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March 2025

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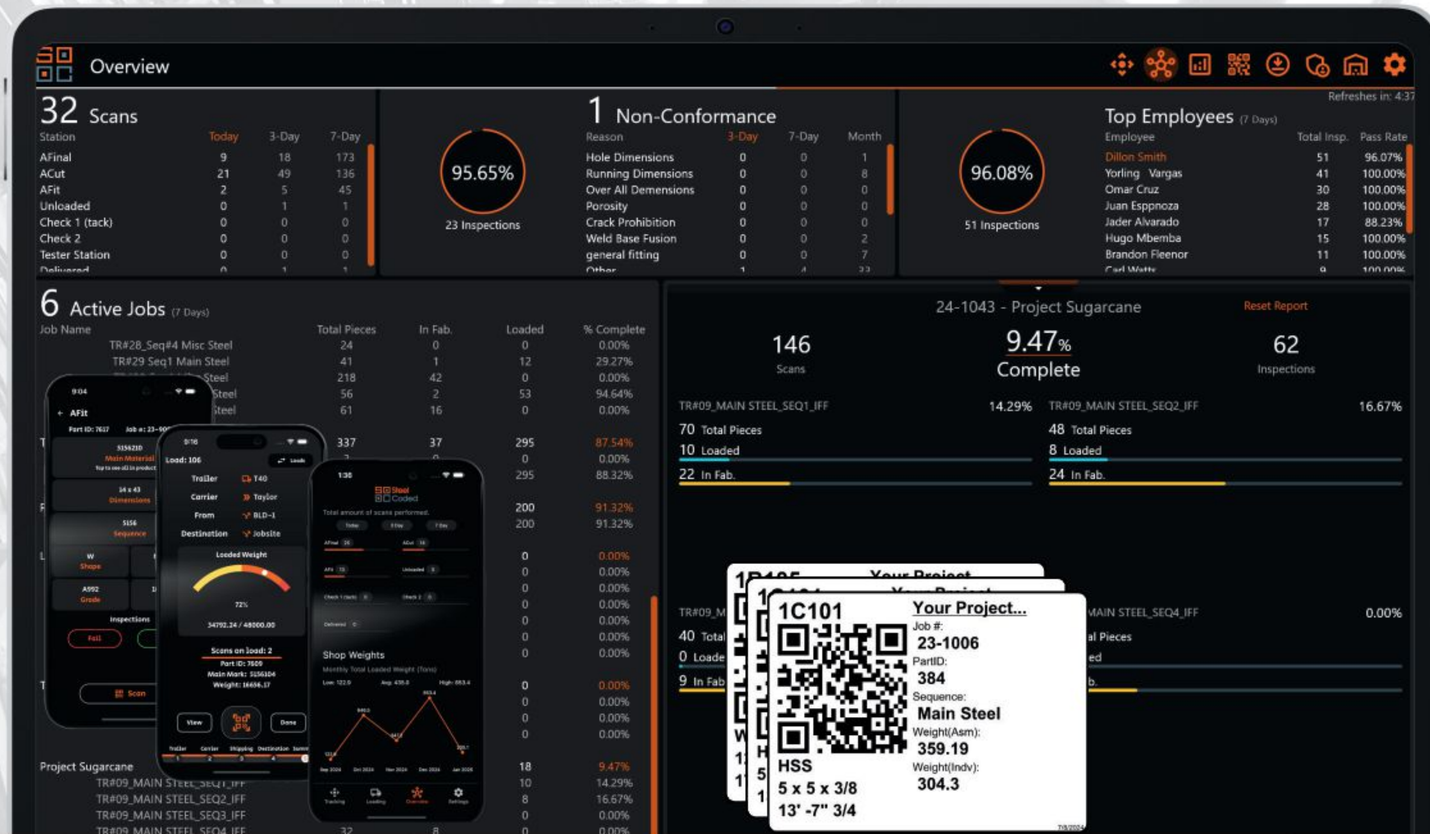

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March 2025

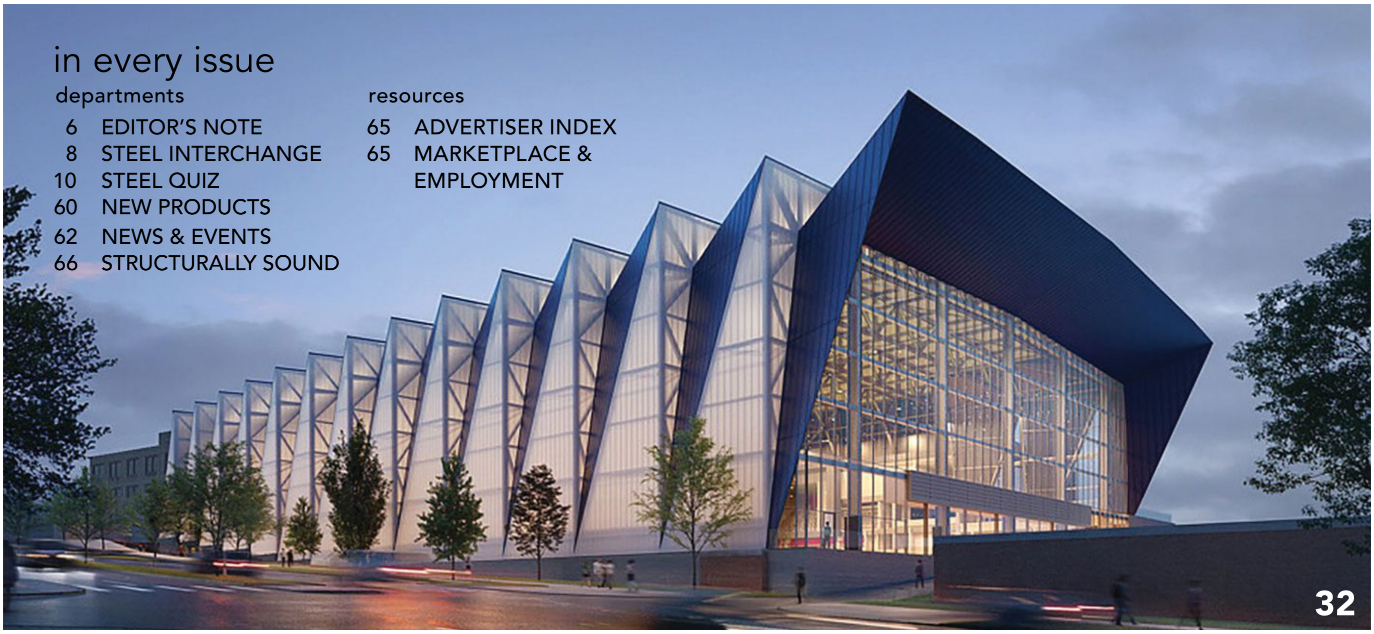
in every issue

departments

6 EDITOR'S NOTE
8 STEEL INTERCHANGE
10 STEEL QUIZ
60 NEW PRODUCTS
62 NEWS & EVENTS
66 STRUCTURALLY SOUND

resources

65 ADVERTISER INDEX
65 MARKETPLACE & EMPLOYMENT



features

24 **Boosting Business**
BY MONICA SIMMONS, SE, PE
JOSH LAWRENCE, SE, PE, AND
JERRY DEROMANIS, AIA
Business (school) is booming at Rochester Institute of Technology, thanks in part to a new steel addition that opened last year.

32 **Threading the Needle**
BY RYAN FIELDS
Long-span steel trusses helped an indoor football practice facility maximize all available space on a tight college campus site.

40 **Life In The Fast Lane**
These AISC steel bridge resources and tools will help you design faster and design for speed on the jobsite.

44 **Casting Light on a Smart Solution**
BY CAWSIE JIJINA, PE AND
STEVE REICHWEIN, SE, PE
Sphere is the new star of the Las Vegas Strip, and its supporting cast of hundreds of steel castings is a big reason why.

48 **Speed Sound-Off**
BY PATRICK ENGEL
Steel detailers and erectors discuss their impact on speeding up steel construction and how other industry partners can help them.

conference preview

54 **Commitment to Quality**
BY CLIFF SCHWINGER, PE
Ensure quality is never compromised in your design drawings with these tips and priorities for establishing a culture of excellence.

columns

steelwise

15 **Go for the Joists**
BY JOE POTE, PE AND DAVE SAMUELSON, PE
Consider these important steps when designing high-performance floors with open web steel joists.

field notes

18 **A Swerve To Steel**
INTERVIEW BY GEOFF WEISENBERGER
Tim Kohany found comfort in carpentry at a young age, but working with wood shaped a curiosity about engineering and designing with steel.

business issues

20 **The Power of Clarity at Work**
BY KATE ZABRISKIE
How goals, roles, and tasks transform teams.

ON THE COVER: Open web joists and W21 sections achieved several cantilevers in a new business school building, p. 24. (Photo: Don Cochran)

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As I write this, Chicago, like much of the country, is in a bit of a cold snap—though it's finally starting to thaw a bit from this past weekend, which was even worse.

Do you know what smart people such as myself do when it's really cold in Chicago? Why, we drive north to Wisconsin where it's even colder, and spend the entire day outside, of course!

This was a quick ski trip with a few other families that had been planned weeks in advance, before we realized that the high would be a balmy 0 °F and that the same number would also refer to how many inches of snow were on the ground (thank goodness for snow machines). After taking a five-year hiatus from snowboarding, my return to the slopes was reasonably triumphant, which is to say I didn't fall and break anything. My son, who was on skis for the first time in probably seven years (and the third time in his life), took a self-guided crash course (literally; thank goodness they wrap the ski lift towers in foam), and after a few thrills and spills, was beating me down the hill. I'm so proud. (I'm so old.) It was really cold but also really, really fun. And no one got frostbite.

Pushing toward the other end of the thermometer, let's talk about the exhibit hall at the upcoming NASCC: The Steel Conference, taking place in Louisville, April 2 to 4. As in years past, we'll be featuring the hottest offerings from the show. This annual Hot Products section, which will appear in the June issue, lists new and innovative software, machinery, equipment, tools, and services from the more than 300 companies in the exhibit hall.

And this year, we're taking a slightly different approach and asking our readers to tell us which candidates are worthy of being Hot Products—because who is better equipped to assess steel-related products than steel industry professionals? After all, you're the ones using these tools in your everyday work, and visiting the various exhibit hall booths (for those of you who attend the show) puts you face-to-face with the people who bring them to life and work to continuously improve them. Stay tuned for details on voting, which will involve a drawing for some cool prizes.

Besides the giant exhibit hall, The Steel Conference includes more than 270 technical sessions (and 16 PDHs), and plenty of networking opportunities to make new connections and reunite with friends and colleagues. It also incorporates the World Steel Bridge Symposium, QualityCon, the NISD Detailing Conference, SafetyCon, Architecture in Steel, and SSRC's Annual Stability Conference. One registration fee gets you into all of this, as well as the keynote addresses, lunch in the exhibit hall on Wednesday and Thursday, the welcome reception, and—of course—the fabulous conference dinner! Visit **aisc.org/nascc** for more information and to register.

