and Bruce Dvorak, Texas A&M University; and Panwang Huo, Karishma Joshi, and Niti Tataria, Texas A&M architecture alumni

AISC member fabricator partner: Tony Baffone, chief operating officer, MSI Fab, LLC

Imagine a world where waste streams from one industry become the source for another. What if consistently large manufacturer waste and byproduct volumes can be transformed into building façades? What if there was a closed-loop supply chain between the automotive and the building industries?

The worldwide automotive industry generates a steady waste stream of galvanized sheet metal byproducts called offals through blanking and stamping operations. Offals are generated when windows and other spaces are stamped out of body panels on the assembly lines. They're consistently sized, high-quality, and irregularly shaped byproducts with much more value beyond standard scrap resale.

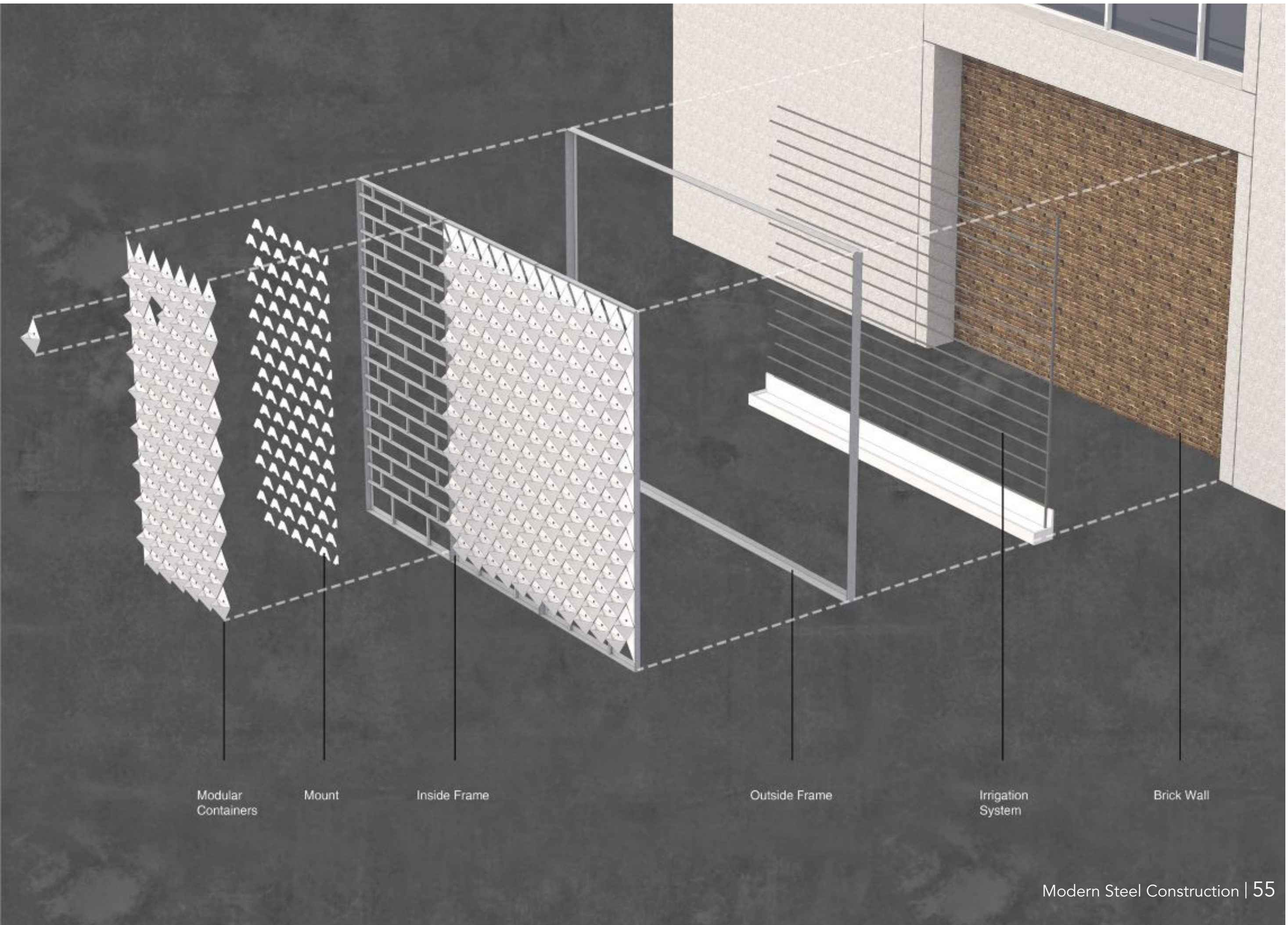
Galvanized sheet metal costs 50 cents per pound, while the waste stream is sold to the scrap market for roughly 6 cents per pound. By directly designing building façade panels and living wall systems from the waste streams, the automotive industry can sell its waste for more than the price of scrap but less than the cost of raw materials.

The modular living wall planter component system has been designed, built, tested, and patented. When central Texas set heat records in summer 2022, native plants integrated into the system thrived, outperforming those planted in the ground. This concept stands out not only for its circular economy and industrial symbiosis approach, but also for its aesthetic appeal, even when plants aren't at their peak. It's missing in most vertical greening systems. Beyond its positive impact on the urban heat island effect and air quality, the combined metal façade and living wall system successfully reduced heat gain on buildings and outdoor microclimate by 10 °F.