If you've already registered to attend the show, stay tuned for emails providing instructions on how to vote for your favorite items from the hall. And if you haven't registered yet, you still have time! Visit **aisc.org/nasccregister**.

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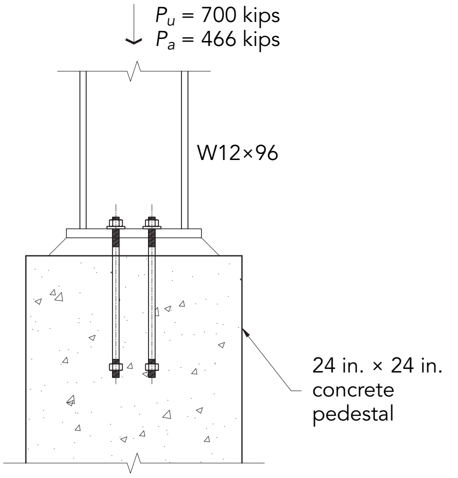
If you've ever asked yourself "Why?" about something related to structural steel design or construction, *Modern Steel*'s monthly Steel Interchange is for you!

Send your questions or comments to **solutions@aisc.org**.

Additional Reinforcement for Concrete Breakout

Why does AISC Design Guide 1: *Base Connection Design* not use the concrete pedestal reinforcement to resist concrete breakout? Are there provisions for when the reinforcement can be used for that purpose?



Base detail example (from AISC Design Guide 1, Fig. 4-21)

The method described in Design Guide 1 (AISC members can download for free at **aisc.org/dg**) for calculating the concrete breakout strength is based on the "concrete capacity design" (CCD) method considering unreinforced concrete, which is consistent with ACI 318-19 Chapter 17. Section 4.4.1 of Design Guide 1 describes approaches for using reinforcement to strengthen concrete limit states based on ACI 318. The section states:

"The concrete breakout strength of anchors is a function of the embedment depth, the thickness of the concrete, the spacing between adjacent anchors, and the location of adjacent free edges of the concrete member, among other variables. In many situations, increasing the anchor embedment does not result in a significant increase in the breakout strength due to geometric limitations of the breakout cone. The concrete breakout strength equations provided in ACI 318, Chapter 17, were developed based on the concrete capacity design (CCD) method considering unreinforced concrete.

"For situations where it is not possible to increase the concrete breakout strength by increasing the anchor embedment to achieve the required design strength or develop the anchor full strength, anchor reinforcement can be used instead of concrete breakout strength for both tension and shear loading per ACI 318, Section 17.5.2.1. For tension, the anchor reinforcement must be developed on both sides of the concrete breakout surface; see Figure 4-11. For shear, the anchor reinforcement must be developed on both sides of the concrete breakout surface or specified such that it encloses and contacts the anchor and is developed beyond the breakout surface; see Figure 4-12."

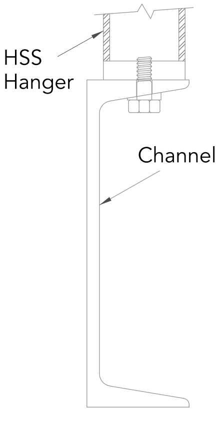
Later in this same section, it states:

"In general, when piers are used, concrete breakout capacity alone cannot transfer the significant level of tensile force from the steel column to the concrete base. Therefore, steel anchor reinforcement in the concrete can be used to transfer the force from the anchor rods into the concrete. The anchor reinforcement is in addition to the reinforcement required to accommodate the bending forces in the pier.

"It is important to make the distinction between anchor reinforcement and supplementary reinforcement. As discussed, anchor reinforcement is an alternate approach to using the concrete breakout strength equations in ACI 318 and is designed to resist the required strength of the base connection. However, supplementary reinforcement is provided to restrain the breakout cones and not specifically designed to resist any loads. When supplementary reinforcement is provided, the strength reduction φ factor for breakout and side-face blowout strength are increased from 0.70 to 0.75 per ACI 318, Table 17.5.3(b).…"

Heather Gathman

Pretensioned Joints Using Threaded Plates



Can a pretensioned bolted joint be used to connect the Hollow Structural Section (HSS) hanger to the flange of a channel where the plate is threaded, and no high-strength nut is used?

The connection shown in the sketch in question cannot be designed as pretensioned. The pretensioning methods in the *RCSC Specification for Structural Joints Using High-Strength Bolts* can only be used with bolting assemblies described in the *RCSC Specification*, which all involve the use of a high-strength nut.

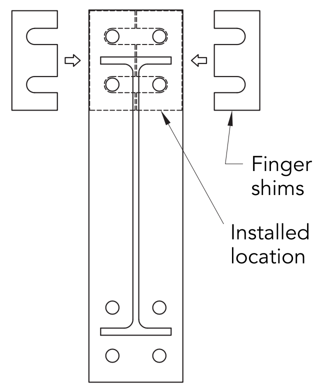
Larry Muir, PE

Braces with Shimmed Bolted End-Plate Connections

I am designing a brace that utilizes bolted end-plate connections. The erector is asking to use shims to simplify fit-up in the field. Would a ⅛-in. shim at each brace end be permitted per the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22)?

Yes, shims would be permitted. While the *Specification* does not directly address this situation, a similar condition exists in end-plate moment connections where the moment is resolved into a force couple, and the bolted connection must resist combined tension or compression and shear.

AISC Design Guide 39: *End-Plate Moment Connections* states, "To solve the tolerance problem, the beam or girder may be detailed and fabricated 3⁄16 in. to ⅛ in. short, and then any gaps between the end plate and column flange filled using finger shims. Finger shims are thin steel plates, usually 1⁄16 in. thick, that are cut to match the connection bolt pattern so that they can be inserted between the column flange and the end plate. Figure 4-1 illustrates the use of finger shims inserted from the sides, although finger shims may also be inserted from the top. A tilted column flange or end plate can be corrected by inserting more or thicker shims on one side of the connection than the other. Experimental tests have been performed with finger shims, and no adverse consequences or differences in connection behavior were observed. If the shim thickness exceeds ¼ in., the bolt shear strength must be adjusted according to AISC *Specification* Section J5.2."



If the brace end-plate connection transfers shear in addition to axial force, the bolt shear strength must be adjusted according to *Specification* Section J5.2 if the shim thickness exceeds ¼ in.

Larry Muir, PE

Heather Gathman (gathman@aisc.org) is a staff engineer in AISC's Steel Solutions Center. **Larry Muir** is a consultant to AISC.

This month's quiz explores AISC Design Guide 40: *Rain Loads and Ponding*. This design guide provides an in-depth review of rain loads and ponding effects to help design professionals properly and efficiently design for ponding on roofs constructed with structural steel, open web steel joists, and joist girders. Download or order your copy at **aisc.org/dg**. This month's questions and answers were developed by Diana Billerman, an AISC intern and student at the University of Illinois Urbana-Champaign.

1 **True or False:** The term "secondary drainage system for structural loading" (SDSL) refers to the drainage system through which water is discharged when all vulnerable drainage systems are blocked.

2 **Select all that apply:** If there is insufficient available strength of each structural component of the roof system from ponding, the modifications that can be implemented for a revised roof design include:
a. Stiffen the roof system
b. Strengthen the roof system
c. Add tapered insulation
d. Add drains near columns
e. Widen scuppers

3 **True or False:** It is not possible for water to accumulate in bays that have an elevation greater than the design water level.

4 **Fill in the blank:** Ponding loads have a _______ nature, which allows the applied load on a portion of the length of a joist or joist girder to occasionally exceed the allowable load, even when the shear and bending moment diagrams fall within their respective design envelopes.

5 Select the option that best completes the following statement: The ______ analysis is perhaps the simplest method of analysis for ponding that captures nonlinear effects.
a. Closed-form solution
b. Amplified first-order
c. Approximate second-order
d. Iterative

6 **True or False:** The amplification factor, B_p, amplifies the results from a first-order analysis based on the undeformed shape of the roof using flexibility coefficients.

7 **True or False:** The Steel Joist Institute Roof Bay Analysis Tool can be used to perform the recommended method of design for ponding described in the design guide and applies to any roof bay.

TURN TO PAGE 12 FOR ANSWERS

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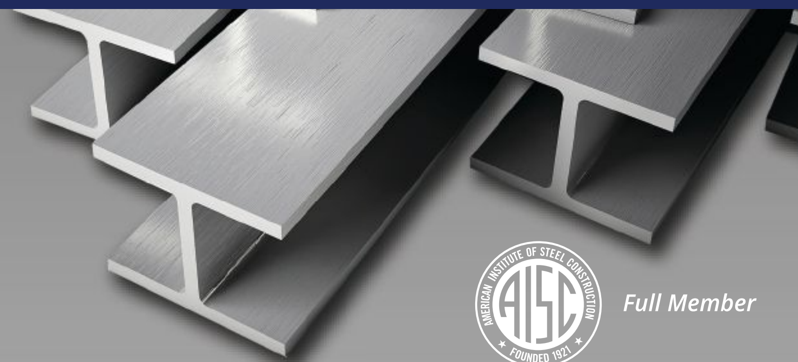

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Answers reference AISC Design Guide 40: *Rain Loads and Ponding*.

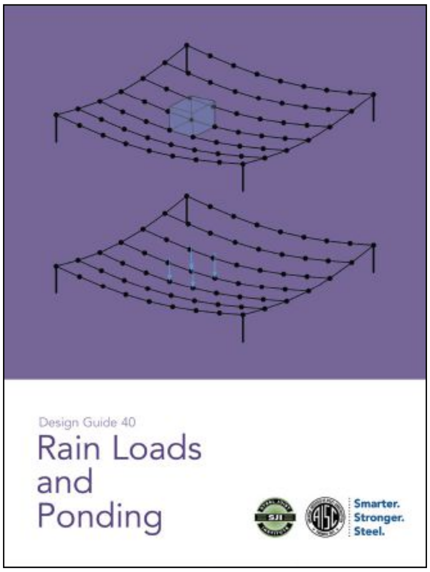
1 **True.** The term "secondary drainage system for structural loading" (SDSL) refers to the drainage system through which water is discharged when all vulnerable drainage systems are blocked. The term SDSL is used regardless of the means of discharge and could include a system with drains and piping, scuppers, or a free draining edge. The provisions of *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7) do not prohibit installing or using secondary drainage systems that would be classified as vulnerable. Those provisions only require that such systems are assumed to be blocked when determining rain load (Section 1.2).

2 **a.**, **b.**, **c.**, **d.**, **e.** Once computed, rain and snow loads are used in standard strength load combinations to determine required strengths, which are then compared to available strengths per AISC *Specification for Structural Buildings* (ANSI/AISC 360-22) Section B3 or SJI *Standards and Specifications* Section 4.2.1 or 4.2.2. If the available strength of each structural component equals or exceeds the required strength, no further ponding checks are required. Otherwise, the roof design needs to be revised. All the modifications listed can be implemented if a roof is found to be inadequate. These modifications include stiffening the roof, adjusting the shape of the roof surface (increasing roof slope, specifying camber, adding tapered insulation, or sloping fill), or increasing the drainage capacity (widened scuppers or added drains near columns) to reduce the additional load caused by ponding or strengthening the roof system to support additional load caused by ponding (Section 2.1 and Chapter 6).

3 **False.** For bays that do not accumulate water in the design condition (their elevation is greater than the design water level), it is still possible for water to accumulate if the slope of the bay is low enough that deflections cause low points in the roof surface. Identified in ASCE/SEI 7, Section 8.3, are cases that require further investigation (Section 2.1). A recommended approach for investigating these bays is described in Section 2.6.

4 **Nonuniform.** Due to the nonuniform nature of ponding loads, there is the potential for overstress due to top chord bending between the panel points for joists or compression failure of web verticals for joist girders. In these cases, the specifying professional may select a larger joist, specify a larger joist girder panel point load, or take no action if the applied loads are determined by analysis or judgement to not cause overstress. (Section 2.5)

5 **b.** Amplified first-order. Amplified first-order analysis is perhaps the simplest method of analysis for ponding that captures the nonlinear effect arising from the applied loads being dependent on the deflected shape of the roof. This method is similar in nature to the B_1/B_2 method for approximate second-order analysis of frames described in AISC *Specification* Appendix 8. Results from a first-order analysis (one in which the loads are based on the undeformed shape of the roof) are amplified by the factor B_p. (Section 3.2)



6 **True.** The amplification factor, B_p, is based on a closed-form solution for an idealized rectangular bay. The calibration of the amplification factor is targeted towards the maximum moment in the secondary members, so it marginally underestimates the maximum loads at the center of the bay where the deflections are greatest and overestimates the forces in the primary members and the total water load in the bay. The flexibility coefficients are for both the primary and secondary members (Section 3.2).

7 **False.** The Roof Bay Analysis Tool applies only to rectangular bays with equally spaced secondary members, but it explicitly accounts for roof slope (as defined by the elevation of the four columns), camber, and rigid perimeter supports. The tool is available at **www.steeljoist.org** (Chapter 4).

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**.

STEEL SOLUTIONS CENTER

Go for the Joists

BY JOE POTE, PE AND DAVE SAMUELSON, PE

Consider these important steps when designing high-performance floors with open web steel joists.

OPEN WEB steel joists are an ideal solution for supporting high-performance floors with optimal vibration characteristics. They usually become even more appealing after considering their low cost of construction, low carbon footprint, conduciveness to low floor-to-floor height, ease of routing HVAC, electrical, and plumbing conduits, large floor areas free of columns, and a reduced construction schedule.

Designing a high-performance floor entails much more than merely using open web steel joists, though. Steel joists can perform well in a floor and achieve their benefits when used properly. When used poorly and if good design procedures are ignored, steel joists may not perform optimally. There are several important steps to consider when using joists in a floor system to make sure they function properly.

Spacing. The floor joist spacing should never be less than 4 ft, with an ideal joist spacing between 5 ft and 10 ft. A larger steel joist spacing means fewer joists to manufacture, ship, sort, and install, which saves time and money. Larger steel joist spacings also result in larger joists with larger chords, requiring fewer rows of bridging—another time and money saver.

Just as important, a larger steel joist spacing results in joists with more stiffness, a higher natural frequency, and more applied dead load from a larger tributary area, which substantially improves the floor vibration characteristics.

Depth. Select steel joists with sufficient depth to run the mechanical ducts through the open webs above the bottom chord of the joist. Even though the joist is deeper, the larger depth will potentially reduce the building floor-to-floor height by containing the ducts within the joist depth. Often, round ducts can be run through the standard triangular web openings. But if necessary, specify a rectangular Vierendeel web opening near the joist mid-span for larger duct passage.

Deeper steel joists are usually more efficient and lighter weight. They are also stiffer, which results in lower live load deflections and higher natural frequency for improved floor vibration characteristics.

Camber. Because steel joist camber is built into the manufacturing process, Steel Joist Institute (SJI) standard camber comes at no additional cost, and special camber comes with little added cost. Furthermore, open web steel joist camber is generally more precise and repeatable than wide-flange beam cambering processes.

Take full advantage of the joist as a cambered product by specifying that the joist be cambered for the dead load of the concrete and steel deck. Placing the concrete at a constant thickness over the cambered steel joist will result in adequate concrete coverage for shear studs, required minimum slab thickness per UL Fire Code, and flat finished floor over the entire joist span.

End Connections. While standard underslung joist bearing seats are handy for placing steel joists during erection, flush-frame shear tab connections (see Figure 1) also offer distinct advantages and should be considered. The bolted shear tabs are similar to simple beam shear connections (see Figure 2). When used with extended

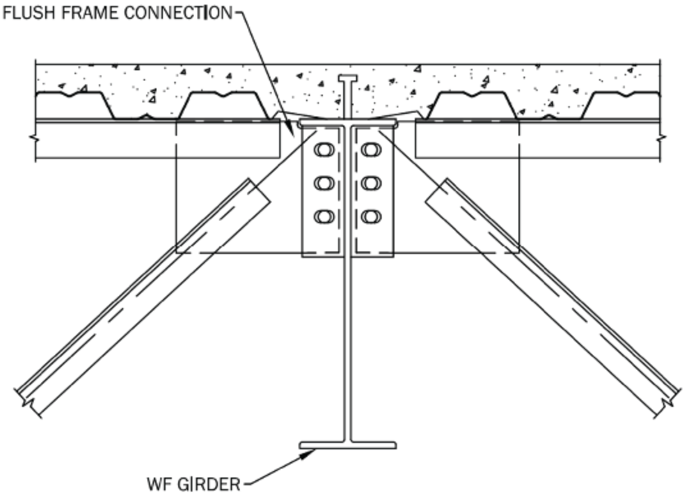


Fig. 1.

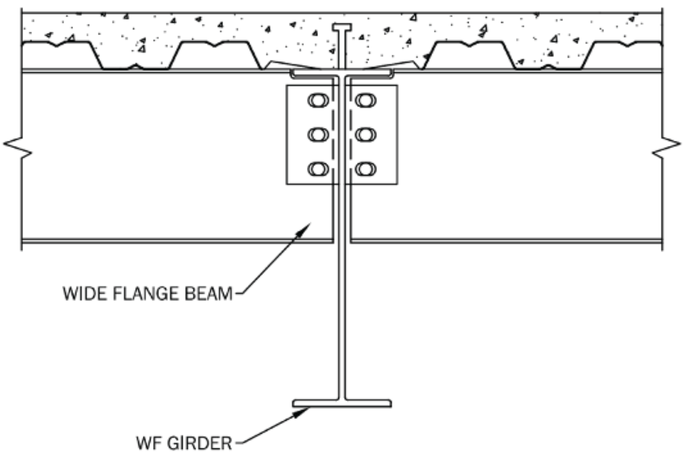


Fig. 2.

Fig. 3.

shear tabs, (see Figure 3) they also allow for unitized erection with steel joists and steel deck pre-assembled on the ground to be lifted and bolted into place. Steel joist and steel deck erection times can be reduced by more than 50% with panelized erection.

The flush frame connection also brings the bottom of the steel deck supporting the concrete into direct contact with the top flange of the girder, which substantially improves the floor vibration characteristics. The girder acts compositely with the slab for vibration excitation. Plus, it brings an additional 50% of the adjacent bay into play if the adjacent span is greater than 0.7 times the span under consideration. With the stiffer flush framed connection to the girder, vibrational energy is transferred into the adjacent span. The 50% increase in the effective panel weight, W_j, translates to a minimum reduction in floor acceleration of 33% given that the floor acceleration is inversely proportional to W_j.

If a designer uses standard clip-angle joist bearing seats, and the predicted floor acceleration from walking excitation is greater than 0.5% of g, the first thing to consider would be changing the joist bearing seats to flush-framed seats. If the building is in a high-seismic area, increasing the floor concrete slab thicknesses to reduce the floor acceleration will increase the seismic lateral loads on the structure. It is far more economical to use flush-framed seats.

Flush-frame connections allow the girder to be easily designed compositely, which translates into girder weight savings of up to 20%.

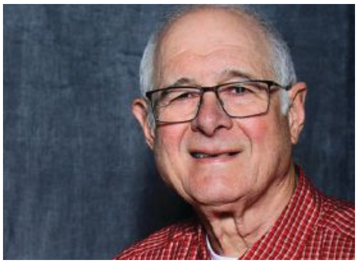
SJI CJ-Series Composite Steel Joists. With the concrete locked to the steel joist top chord via welded shear studs, compression loads normally carried by the joist top chord are transferred into the concrete slab. The transfer allows the top chord of a composite joist to be substantially smaller. Likewise, a composite joist's greater effective depth permits a reduction in the bottom chord size. The result is a 20% to 30% reduction in steel joist weight to carry the same equivalent load.

Composite steel joists have a much greater moment of inertia, which translates into reduced composite live load deflections.

SJI Floor Bay Comparison Tool—With Vibration. SJI's Floor Bay Comparison Tool assists the structural engineer of record with comparing weights, costs, and floor depths for selected bay sizes and framing configuration. The tool offers comparisons using non-composite and composite options for steel joists, wide-flange beams, and wide-flange girders, plus non-composite steel joist girders. Floor vibration criteria is checked for each framing option. The Floor Bay Comparison Tool is available for free download and can be found at **www.steeljoist.org**.

Following these guidelines will result in a high-performance steel joist floor system with excellent floor vibration characteristics, flatter finished floors with more consistent concrete thickness, lower floor-to-floor heights, easy passage of mechanical systems, large floor areas free of columns, faster erection, a lower weight and cost, and a smaller carbon footprint than other floor framing options. ■

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



Joe Pote (joe.pote@newmill.com) is the director of research and development at New Millenium.
Dave Samuelson (dave.samuelson@nucor.com) is a retired structural research engineer at Nucor and prior chair of the Steel Joist Institute's composite joist subcommittee.

A Swerve To Steel

INTERVIEW BY GEOFF WEISENBERGER

Tim Kohany found comfort in carpentry at a young age, but working with wood shaped a curiosity about engineering and designing with steel.

TIM KOHANY'S path to the steel industry began with woodworking.

He first discovered construction in elementary school by experimenting with carpentry in his dad's workshop. He enjoyed it enough to join his dad as a carpenter. The more he worked with wood, though, the more he became fascinated with the math behind creating structures. His decision to take engineering classes at a local community college led him to multiple civil engineering degrees and a design-focused career at DTS Provident Design Engineering in White Plains, N.Y.

Kohany immersed himself in the field as soon as he started undergraduate studies. He took on a challenging research project, earned his PE license, and joined AISC's Emerging Leaders Program, which integrates early-career AEC professionals across the country into focused initiatives within AISC. He spoke with *Modern Steel Construction* to discuss his history with carpentry, involvement with AISC, and more.

How did you become interested in construction?

My interest started when I was young. I never thought college was an option, but at the same time, I loved math and remember being fascinated by its power. I had access to my dad's workshop, and I enjoyed using his tools to build things out of scraps of lumber I found. My dad is a proud union carpenter, and that's likely the root of my mechanical inclinations. Thanks to my dad, by age 10, I probably had a good working knowledge of gear ratios, block and tackle, inclined planes, and other simple machines. I attribute that to my desire to know how everyday things work.