The concept is a novel approach to vertical greening that also provides a modular metal façade system to act as a double building envelope. The double envelope and living wall system functions as a rain screen, reducing heat gain on buildings, increasing airflow, and mitigating urban heat island effects. It's easy to install on the exterior of existing buildings.

A concept that reuses steel byproduct can, of course, only be done using steel. And steel's inherent recyclability and adaptability make reuse possible. Reusing offals has enormous cost-benefit values for the automotive industry and future reclaimed steel users.

General Motors produces approximately 40,000 offal pieces per month in 12 different shapes and sizes at one of its blanking plants in Michigan. In 2014, the company claimed it generated nearly $1 billion in annual revenue through byproduct reuse and recycling and avoided releasing over 10 million tons of CO_2-equivalent emissions into the atmosphere. For reclaimed steel users, the cost of offal building façade panels will be less than that of panels made from conventional material.


Modular
Containers
Mount
Inside Frame
Outside Frame
Irrigation
System
Brick Wall




SECOND RUNNER-UP

Pedestrian Bridge of Echo Lake

Los Angeles
Kaikang Shen, Abramson Architects

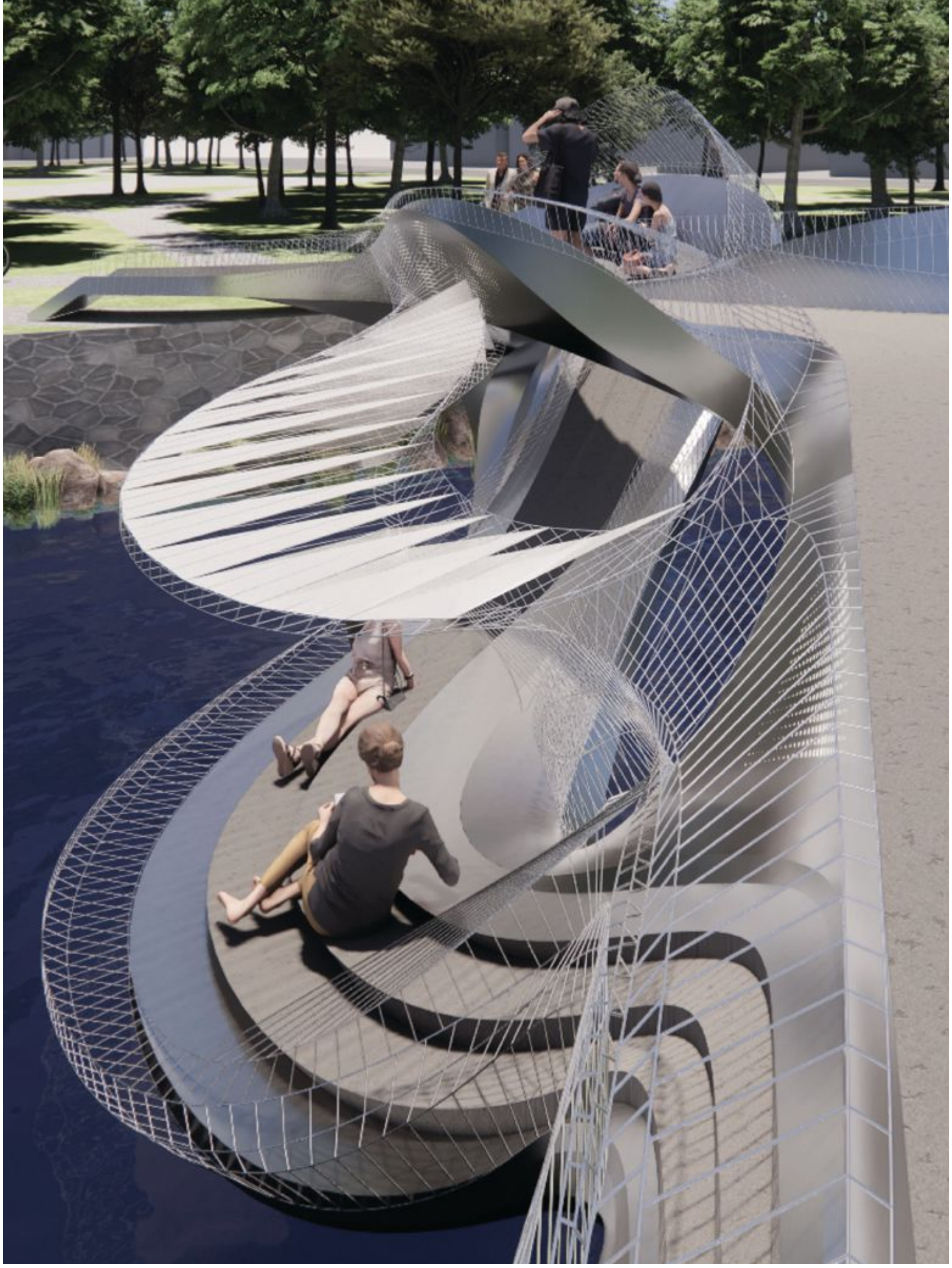
AISC member fabricator partners: Phil Schlosser, president, and Barry Gossler, vice president of operations, Schlosser Steel

This pedestrian bridge, envisioned for Echo Lake Park in Los Angeles, draws inspiration from a Möbius strip's infinite loop. The bridge transcends traditional linear forms using advanced parametric design principles, offering a sculptural and functional experience that harmonizes with the park's serene environment.