I worked in carpentry as a rough framer before going to college, and I quickly learned how to read blueprints. I wanted to learn anything and everything about advanced carpentry concepts like roofs and staircases, which are essentially just an assembly of triangles. I remember being on the jobsite and seeing the foreman or lead carpenters mess around with a framing square or steel square. I remember being amazed that a tiny object was so powerful and had so much influence over everything on the jobsite.

I wanted to learn everything I could about the steel square. When I turned 18, I had cut my first roof and dove into learning more about irregular-pitched roofs, which required more advanced trigonometry and geometry. I bought roof framing books and read them—I think one was the *Roof Framers Bible*. I remember reading that every night when I got home from work and wanted to learn so much about it.

Years later, in my college courses, I would think back to my framing background and try to imagine the structures that I was calculating in three dimensions. I'd try to resolve trusses or size W-shapes, and they weren't just figures on a page. They often had a physical representation in my mind, and that gave me a working understanding of some calculations that I probably would not have otherwise had.

I continued in construction for a while, never thinking higher education was an option. It wasn't discussed growing up, and I didn't know what I was missing. I gained more versatility as a carpenter by learning finished carpentry, and that's where I developed an eye for detail. I eventually joined the carpenter's union and ventured into commercial construction, where I began working exclusively with steel and in core and shell operations. I worked alongside the ironworkers as I fastened the cold-formed steel to the structural members.

After working with instructions provided by blueprints for so many years, I started wondering more about the people who created those blueprints, what their day-to-day was like, and if it involved applying the simple machines that I learned as a kid. After talking with my now-wife, I decided I wanted to learn more advanced math and see if there was room in engineering for a curious carpenter. With nothing to lose but my weeknights, I enrolled at Westchester Community College (WCC) near White Plains. In three years, I obtained associate degrees in engineering and mathematics while working full-time as a carpenter. That was 10 years ago, though it feels like yesterday and an eternity at the same time.

Did you continue your studies after WCC?

Yes. I knew I had to continue. After WCC, I earned my bachelor's and master's degrees in civil engineering from Manhattan College, which attained university status in 2024. It's now Manhattan University, and that's where I discovered the world of research, which was a driving force for years to come.

What did your research entail?

During my undergrad studies, I got a taste of research while working with one of my professors, Shahriar Quayyum. I learned how to harness the power of finite element analysis by way of Ansys APDL all the way through to my thesis work in grad school. We even had a publication before I graduated. The research was on improving the seismic performance of eight-bolt extended end plate moment connections. We removed the end plate stiffener and rearranged the bolt pattern into an octagonal orientation. We held those parameters constant and adjusted other physical parameters.

After the analysis, we noted improvements in strength degradation and energy dissipation. As a result of removing the end plate stiffener, we had more usable floor area, which I could appreciate from my background as a carpenter. It was now a bolted moment connection, which also increased constructability in the field.

I submitted my thesis and I graduated in February 2024, passed the PE structural exam in March, and was awarded my PE license in December. Now that I have all the scholastics behind me I plan to continue my research with Dr. Quayyum and Manhattan University's support.

What's the most memorable steel project you've worked on so far?

That's an easy one. About two years ago, I worked on NASA's Artemis II Mission, where I designed structural components of support for its SLS rocket. The whole experience was life-changing. After obtaining mandatory security clearance, I worked with top-notch engineers from all over the country. In school, you learn about gravity loads and typical environmental loads, but I was working with blast loads and a decreased modulus of elasticity due to the increase in temperature. I'm fortunate to have had the opportunity to work on it.

Describe your involvement with AISC and what you've enjoyed about it.

Before taking my first steel course in undergrad, I remember seeing students walking around campus holding a giant blue book. After learning a little about it, I knew I had to have one. That book was the 15th Edition AISC *Steel Construction Manual*, the current version at the time. That steel design class ended up being one of my favorites, and I could finally apply some of the theory I learned.

I also had the privilege of attending an AISC task committee conference in Chicago as a grant recipient. There, I saw what went into materializing such an iconic text. It opened my eyes. In school, you see the manual and think that's where AISC starts and ends. But the *Manual* is just a drop in the bucket compared to everything I've learned since then.

The task committee meeting was really rewarding. I made many friends and made sure to keep in touch with them—I think that was the idea of it. I met Jonathan Tavarez, who was then AISC's New York structural steel specialist, and he was kind enough to visit Manhattan College and share his experience in a presentation called "Beyond the Steel Manual."

The following year, I attended a SteelDays event in Brooklyn at an Iron Workers Local training center with some coworkers and classmates. We all learned how to weld using the virtual welder and climbed the steel column. That was a lot of fun. This past October, I joined AISC's Emerging Leaders Program, which has taken me to AISC's Chicago headquarters. The program is in its first year and has taught me a lot about how AISC helps the industry. My twin sister lives in Chicago, and I love visiting with her family and seeing my nieces and nephews. I enjoy any chance I get to come to Chicago.

Speaking of climbing, I understand you're a rock climber. How did you pick up that hobby?

I picked it up while living in Chicago. I often finished work on Friday afternoon and drove six hours to climb at the Red River Gorge in Kentucky or Jackson Falls in Southern Illinois. I did that every weekend if it wasn't raining, and even if it was raining, the rock was steep enough to climb and not get wet. I trained hard during the week in Chicago and then climbed in Southern Illinois or at the Red River Gorge most weekends.

Rock climbing has taken me all over the country and introduced me to people from all over the world. It's how my wife and I met. When I moved back to New York, I got involved with the local climbing scene. The Shawangunk Mountains, also called The Gunks, are 90 minutes away. They're a series of hard quartzite cliffs that jet out of the ground 300 ft with steep roofs and overhangs.

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

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

The Power of Clarity at Work

BY KATE ZABRISKIE

How goals, roles, and tasks transform teams.

IMAGINE A TEAM starting a project with energy and optimism.

Ideas are flying, everyone's ready to contribute, and the excitement is high. But a few weeks into the project, the team is struggling and the wind is out of their sails. People are frustrated, deadlines are slipping, and despite all the effort, they're behind.

That's the cost of confusion. When teams aren't clear on goals, roles, and tasks, even the most talented group can lose direction. Clarity isn't just nice to have; it keeps teams aligned, productive, and drama-free. When everyone understands the bigger purpose behind their work, their unique role, and the tactical steps needed to get there, teams don't just function—they thrive.

To understand fully how clarity benefits a project team, start by looking at the consequences of its absence. Without clear goals, roles, and tasks, the impact on teams is anything from demoralizing to destructive.

Picture Doug and Arora, each assuming they're leading the next client pitch. They each spend hours preparing, researching, and crafting slides. Finally, they meet, only to realize they've both been working on the same thing. Instead of doubling their productivity, they've doubled their workload. That's time and energy wasted, and two people left wondering why it happened in the first place.

Imagine a content team tackling a project with a tight deadline. They're confident they can get it done, but no one is clear on roles. Karen thinks Colin is handling client follow-ups, while Colin assumes Karen is on it. Hours pass as they scramble to sort out tasks. By the time they do, the deadline has passed, and trust fades as frustration takes hold.

Consider John, a team member new to the project. He's eager to contribute, but no one is clear on his role. Days pass in uncertainty, and over time, the lack of direction drains his energy. Without a clear role, John isn't just unproductive—he's on a fast track to burnout.

When roles and responsibilities are unclear, accountability fades. If something goes wrong, the response can become deflection phrases like "that was not my job" or "I thought someone else was handling that." Blame circulates, and soon, the team is more focused on defending actions than solving problems.

The Magic of Clarity

The cost of confusion is depressing, but when clarity is present, a team transforms from a group of individuals into a coordinated unit. Goals, roles, and tasks create a structure where every person can confidently contribute and knows how their work ties into the bigger picture.

Clear goals give every team member a sense of purpose. When goals link to a bigger "why," people make better decisions about where to spend their time and energy. Imagine a team's goal is to increase customer satisfaction scores by 20% this quarter. Why? Because high satisfaction improves retention, loyalty, and referrals. Each team member understands that by improving these scores, the company is building stronger client relationships that will drive future growth. Clear goals turn work into a shared mission.

When roles are defined, team members know their unique contribution. Patrick focuses on research, while Karen leads presentations. They can each focus on their strengths without worrying about overlap or missed tasks. Clear roles promote accountability and empower people to bring their best without fear of overlapping or overstepping.

Tasks bring goals to life, and clear tasks provide a roadmap that makes daily work straightforward. Vague instructions like "make customers happy" create hesitation. But if the task is specific, such as "send follow-up emails to five top clients this week," each step brings the team closer to the goal. Clear tasks keep work moving consistently and make meaningful progress possible.

Five Simple Clarity Steps

Making clarity part of your team's backbone is a manageable undertaking. Here are five steps to bring goals, roles, and tasks into focus:

Set specific, measurable goals. Goals should be like a GPS pin. Move away from vague ideas like "improve client engagement." Instead, set a target like "increase customer satisfaction by 15% by the end of the quarter." When goals are measurable, they give the team a clear destination, helping everyone stay focused and motivated.

Define roles with purpose. Each team member should understand their specific part in the mission. If Rod is responsible for research and data analysis, ensure everyone knows that's his lane. Defined roles mean less confusion, fewer overlaps, and more accountability. Plus, team members feel confident knowing their contributions matter.

Break big goals into actionable tasks. General instructions leave too much to interpretation and offer little clarity on where to begin. Break big goals down into bite-sized tasks. Instead of "make the product launch successful," assign tasks like "prepare a launch strategy proposal" or "organize a demo day with top clients." When tasks are actionable, team members know the items that must be accomplished.

Encourage open, consistent communication. Clarity isn't a one-time fix; it's a habit. Create an environment where team members feel safe to ask questions and clarify expectations. Open communication keeps misunderstandings small and creates a culture where clarity is everyone's responsibility.

Use tools that keep everyone aligned. Use shared tools to keep goals, roles, and tasks in one place. When everyone can access a shared roadmap, confusion decreases, alignment improves, and the whole team can focus on the most important matters.