The Möbius strip is the conceptual foundation and symbolizes continuity and fluidity. The resulting parametric, nonlinear structure seamlessly integrates dynamic geometries, creating an iconic and engaging form. The bridge traverses the lake, connecting the main park to a small island, while its undulating design transforms into diverse spatial experiences along its length.

One segment of the bridge functions as a direct crossing, while others evolve into rest areas or platforms closer to the water, offering spaces for relaxation and lakeside interaction. The design interacts harmoniously with the surrounding environment, framing views of the lake and enhancing the park's aesthetic appeal. The bridge is primarily constructed using steel, chosen for its strength, durability, and adaptability to complex parametric forms. The surface is adorned with intricate, generative patterns reflecting water and light's fluidity, adding visual dynamism. These patterns also enhance the structural design by optimizing material use.

The railings, composed of slender rods, mimic the graceful movement of flowing water. The design ensures safety and maintains visual continuity with the



bridge body. The bridge invites pedestrians to experience a journey rather than a mere crossing. The combination of movement, rest, and interaction with water creates a multifaceted narrative, transforming the bridge into a destination itself. Its unique design and functionality establish it as a landmark within Echo Lake Park.

Selecting steel as the primary material was based on several factors:

Structural performance. Steel offers an excellent strength-to-weight ratio, enabling the structure to support the intricate geometric forms and spans of the bridge while maintaining safety and stability—crucial for a Möbius-inspired parametric design. Its malleability allows it to be bent, welded, and fabricated into complex curved surfaces and streamlined shapes, perfectly aligning with the nonlinear design requirements. It is highly resistant to fatigue and well-suited for handling the stress variations caused by pedestrian loads over extended periods.

Aesthetics. Steel surfaces can be polished, painted, or oxidized to produce a flowing sheen that echoes the bridge's design concept of fluidity. Its modern and technological aesthetic highlights the bridge's innovative nature. Advanced fabrication techniques, such as laser cutting or CNC machining, help achieve intricate parametric patterns, making the bridge deck and railings visually striking and unique. Steel surfaces' reflective properties create dynamic light and shadow effects throughout the day, harmonizing with the surrounding lake environment and enhancing its natural beauty.

Constructability. The steel components can be prefabricated in factories and assembled on-site, ensuring efficient construction while minimizing the impact on the sensitive lake environment. They are easy to weld, bolt, and reinforce, making them ideal for ensuring stable and reliable connections in a complex design.

Environmental adaptability and sustainability. The bridge is in a humid lakeside environment, which makes galvanization, anti-corrosion coatings, and other finishes crucial because they can extend the bridge's lifespan. Steel's recyclability aligns with the bridge's sustainable design principles.

Economics and maintenance. While the initial material cost may be higher, steel's durability and low maintenance requirements make it a cost-efficient choice in the long run. Steel components can be quickly repaired or replaced if damaged, minimizing downtime and additional costs.

MEET CLARK:

PUTTING THE AI IN AISC

Have a technical question? Let AISC's new chatbot search through hundreds of thousands of pages of authoritative steel standards and technical documents for you!

Clark will do the heavy lifting, searching through the *Steel Construction Manual*, *Seismic Design Manual*, all AISC standards, and, of course, all AISC design guides—and it will show you where it found the information you asked for. Clark is a closed system, as well, so you don't have to worry about it picking up bad habits from other users.

So give it a shot! Clark is ready and waiting to help you with your next technical question.

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new products

This month's new products include several material handling machines and an end-to-end material tracking software.

JLG High-Capacity Telehandlers

The JLG high-capacity telehandler line is popular in specialty industries where greater reach in additional heavy lifting capacity is desired. Pick-and-carry applications, like steel erection work, require a high-capacity telehandler to lift the load and move it to another destination, sometimes over large distances.

JLG high-capacity models include the 1644 (maximum lift capacity 15,650 lb), the 1732 (16,755 lb), and the 2733 (26,600 lb). They're equipped with optional SmartLoad technology, an advanced bundle of three integrated technologies that deliver greater operator confidence. They also have JLG's precision gravity lowering system, a soft stop boom control that slows boom functions at the end of the cylinder stroke, and optional boom float and ride control for enhanced load stability when traveling on uneven terrain.

The high-capacity models also have spacious cabs with enhanced visibility, two-speed hydrostatic transmissions, a reverse camera, and optional reverse sensing features. They have a remote-control option, which enables operators to control the boom from outside the cab. Visit **www.jlg.com** for more information.

ITS Mobile Transport Tray

ITS' patented Mobile Transport Tray (MTT) is manufactured using solid steel and equipped with heavy-duty industrial rollers, allowing it to handle up to 30 tons of load. Once loaded, it can be transported using a regular forklift truck, and the fixed mechanism locks the cargo in place preventing shifting during transit.

The MTT eliminates the need to use open-top containers, flat-racks, flatbeds, and cranes hired for loading and unloading. The fixing mechanism eliminates the need for shrink wrapping and expensive airbags. The roll-in and roll-out loading and unloading reduces turnaround times. Per-diem and cargo demurrage changes are reduced or eliminated by avoiding waiting for special unloading equipment. MTTs can be multi-stacked up to 15 units, saving on storage and transportation cost. For more information visit **www.innovativetransportsolutions.com**.

Hyster High-Capacity Electric Forklifts

Hyster has unveiled an expanded lineup of high-capacity electric forklifts that offer the configurability to match a range of heavy-duty applications. The Hyster J230-400XD series' integrated lithium-ion battery provides the performance and rugged reliability required by demanding environments, while offering a zero-emission alternative to internal combustion engine (ICE) power.

The J230-400XD series is available with a range of battery sizes to match duty cycle and charging requirements, configurable up to 280kW. The 350-volt architecture provides a right-sized solution for ICE-like performance and energy efficiency. The J230-400XD series has load capacities from 23,000 lb to 40,000 lb and 24-, 36- or 48-in. load centers. All Hyster trucks incorporate the Combined Charging System as standard.

Multiple performance modes allow operators to tailor deceleration and regeneration to suit specific tasks. Based on the deceleration level selected, regenerative braking sends energy back to the battery, helping increase time between charges. Visit **www.hyster.com** for more information.

new products

Combilift Combi-CB 155E

The electric Combi-CB 155E from the Irish material handling specialist Combilift boasts a lifting capacity of 15,500 lb and is an excellent choice for the steel industry. Notably, it is the most compact counterbalance forklift in its class, and its small footprint and lateral movement facilitate seamless navigation in confined spaces and narrow aisles while effectively handling long and bulky steel loads.

Awarded for its ergonomic design, the Combi-CB 155E features a spacious gas strut suspension cab with panoramic glass, offering exceptional visibility and safety for operators. One highlight is its auto swivel seat, which automatically swivels the seat and armrest 15° to the right or left following the direction of travel, significantly reducing driver strain, especially when reversing.

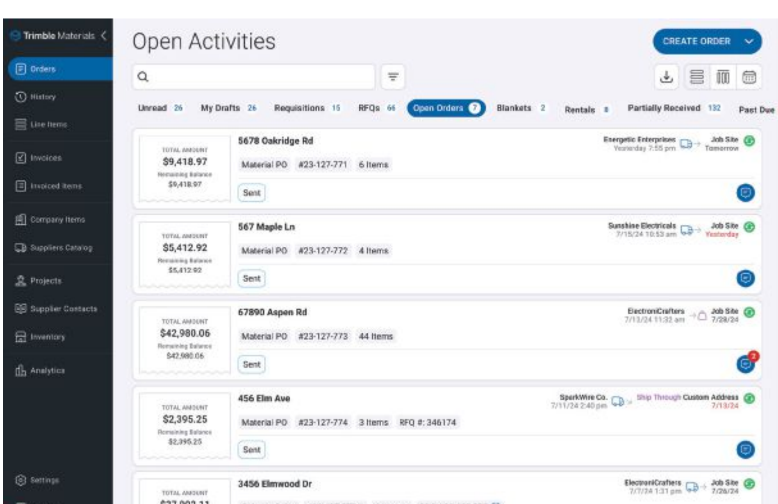
Additionally, the Combi-CB 155E features independent traction, eliminating the need for a differential lock on slippery surfaces and reducing long-load momentum twisting when traveling sideways. Visit **www.combilift.com** for more information.

Trimble Materials

Trimble has released Trimble Materials, an end-to-end purchasing, inventory, and accounts payable software solution designed to help contractors gain control over material costs with enhanced budget and inventory tracking. Through its office and mobile applications, the solution connects the office, field teams, warehouse teams, and suppliers to centralize and streamline the entire purchasing and materials management process.

Trimble Materials integrates with Trimble ERP solutions, including Viewpoint Spectrum and Viewpoint Vista to provide connectivity to develop more efficient estimating, operations, and accounting management ecosystems. It complements Trimble's existing construction supply chain workflows that automate the exchange of material pricing between suppliers and contractors and facilitate ordering from preferred suppliers.

With Trimble Materials, field users can easily search for and request materials, view inventory, record received materials, and communicate with the office. Office users, such as project managers and purchasing teams, can more efficiently control, approve, and process orders, view inventory, generate RFQs, compare quotes, and reconcile invoices. Visit **www.trimble.com** for more information.



Magni RTH 6.31

The Magni RTH 6.31 rotating telehandler combines the power of a telehandler, rough-terrain crane, and aerial work platform in one high-performance machine—ideal for structural steel work. With a 101-ft lift height, 88-ft reach, and 13,200-lb max capacity (maintaining 5,500 lb at full height), it gives ironworkers the reach and strength needed to set beams, columns, and trusses efficiently.

The crane has an LMI system with RFID-recognized attachments and load-limiting technology for safe lifting. It's equipped with touch-screen controls, automatic outrigger leveling, and a climate-controlled cab. Built for demanding jobsites, the RTH 6.31 improves productivity, safety, and precision with every lift. Visit **www.magnith.com** for more information.

ENGINEERING JOURNAL

Third-Quarter 2025 *Engineering Journal* Available

The third-quarter issue of AISC's *Engineering Journal* is available at **aisc.org/ej**. It includes papers on the buckling behavior of austenitic stainless steel unequal-leg angle columns, the separation factor approach for structural reliability, and the impact of bolt pretension on bearing strength for all-steel members and composite members. Here are some highlights.

Numerical Study on the Buckling Behavior of Austenitic Stainless Steel Unequal-Leg Angle Columns
Edward J. Sippel and Hannah B. Blum

A computational-based parametric study on stainless steel unequal-leg angles with various end conditions assessed the buckling behavior and comparison to *Specification for Structural Stainless Steel Buildings* (ANSI/AISC 370-22) provisions.

Experimental work completed at the University of Wisconsin-Madison subjected hot-rolled Grade 304 austenitic stainless steel unequal-leg angles, ranging in length from 10 in. to 148 in., to uniform compression with fixed supports. This paper reports on the finite element modeling validation of the flexural-torsional buckling failures and subsequent 2,880-model parametric study.