Clarity isn't just about getting things done—it's about giving your team the foundation to thrive. When everyone understands the goal, their unique role, and the tasks that bring it together, work becomes more than a to-do list. It becomes a shared mission where each person is confident in their contribution. ■

Kate Zabriskie is the president of Business Training Works, Inc., a Maryland-based talent development firm. She and her team provide onsite, virtual, and online soft-skills training courses and workshops to clients in the United States and internationally. For more information, visit **www.businesstrainingworks.com**.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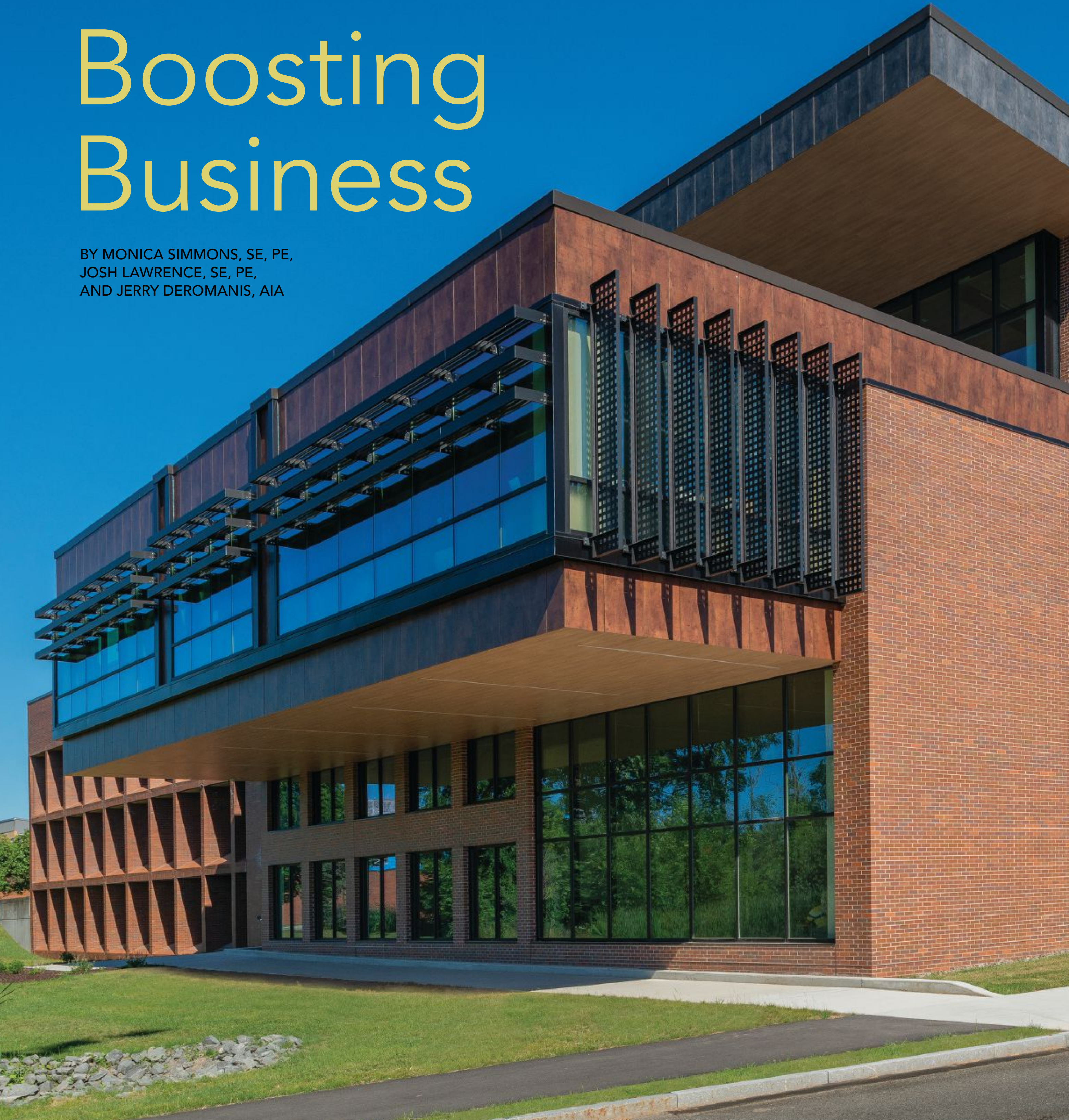
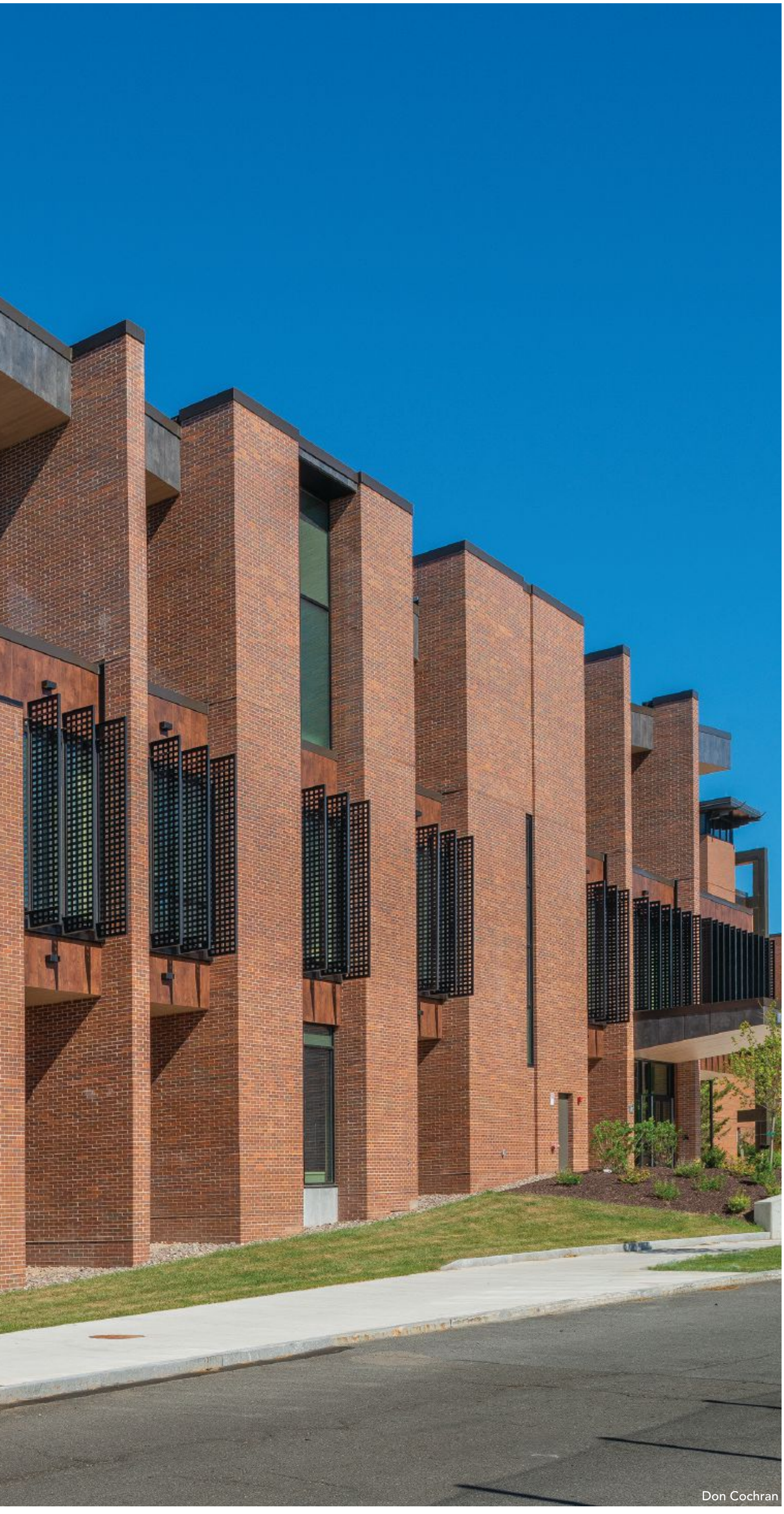
Business (school) is booming at Rochester Institute of Technology, thanks in part to a new steel addition that opened last year.

Boosting Business

BY MONICA SIMMONS, SE, PE, JOSH LAWRENCE, SE, PE, AND JERRY DEROMANIS, AIA





ROCHESTER INSTITUTE OF TECHNOLOGY (RIT) is amid its largest construction boom in more than 50 years, with an estimated $200 million slated for new projects. A steel building addition that opened in late 2024 is among the most notable components.

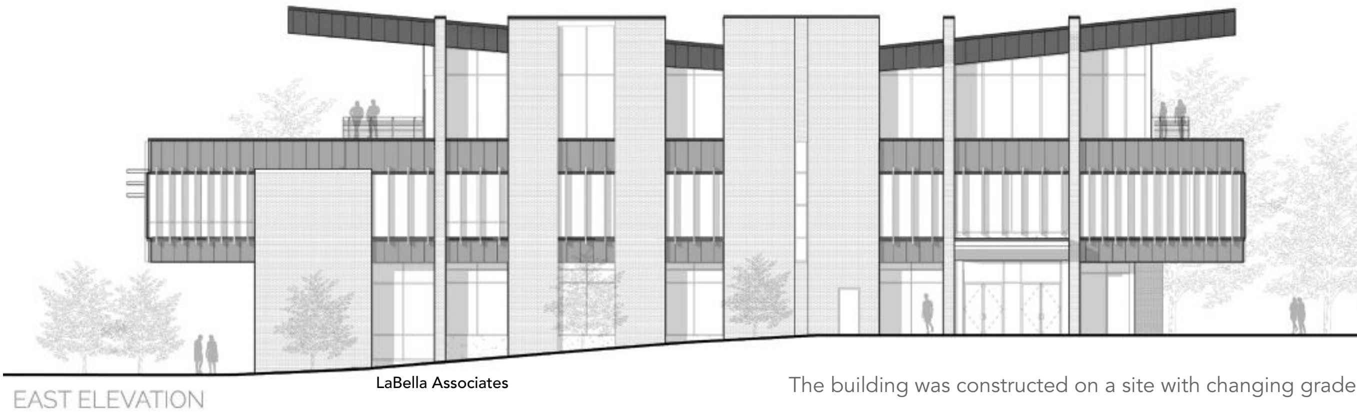
An expansion of the Saunders College of Business' Lowenthal Hall will provide students with state-of-the-art facilities that combine business with technology. Designing and building it meant integrating a design-rich, modern setting into the modernist and brutalist principles that influenced the Henrietta, N.Y., campus' original mid-20th century construction.

The existing Lowenthal Hall, designed by Rochester architect Robert Macon and built in 1977, is no exception to the original architecture. Stark brick reveals pattern the exterior walls in an undulating façade, creating sharp shadow lines. Visitors to the building atrium find an abundance of exposed cast-in-place concrete structure accented with brick and wood elements. Skylights within exposed waffle slabs and punched window openings looking onto adjacent exterior brick walls provide indirect light.

The design team for the Lowenthal Hall addition sought to honor the modernist detailing and material palette while re-interpreting the new four-story building structure with a lighter steel frame and dramatic building projections. While referencing the rhythm of deep brick recesses along the original façade, the new building addition incorporates significantly more glass, creating a healthy environment conducive to learning. Ceramic fritting integrated within the glazing, custom building-mounted louvers, and strategic shading inherent to the building massing prevent excessive solar heat gain. Breaking from the orthogonal modernist nod, a sweeping butterfly roof projects beyond the building face to capture light and frame views above exterior balconies and cover outdoor spaces below.

Modernist design principles flow from outside to inside and old to new. A cast-in-place concrete stair and balcony reference the detailing and materiality of the adjacent existing building. Oak wood tones of the existing wood ceiling match the linear metal wood-look ceiling of the new building

The new Lowenthal Hall honors the campus's modernist architecture, but has a lighter steel frame and dramatic projections.