The finite element analysis used a simplified approach that isolated the angle column with perfect fixed-fixed boundary conditions and incorporated measured material properties, cross-section dimensions, and geometric imperfections. The evaluation of 12 nonslender-element unequal-leg angles, considering nominal and measured material properties supported by fixed-fixed or pinned-pinned boundary conditions, provided additional data to qualify the behavior of unequal-leg single angles.

Review and Evaluation of the Separation Factor Approach for Structural Reliability
Isabelle M. Jollymore, Kyle Tousignant, and Jeffrey A. Packer

Studies have indicated that resistance factors calculated using a first-order second moment reliability method that uncouples the load effect from the resistance, termed the separation factor approach (SFA), differ considerably from those calculated using more accurate methods that also consider statistical variations in both the load effects and resistance. This can be attributed, in part, to the SFA implementing a separation factor, α, equal to 0.55, which was determined from tentative loading criteria and statistics in the 1970s.

This paper amalgamates the disparate literature and background on the SFA and investigates its sources of error to illustrate its inherent assumptions and limitations. Three studies were conducted, and their results were used to recommend appropriate separation factors (with associated bounds) for use in the SFA when determining resistance factors for steel components.

Impact of Bolt Pretension on Bearing Strength for All-Steel Members and Composite Members
Jia-Hau Liu and Michel Bruneau

Bolted connections are widely used in steel structures, and their design for slip-critical resistance and bearing strength is well documented in past research and current standards. However, the physical behavior that explains how friction and bearing forces interact in a pretensioned bolted connection and how these forces evolve under axial deformation remains unclear.

This paper investigates the influence of bolt pretension on bearing strength through finite element analyses of all-steel and composite splices. The latter is found in composite plate shear walls/concrete filled (C-PSW/CF). The analyses captured the bolted connection's behavior, showing a significant reduction in friction forces as bolt hole elongation increased.

A simplified free-body diagram with contact springs was then employed to explain the yielding and bending of bolts, the loss of clamping forces, and the thinning of plates (due to the Poisson ratio effect), all of which contribute to the reduction of friction as hole elongation increases. Additionally, the study examines how bolt pretension affects C-PSW/CF connections under compression, showing that concrete restricts hole deformation and allows friction forces to be sustained until the concrete cracks and deformation progresses.

People & Companies

Magnusson Klemencic Associates (MKA) announced several promotions this spring. Robert Baxter was promoted to senior principal. He joined MKA in 2002 and is a member of its sports and cultural specialist group and the leader of its advanced geometry technical specialist team. Dave Tayabji, Stephen Pool, and Travis Corigliano were promoted to principal. Beatriz Arostegui, Bethany Myelle, Hannah Bonotto, and Taylor LaForge are now senior associates. Johanna Baker, Juliana Rochester, Pablo Echeverria Garcia, and building information modeler Michael Murphy are associates. Andrew Nepochatykh is an information systems manager.

Purdue University awarded MKA chairman and CEO **Ron Klemencic** an honorary Doctorate of Engineering from the College of Engineering during its spring commencement ceremony. Klemencic is a globally recognized innovator and leading expert in high-rise structural engineering, sought after for his creativity, big-picture approach, and history of cost-effective and inventive designs.

Klemencic's distinguished career has been marked with numerous honors, including induction into the National Academy of Engineering and the National Academy of Construction. He is also a director of the Charles Pankow Foundation, the National Council of Structural Engineers Associations Foundation, and the MKA Foundation, where he champions the research and development of new technologies that further the structural engineering profession. He earned a Master of Science in structural engineering from the University of California, Berkeley, in 1986 and a Bachelor of Science in civil engineering from Purdue in 1985. He previously received the Distinguished Engineering Alumni Award and the Civil Engineering Alumni Achievement Award from Purdue.

NSBA

Learn Steel Bridge Design Fundamentals in New NSBA Courses

Want to learn more about steel bridge design fundamentals with the help of an AISC award winner and veteran bridge industry expert with over 30 years of bridge engineering experience? AISC and NSBA have added a three-part series of self-paced learning modules called Fundamentals of Steel Bridge Design to its steel bridge engineering curriculum, all led by Francesco Russo, PE, PhD, founder and principal of Russo Structural Services.

Participants can earn up to 34 PDHs by completing all three self-paced modules. The series complements the lesson modules for the AISC/NSBA's Fundamentals of Steel Bridge Engineering coursework and the NSBA *Steel Bridge Design Handbook*, providing a comprehensive steel bridge education suite for educators, students, and practicing bridge designers and engineers.

Part 1 is an in-depth study of steel-girder bridges, progressively advancing from foundational concepts to more detailed design and analytical techniques. In part 2, each lesson builds on fundamental concepts and introduces advanced topics related to the design of steel-bridge I-section flexural members, culminating in the detailed design of bracing elements for stability. Part 3 focuses on welded and bolted joints, tension and compression members, deck types for steel bridges and design requirements for a concrete deck as detailed in Section 9 of the AASHTO *LRFD Bridge Design Specifications.*

Register today at **learning.aisc.org/catalog**.

SEAA

AISC Members Earn SEAA Safety Excellence and Craft Training Awards

Eight AISC member companies earned 2025 Steel Erectors Association of America (SEAA) Safety Excellence Awards, and three also earned an SEAA Craft Training Excellence Award. The awards highlight member companies who demonstrate exceptional performance in workplace safety and the training of ironworkers.