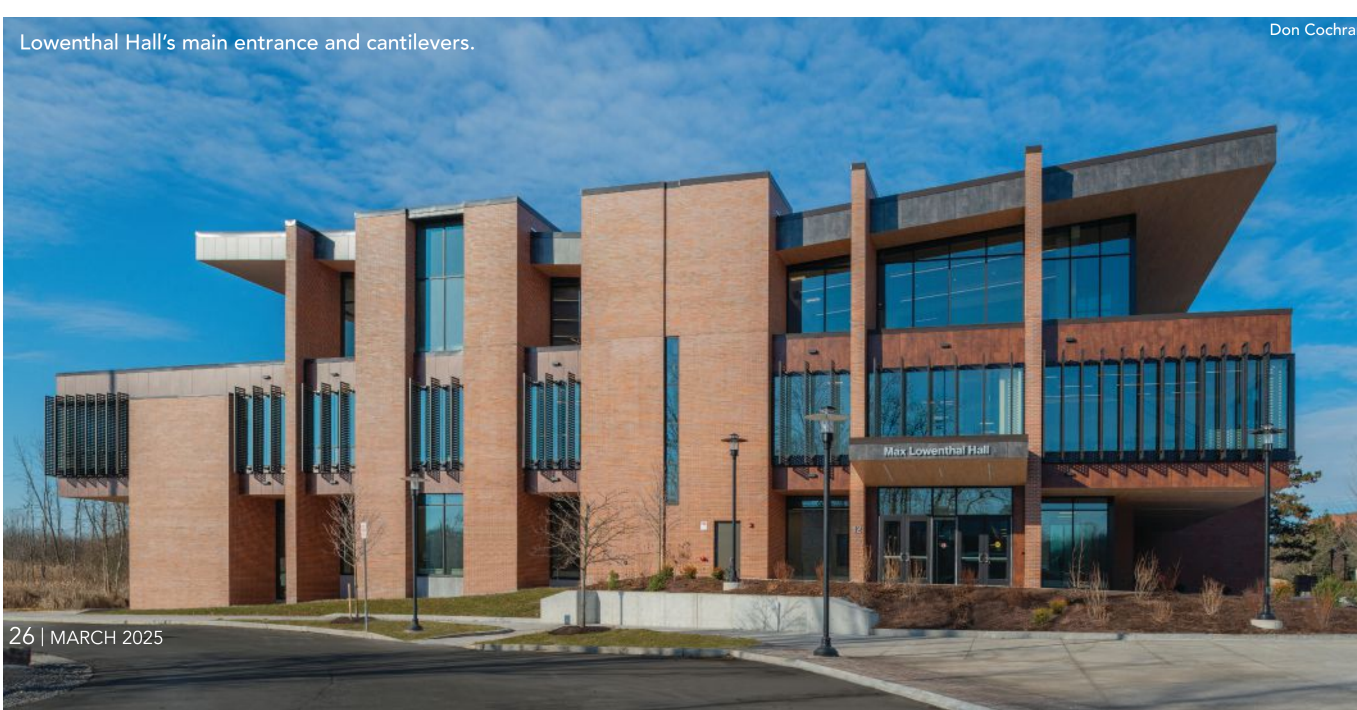


LaBella Associates

The building was constructed on a site with changing grades.

The program space diagram for Lowenthal Hall.

LaBella Associates



Lowenthal Hall's main entrance and cantilevers.

Don Cochran

addition. Similarly, the exterior phenolic rainscreen panels complement the modernist palette. The addition is structurally independent of the adjacent existing building, but the circulation on each level seamlessly ties into the circular pattern of the existing building.

Teaching spaces are easily reconfigured, embrace natural light, and minimize visual and acoustic distractions. A tiered lecture hall is located at the core of the ground floor, while the third floor hosts an educational research program at the center, a dean's suite to the south, and general classrooms to the north. The fourth floor boasts a large column-free event and pre-function space with a three-story large-format ceramic tile feature wall visually connecting all floors through an open atrium.

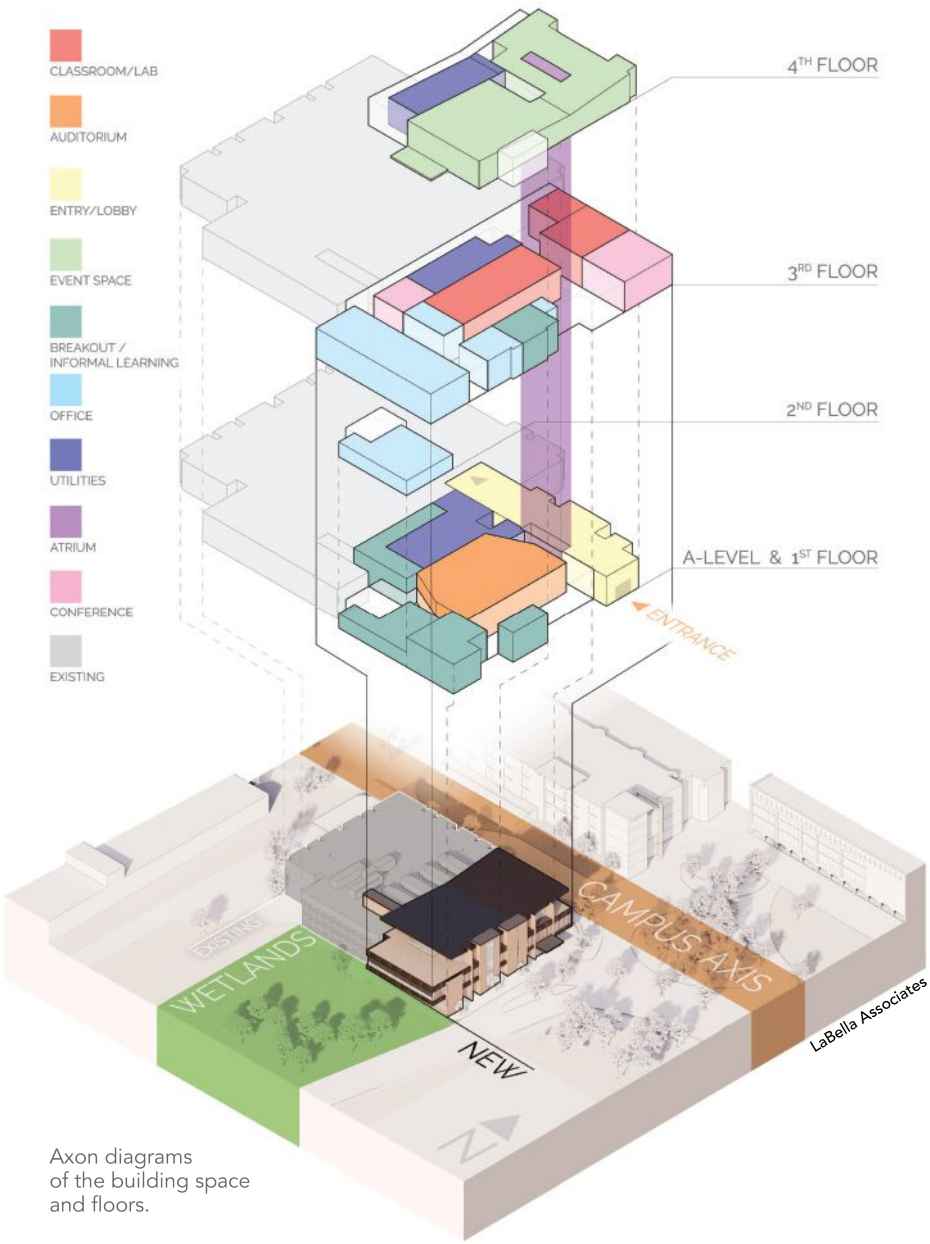
The diverse, stacked programmatic space requirements shaped many obstacles throughout the design process, pushing the design team to find innovative solutions through multiple load transfer structures for the gravity and lateral systems.

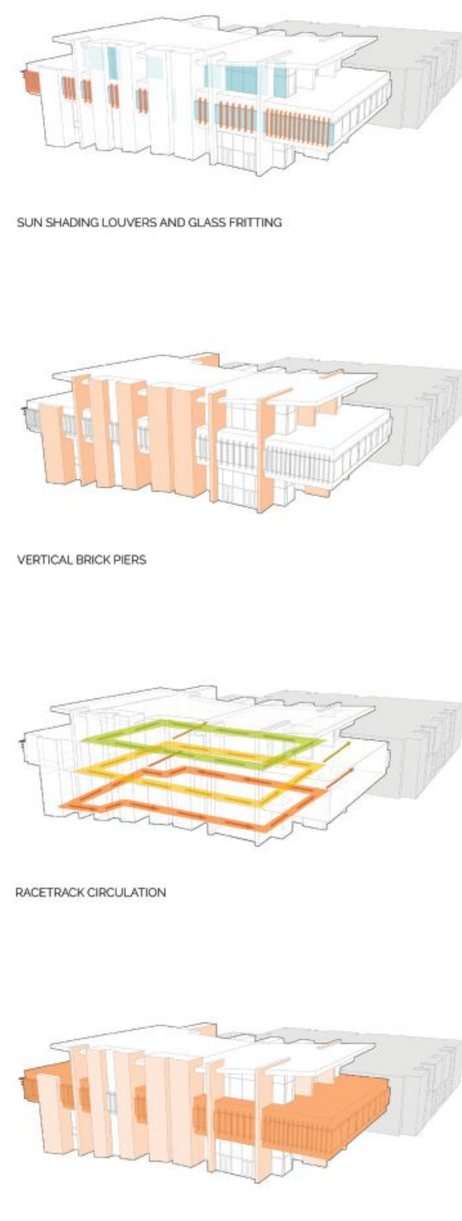
Integration Ingenuity

The new building is a full story taller than the existing building, resulting in new, large snow drifts along the east side of the existing roof structure. Additionally, new rooftop mechanical units were proposed to be supported on the existing building roof structure within the snow drift influence area.

A complete existing building roof structure analysis revealed the structure—a two-way cast-in-place concrete waffle slab—lacked adequate capacity to support additional load. The team explored multiple options to strengthen the roof's structural system, including increasing the concrete system depth, fiber-reinforced polymer reinforcement, and supplemental structural steel sub-framing. However, each option negatively impacted the aesthetic in spaces where the existing concrete structure is expressed.

The design team's solution was creating a new steel dunnage atop the waffle slab tucked behind the new building away from views from the ground. The dunnage supports the new rooftop units and extends over the snow drift influence area at a height that precludes additional snow drift load on the existing building. The dunnage consists of ⅜-in.-thick galvanized steel diamond plating on a 16-in.-deep galvanized steel frame. Steel posts extend down, connecting directly to existing concrete columns.





Axon diagrams of the building space and floors.