"This year's recipients demonstrate what's possible when safety and training are treated as top priorities," said Jason Farris, Chairman of SEAA's Safety & Education Committee. "Their commitment to safety and workforce development is essential for the future of our trade. These companies lead by example, invest in their people, and prove that excellence is achievable at every level."

Recipients are selected through a blind evaluation process led by the association's Safety & Education Committee. Submissions are judged across multiple criteria, including training investments, portability of credentials, incident rates, and overall safety performance. Safety Excellence Awards have three categories: world class, premier, and gold. Winners were evaluated based on EMR ratings, OSHA 300A logs, and safety program practices over a three-year period.

World Class

- Cooper Steel, Shelbyville, Tenn.
- Derr & Gruenewald, LLC, Brighton, Colo.
- GMF Steel Group, Lakeland, Fla.
- High Plains Steel Services, LLC, Windsor, Colo.

Premier

- Group Steel Erectors, Inc., Ridgeland, Miss.
- JPW Erectors, Inc., Syracuse, N.Y.
- L.R. Willson & Sons, Inc., Gambrills, Md.
- S&R Enterprises, LLC, Harrisburg, Pa.

GMF Steel, Derr & Gruenewald, and Shelby Erectors also earned Craft Training Excellence Awards, which recognized their workforce development programs. Evaluations considered credential portability, apprenticeship programs, training content, and recruitment efforts.

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 from May 1–31, 2025.

Newly Certified Companies (May 2025)

Arc Rite Welding and Fabrication, LLC, Truesdale, Mo.
ATS Industrial, Inc., Corpus Christi, Texas
Bay Machine and Fabrication, Alameda, Calif.
C.E. Toland & Son, Benicia, Calif.
Elite Welding & Industrial Services LLC, Millwood, Ky.
GOP Ironworks, Paterson, N.J.
Morris Industries, Powhatan, Va.
Nick's Metal Fabricating & Sons Inc., Seneca, Ill.
Steele Solutions, Inc, South Milwaukee, Wisc.
Swan Island Sheet Metal Works, Portland, Ore.
Tri-Steel, Inc., Saginaw, Mich.

Certification Renewals (May 2025)

3 Cross Construction, Inc., York, S.C.
Abele Ironworks Inc., Spring Mills, Pa.
Acadian Contractors, Inc., Abbeville, La.
Alamo Structural Steel, LLC, Waco, Texas
ALW Welding, Inc., Washington, N.C.
American Bridge Company, Corapolis, Pa.
American Steel Fabricators, LLC, Springfield, Ohio
Apex Steel, Inc., Kirkland, Wash.
Arc Rite Welding and Fabrication, LLC, Pipe Creek, Texas
Arcorp Structures, LLC, Chicago
Area Iron & Steel Works, Inc., El Paso, Texas

Arlington Structural Steel Co., Inc., Arlington Heights, Ill.
Arning Companies, Inc., Cassville, Mo.
B&B Fabricators, Inc., Arlington, Wash.
B&B Steel Fabrication, Washington, Utah
Bald Eagle Erectors, Inc., Lino Lakes, Minn.
Baseline Manufacturing Partners LP, New Waverly, Texas
Benchmark Fabricated Steel, Terre Haute, Ind.
Benson Steel Fabricators, Saugerties, N.Y.
Bickers, Miamitown, Ohio
Bohling Steel, Inc. dba Cavalier Steel, Lynchburg, Va.
Borrelli Steel Fabricators, LLC, Vineland, N.J.
Bristol Steel Erectors, Davison, Mich.
BZI Steel, Cedar City, Utah
C.E. Toland & Son, Benicia, Calif.
California Erectors, Inc., Benicia, Calif.
Cambria Welding & Fabricating, Inc., Carrolltown, Pa.
Casadei Structural Steel, Inc., Sterling Heights, Mich.
Century Steel Erectors Co., LP, Dravosburg, Pa.
Coenen Mechanical LLC, Appleton, Wisc.
Concord Iron Works, Inc., Pittsburg, Calif.
Construction Steel, Inc., Cedar City, Utah
Contracting Engineering Consultants, Inc., Maidsville, W.V.
CoreBrace, LLC, Pocatello, Idaho
Cornell & Company, Inc., Westville, N.J.
Crystal Steel Fabricators, Inc., Delmar, Del.
Crystal Steel Fabricators, Inc., Federalsburg, Md.
Crystal Steel Fabricators, Inc., Hatfield, Pa.
D.L. George & Sons Manufacturing, Inc., Waynesboro, Pa.
Daigle Brothers, Inc., Tomahawk, Wisc.
Dixie Erectors Division of Dixie Crane Services, Inc., Mableton, Ga.
Donald's Welding, Inc., Chinquapin, N.C.
DuBose National Energy Services, Inc., Clinton, N.C.
Eddy's Welding, Inc., Ellicott City, Md.
Evers Steel Construction LLC, Harrison, Ohio
G2 Metal Fab, Stockton, Calif.
Garbe Iron Works, Aurora, Ill.
GEM Technologies, Inc., Knoxville, Tenn.
Graycor Southern Inc., Charlotte, N.C.
Gridiron Steel Inc., York, Pa.
GT Grandstands, Inc., Plant City, Fla.
Gulf Island LLC, Houma, La.
H&L Ornamental Ironworks Corp., Bronx, N.Y.
Hamilton Iron Works, Inc., Woodbridge, Va.
Hammonasset Construction LLC, Clinton, Conn.
Hartland Building and Restoration Co., Cromwell, Conn.
James F. Stearns Company, LLP, Pembroke, Mass.
K&J Steel, Inc., Washington, Utah
Kasco Structures LLC, El Paso, Texas
Kinsley Steel, Inc., Richmond, Va.
Kupferer Brothers Iron Works, Inc., St. Louis
Kwan Wo Ironworks, Inc., Hayward, Calif.
L.S. Steel, Inc., Gap, Pa.
Legacy Steel, Grand Rapids, Mich.
Macuch Steel Products, Inc., Augusta, Ga.
McPeak Supply, LLC, Salem, Va.
Merit Erectors, Inc, Cincinnati
Metals Fabrication Company, Inc., Airway Heights, Wash.
Metrolina Steel Erectors, Inc., Statesville, N.C.
Mid Atlantic Steel Erectors, Inc., Moseley, Va.
Mid-Ohio Mechanical, Inc., Granville, Ohio
Midwest Automation & Custom Fabrication, Inc., Fort Smith, Ark.
Milestone Metals, Inc., Houston
Mission Critical Solutions, LLC, Alum Bank, Pa.
Mission Critical Solutions, LLC, Bedford, Pa.
Mohawk Northeast, Inc., Groton, Conn.
Mohawk Northeast, Inc., New London, Conn.
MSI Structural Steel, LLC, Anaheim, Calif.
Munich Welding, Jeffersonville, Ind.
National Welding, Inc., Cleves, Ohio
Nello, South Bend, Ind.
New Beginnings Steel and Crane Service, Royse City, Texas
New Industries, LLC, Morgan City, La.
Niagara Bridge and Rail, Sanborn, N.Y.
Nimsgern Steel Corp., Minocqua, Wisc.
North American Manufacturing Corp., Maspeth, N.Y.
North State Steel, Inc., Greenville, N.C.
North State Steel, Inc., Louisburg, N.C.
Ogeechee Steel, Inc., Swainsboro, Ga.
Patriot Manufacturing Group, Carlisle, Ohio
Piedmont Metal Products, Inc., Bedford, Va.
Pip's Iron Works, Inc., Knoxville, Tenn.
Porter Corporation, Holland, Mich.
Premier Steel Services, LLC, Glenpool, Okla.
Quality Steel, Inc., Idaho Falls, Idaho
R&R Fabrication Enterprises, LLC, Prince Frederick, Md.
Rainier Welding Partners LLC, Anacortes, Wash.
Rearden Steel Fabrication, Inc., Lemoyne, Pa.
Red Dot Corporation, Athens, Texas
Reynolds Welding & Fabrication LLC, Windsor, Conn.
Richards Welding & Metal Fabrication, Dunn, N.C.
RJ Watson Inc., Alden, N.Y.
RNR Construction Co., Inc., State College, Pa.
ROTHA Contracting Company, Inc., Avon, Conn.
S&R Enterprises, LLC, Harrisburg, Pa.
S.E.K. Construction, Inc., East Earl, Pa.
SC Steel LLC, Taylors, S.C.
Shewmake Steel Erection, Inc., Augusta, Ga.
Space Coast General Contractor, Inc., Cocoa, Fla.
Spector Metal Products Co. Inc., Holbrook, Mass.
SteelFab, Inc., York, S.C.
Sterling Erectors, Sterling Heights, Mich.
Structural Iron Erectors LLC, Annapolis Junction, Md.
STS Steel, Inc., Schenectady, N.Y.
The Gateway Company of Missouri LLC, St. Louis
The Herrick Corporation, San Bernardino, Calif.
The Herrick Corporation, Stockton, Calif.
Thornton Steel Company, LLC, Fort Worth, Texas
Trinity Products, LLC, O'Fallon, Mo.
Trinity Steel Erection, Inc., Powhatan, Va.
V & S Schuler Tubular Products, Muskogee, Okla.
Valmont Industries, Inc., Brenham, Texas
Valmont Industries, Inc., Elkhart, Ind.
Valmont Industries, Inc., Plymouth, Ind.
W&W Steel Erectors, LLC, Oklahoma City
Warrior Mfg LLC, Hutchinson, Minn.
Williams Steel Erection Company, Inc., Manassas, Va.
Tubal-Cain Industries, Inc., Vidor, Texas
Vegter Steel Fabrication, Morrison, Ill.
W&W | AFCO Steel, Oklahoma City
Westeel Builders, El Cajon, Calif.
Whitley Steel Co., Inc., Jacksonville, Fla.
Wilton Corporation, Finksburg, Md.
XKT Engineering, Inc., Vallejo, Calif.

SEAA

Four AISC Member Erectors Earn 2025 SEAA Project of the Year Awards

The Steel Erectors Association of America (SEAA) recognized four AISC member and AISC-certified erection companies with a 2025 Project of the Year award.

Hodges Erectors, Inc. won in the Structural Class I (up to $500,000) for its role in the Kaseya Center renovation project in Miami. The arena is home to the NBA's Miami Heat and recently underwent a $50 million renovation.

Hodges Erectors was responsible for demolishing existing steel structures and installing new framework to accommodate four corner scoreboards, a center scoreboard, and a catwalk. The arena was not closed for construction, and work revolved around concert and game schedules. On multiple occasions, Hodges Erectors' crew had to completely demobilize—removing the crane, equipment, tools, and materials offsite—and remobilize a short time later.

The Structural Class II ($500,000 to $1 million) recipient is All Things Metal, LLC, the fabricator and erector on a Phoenix office building tenant improvement project. The rehabilitated building added unique amenities for office workers, including a basement speakeasy, fitness center, training center, and open-concept mezzanine.