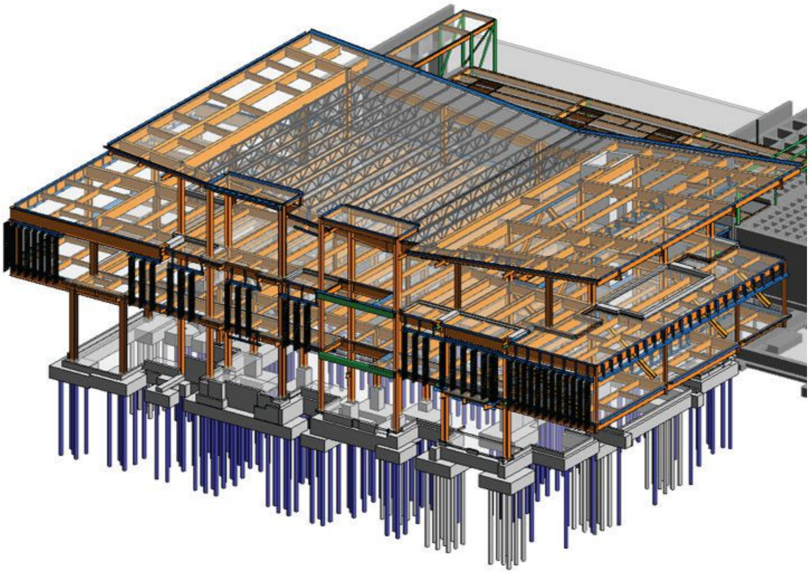
The new building addition also relies on the existing building for egress, requiring continuous, clear pathways. At the existing roof level, the project extended an egress stair at the southeast corner of the building by a full story to service the top level of the new building addition. Like the new rooftop dunnage structure, the stair headhouse vertical addition is a steel frame with new steel columns supported directly on existing concrete columns and concrete bearing walls. A small portion of the existing waffle slab structure enclosing the roof-level stair tower was removed to provide access to the new stair headhouse.

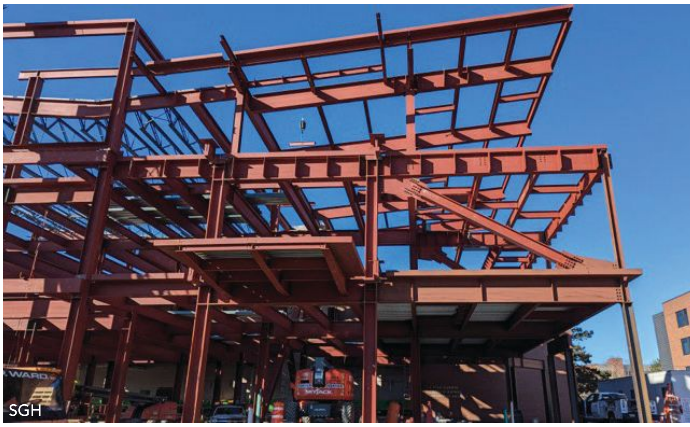
Striking New Spaces

The new building addition and existing building meld together and connect through intentional cues. The adjacency to the existing building created many design challenges, which were achieved with a multitude of steel-framed solutions. One impactful challenge was the required offset distance of the new building's first column line from the face of the existing building. The new building is founded on concrete-filled steel-driven piles to support high loads with limited differential settlement. The foundation limitations set the stage for the building framing above.

The roof framing over the fourth-floor event space is supported by only two rows of columns that extend from the foundation to the roof. The 68-ft clear-span space was a strong candidate for open web steel joist framing because of joists' economical span-to-weight ratios. But during the design phase, local joist suppliers reported long lead times that did not meet the construction schedule. The team explored alternative framing, including custom trusses and heavy wide-flange beams. To add complexity, the plenum space at the roof level is shallow and needed to accommodate large ring ducts within the roof framing.

After multiple holistic design iterations and cost-estimating exercises, the team landed on heavy W21 sections that span 68 ft. However, when the project was ready for bidding, the open web steel joist market had changed and made joists a viable option. The team pivoted and redesigned the roof structure with open web steel joists at the start of construction.





above: Hanging the north cantilever.

left: The isometric drawing for the building framing.

below: The north cantilever extends 25 ft and houses offices and classrooms.

The new building is founded on concrete-filled steel-driven piles to support high loads with limited differential settlement.

SGH

Lowenthal Hall is an expansion of an existing building, but is structurally independent.

SGH

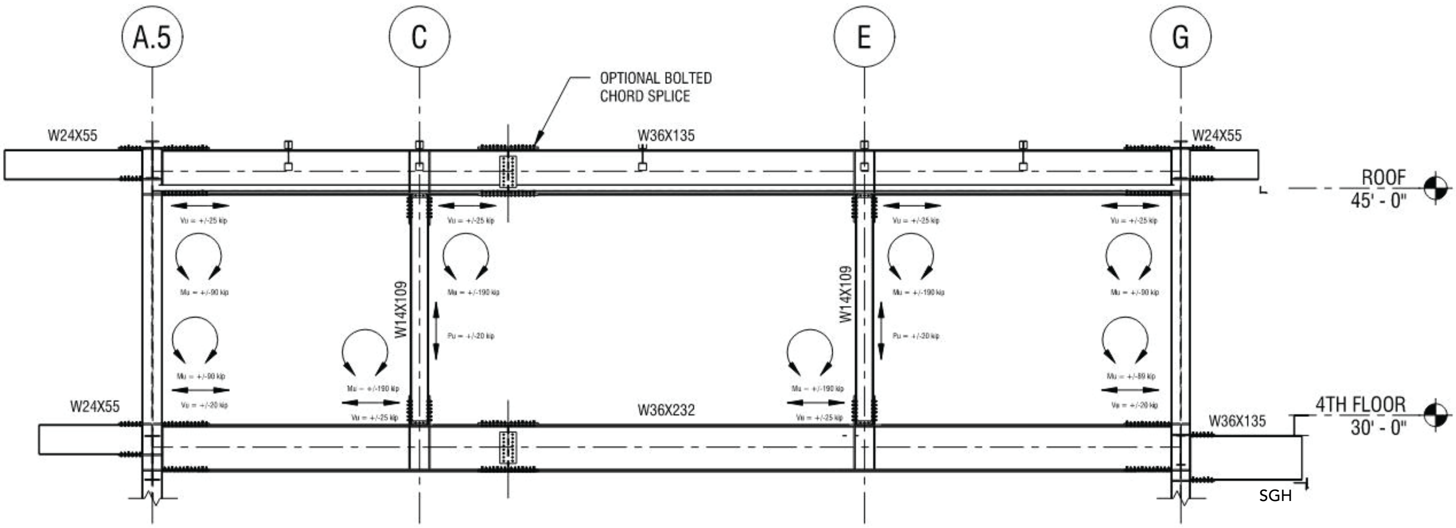
The joists achieved a 10.5-ft cantilever on the west side of the building using a custom, built-up top chord extension. They are framed at an angle to their strong axis, perpendicular to the butterfly roof slope. The joists incorporated additional bridging to resist out-of-plane loads along their length.

Though the 68-ft clear span could be economically framed with open web steel joists at the roof level, the assembly live load in the event space and floor-to-floor height restrictions to align with the existing building levels below required an additional column line within office partition walls at the third floor to reduce the long span.

The large lecture hall on the first floor features an impressive 50-ft clear span achieved with transfer girders supporting the columns at the third-floor level. During early design phases, the design team collaborated with the steel fabricator, AISC full member Rochester Rigging, Inc., to evaluate the economy and availability of heavy-rolled wide-flange sections versus built-up plate girders, eventually selecting W36×262 sections.

The gravity system is not the only portion of the structure with load-transfer elements. The east-west building lateral system consists of steel concentrically braced frames to efficiently control lateral drift at the existing building interface. At the south end of the building between the fourth floor and roof level, a concentric braced frame transitions to a full-story lateral Vierendeel truss. The Vierendeel truss system provides unencumbered southern views of the campus within the event space.

The Vierendeel truss drawing.



Perhaps the most striking features of the addition are the north and south full-bay cantilevers that extend over walkways and plazas. The building extends approximately 25 ft on the north end and about 18 ft on the south. Both cantilevers house office and classroom spaces. At the fourth-floor level, they support rooftop patios accessible from the event space.

At the south, Vierendeel trusses support the building cantilever at each of the four column lines. The second-floor interstitial level is shoehorned below the Vierendeel trusses with tight floor-to-floor heights to align with the existing building. Due to floor plan constraints, the rear column of the Vierendeel trusses is offset from the column below by 2½ ft and relies on a full moment connection at the second-floor level beam to achieve Vierendeel action. The design team tuned the Vierendeel truss beam top chord and column web members to permit shallow bottom chord members over the second-floor space.

At conception, the design envisioned the north cantilever structure as a Vierendeel truss, similar to that of the south. However, the beam and column section sizes required to meet the building deflection criteria encroached on usable floor space. The design team collaborated to reconfigure the spaces and to incorporate a floor-to-floor diagonal brace at each column line, hanging the north cantilever. The architectural team chose to expose the northwest corner brace and its connections as a design feature.

The hanging action from the braces is resolved through a tension reaction on the fourth floor and a compression reaction on the third. The reaction forces are transferred to lateral moment frames in the north-south direction through collector beams and distributed through the floor diaphragms.

The Lowenthal Hall addition represents RIT's transformation by honoring the past and forging ahead for the future, and structural steel allowed the design team to realize complex geometric features and re-envision Macon's original design. ■

Owner
Rochester Institute of Technology

Architect
LaBella Associates

Structural Engineers
Simpson Gumpertz & Heger
LaBella Associates

General Contractor
LeChase Construction

Fabricator, Erector, and Detailer
Rochester Rigging, Inc. AISC CERTIFIED FABRICATOR