All the structural steel was on the building's interior. As with any existing structure conversion, there were discrepancies between the plans and the realities of the original construction. One of the biggest challenges was that the seismic connection at the building's expansion joint could not be built as originally designed, requiring an alternate solution. The building remained occupied during construction, requiring reduced noise during daytime hours.

The Structural Class III ($1 million to $2.5 million) category went to sister companies GMF Steel Group and GMF Industries, which were the erector and fabricator, respectively, on the Tampa Convention Center expansion in Florida. The 600,000-sq.-ft addition involved integration of new steel structures into the existing foundation while preserving the original roof's precast façade.

The site was fenced on three sides, with the fourth side facing the water. The erector overcame the landlocked location by erecting steel from a crane barge. With no place for materials or staging, additional barges were secondary docks carrying steel from a remote location in precise sequence for erection. The convention center continued to host events during construction, limiting the construction timeline window to 55 days.

In Structural Class IV (over $2.5 million), Alliance Riggers & Constructors, Ltd. built a new performing arts center with seating for 1,100 people on a high school campus in Carlsbad, N.M. The company managed the concurrent coordination of the structural steel and tilt-wall erection. In addition, they were responsible for erecting multiple staircases and elevated seating structures.

Campus buildings surrounded the 79,000-sq.-ft site on three sides, providing only a single access point for construction. Crane selection and lift planning were critical to the job because of limited site access, panel weights, and lifting radii. The company attributed success to correct use of the proper equipment, which included a traditional lattice boom crawler, a telecrawler, all-terrain crane, and a rotating telescopic handler.

FABRICATOR TRAINING

AISC Fabricator Education Training Program Adds New Courses

AISC's Fabricator Education Training Program has developed and released new resources to help fabrication shops boost employee familiarity with the layout and fit up of columns, welding, and fit up of more complex beams.

The new columns course includes modules on wide-flange, square HSS, HSS with through plates, columns with moment connection or opposite offsets, and two modules on round HSS columns. Each of those situations has its own considerations for successful fabrication, and the column course equips steel fabricators with the basic concepts they need.

"Precision is even more critical when working with columns," AISC fabricator education program manager Joel Landsverk said. "We tailored this curriculum to help workers with the desire and the aptitude for more advanced work develop the skills they'll need for the next step in their careers, and that includes fabricating columns."

Three other new courses lay the foundation for the program's welding curriculum and cover welding symbols and procedures—a perfect complement to hands-on training.

"Watching a few videos on the theory of how and why things work as they do and why certain protocols are followed before they start practicing welding is invaluable in speeding up the learning process," said B.J. Carmer, Stone Bridge Iron & Steel technical director. "We believe it is important to know the reasons how and why versus just holding the gun and running a bead. That makes the difference between a good and a great welder."

Three courses added to the layout and fit up training will help fabricators work on beams with features like bent steel plate, camber, and CJP weld prep. Each of those components has its own considerations for successful fabrication, and the intermediate course equips steel fabricators with the basic concepts they need for these specific situations.

AISC will release additional new Fabricator Education Training Program courses on layout and fit up of pitched beams later this year.

The award-winning online Fabricator Education Training Program is a supplement to in-person instruction. It helps new hires acquire necessary skills as quickly as possible, which will help them progress into more specialized career paths that become available with experience. They're also an excellent way for a steel fabricator to demonstrate investment in the potential of individual employees, which is key for retention.

The program is free for AISC full-member fabricators and is included in their membership fees. Learn more at **aisc.org/fabricator-training**.

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Rapid Railroad Replacement

A STEEL TEAM helped Norfolk Southern Railway quickly solve a crisis the railway thought it had dodged. Hurricane Helene and its resulting floods damaged or destroyed more than 13 miles of track on a rail line between Newport, Tenn., and Asheville, N.C., in September 2024, forcing the line to close. About a month after the storm, though, another problem arose. A steel bridge over the Pigeon River near Newport collapsed, adding a rapid bridge replacement project to a lengthy list of fixes on the line. Originally, the existing two-span bridge appeared to need only a pier repair.

AISC full-member fabricator Veritas Steel helped the railroad complete a replacement bridge about four months after it signed a production order. Veritas signed the agreement on November 5, began fabrication on December 20, delivered the first girders on February 23, and ended delivery on March 13. Construction on the bridge finished in late March, and the railroad reopened the line on May 20. Veritas allocated additional time and labor to finish the girders quickly and put other projects on hold.

The new bridge has three spans, each approximately 106 ft. Each span has eight girders, and the 24 total girders weigh 353 tons. Four girders per span are 72 ft long, and four others are 34 ft long. All girders have a 7-ft, 8-in. web depth (8 ft including flange thickness). They're finished with a three-coat paint system. Veritas worked with construction manager Hall Contracting of Kentucky, Inc. and designer HDR.

The quick turnaround and reopening is another example of the steel industry's ability to collaborate when an unexpected rapid replacement project arises. That mentality is highlighted in more detail in the "All Hands on Deck" Article in the December 2023 issue (read at **www.modernsteel.com**). AISC also has resources to help all parties involved in an emergency repair project. Go to **aisc.org/bridge-emergency** to find steps to design and fabricate a steel bridge fast and to read about prior emergency repair projects. And if you're looking for ways to make non-emergency bridge projects go faster, check out *Accelerated Steel: Achieving Speed in Steel Bridge Fabrication*, a free National Steel Bridge Alliance resource available at **aisc.org/fasterbridgefab**. ■