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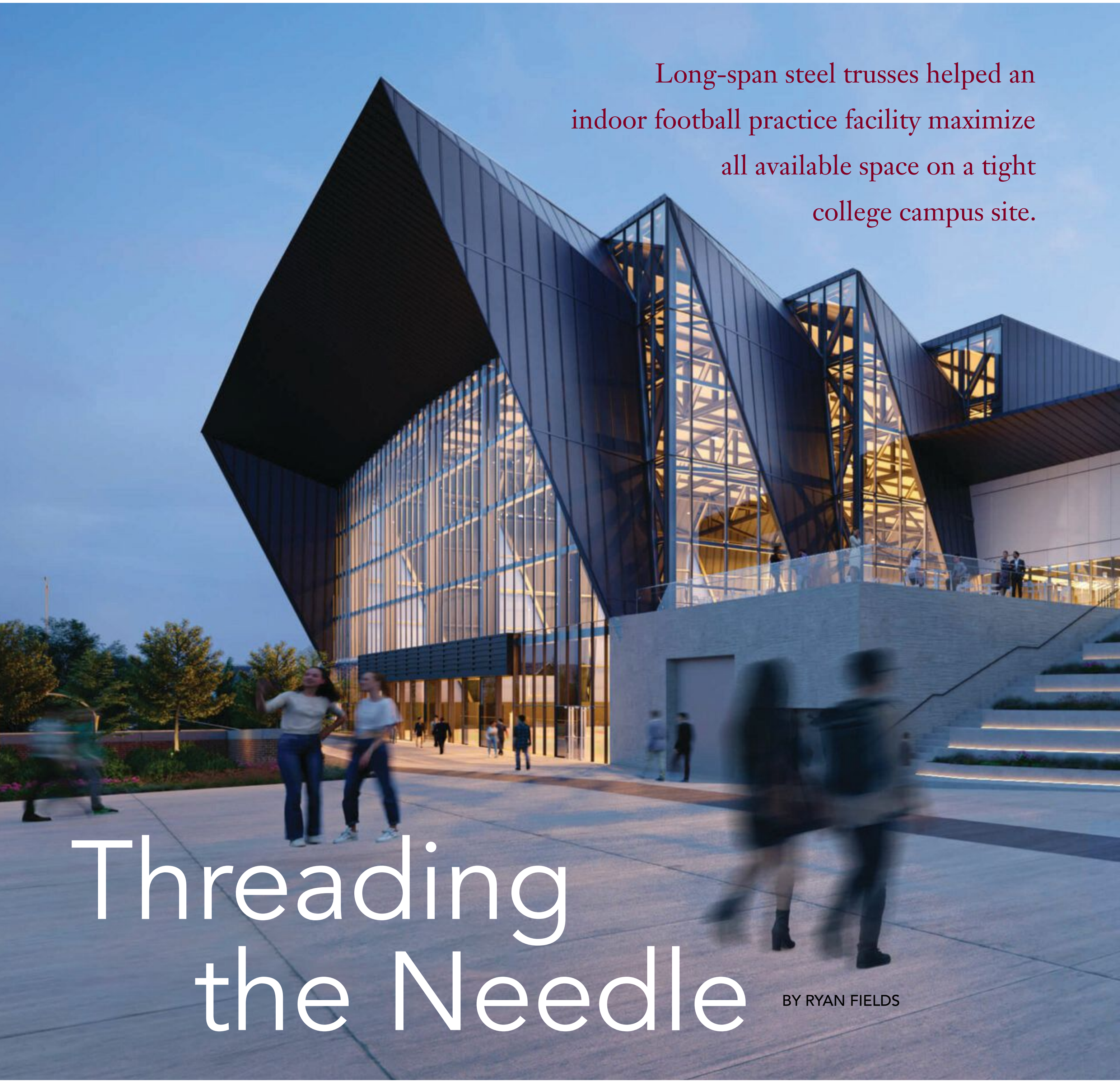


Long-span steel trusses helped an indoor football practice facility maximize all available space on a tight college campus site.

Threading the Needle

BY RYAN FIELDS

THE UNIVERSITY OF CINCINNATI'S CAMPUS is welcoming a steel addition that will immediately make a big play for one of its sports teams.

A $160 million indoor practice facility for the Cincinnati Bearcats football team will ensure weather is a non-issue for practice 12 months a year and keep the team's facilities competitive with its peers after its move up the college football hierarchy into the Big 12 Conference. It's built on top of an existing field like a steel canopy, and once completed, will occupy every square inch of the available ground on the plot of land.

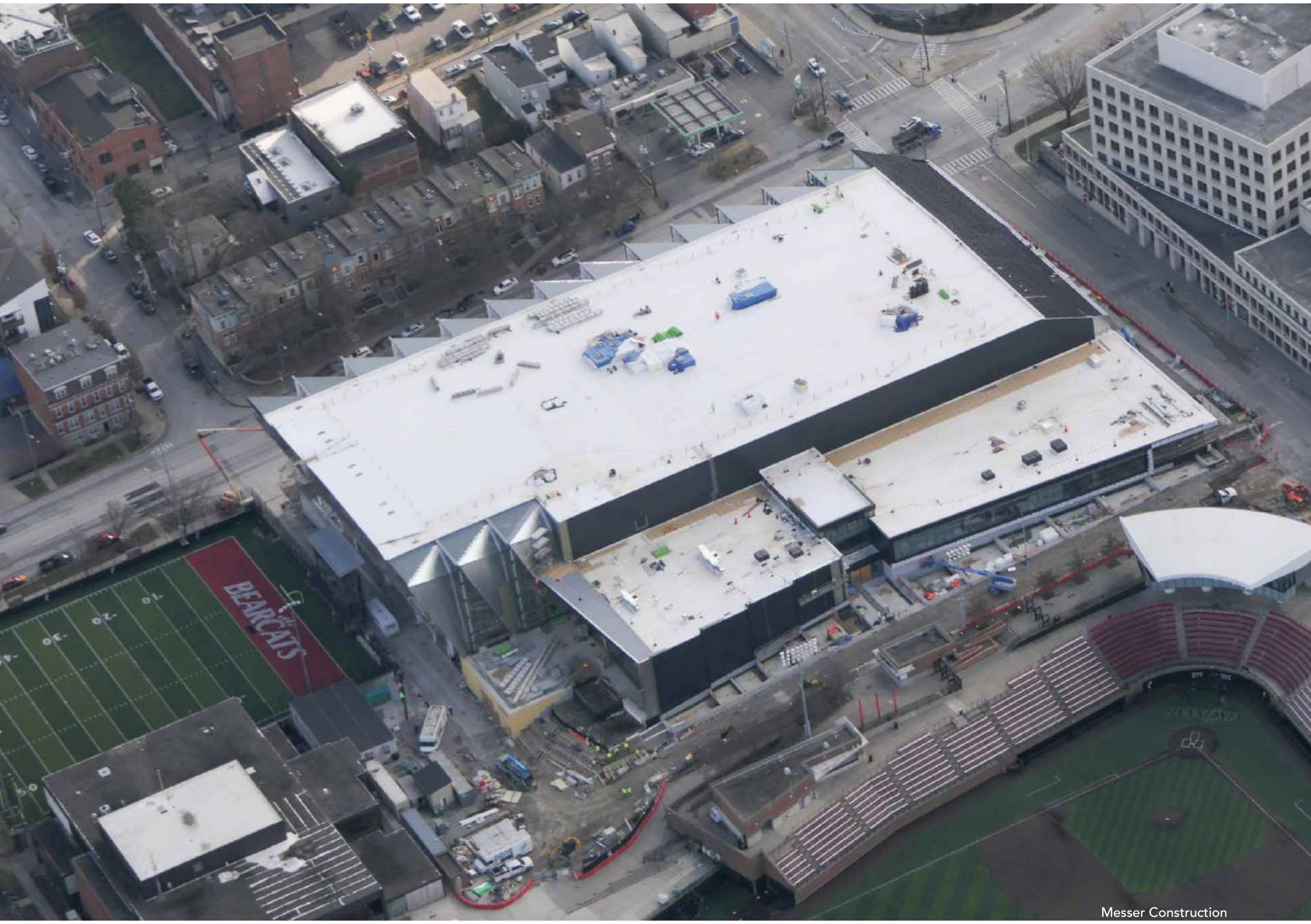
An indoor football facility must have an expansive column-free interior to fit a regulation-size football field and a small sideline space around it, making structural steel the obvious material choice for structural engineering firm Walter P Moore. The practice facility is nearly 90 ft tall, 400 ft long, and more than 200 ft wide, and it contains 2,000 tons of complex structural steel. The roof backbone consists of 13 trusses that are 200 ft long and weigh about 50 tons each. The truss top and bottom chords are W14×140 members, with W14×90 and W14×43 web members.

The University of Cincinnati's new indoor football facility will open in 2025.

The most significant fabrication challenge was the 13 trusses, which are comprised of Grade 65 AEOS steel rolled by Nucor in Blytheville, Ark. To accommodate the structural strength and design, every weld on the trusses is a complete-joint-penetration groove weld. Structural requirements also led to ultrasonically testing each weld and strengthened connection design. By involving the fabricator early, Grade 65 material could be worked into Nucor's rolling schedule with no impact on the construction schedule.

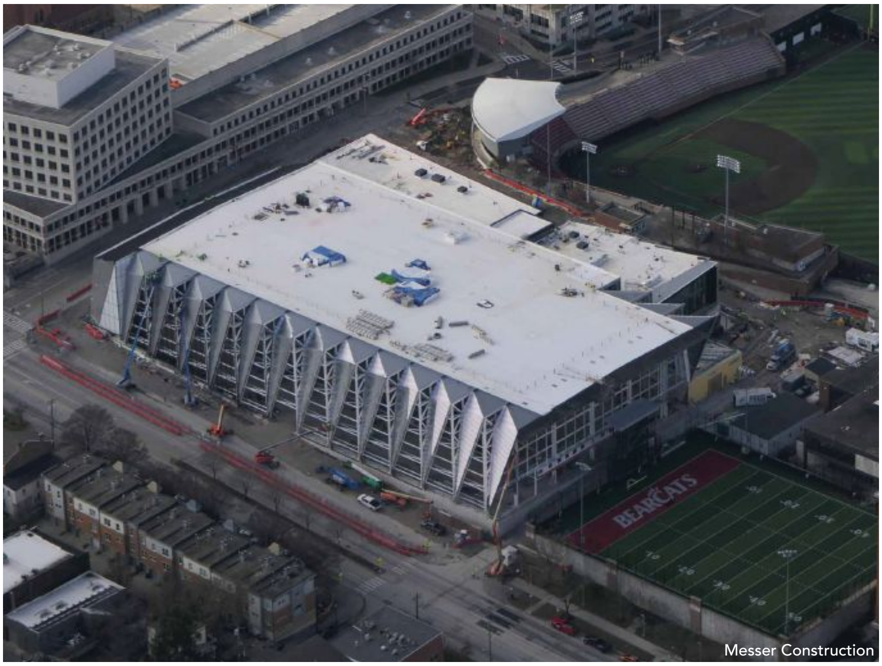
Walter P Moore, known for innovative athletic facility and stadium design, used a triangular lattice framing down the side of the building combined with trusses tying in at the top. The system is anchored by a shared column line between the steel-framed indoor facility and the concrete-framed athletic performance center that's also part of the project. The column line is supported by 83-ft-tall W36×262 columns wrapped in concrete and poured monolithically within the concrete slab.

The columns are a conduit for the forces of the steel building to lean into the concrete structure, creating greater strength and stability due to the loading imposed by the 200-ft-wide clear-span structure. The exterior side has lattice columns consisting of



above: The facility is nearly 90 ft tall, 400 ft long, and 200 ft wide.

below: The building occupies every part of a tight space between other athletic facilities.



W14×109 members for the vertical chords with W14×61 and W14×43 lattice members.

Steel erection occurred first along the shared column line, with concrete column encasement happening alongside concrete floor pours. All columns that were later encased on-site arrived on site several months before the main steel to avoid slowing the overall schedule and to allow the concrete portions to progress so that setting steel and pouring concrete could occur in concert with each other.

The erection sequence involved a 200-ton crawler crane along with a shoring tower to support the truss during installation. Half of the truss was assembled on the ground, with the shoring tower placed in the eventual center to hold the erected truss half while the other half was assembled and hung in place. The crane sat in the middle of the building's footprint, starting on one side and backing up as each sequence was erected. Due to the truss weight, the crane had to be directly on top of the trusses to perform the pick to remain stable.

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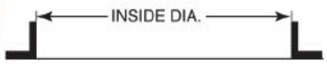
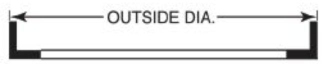
1 Angle Leg Out



10" x 10" x 1" Angle

2 Angle Leg In

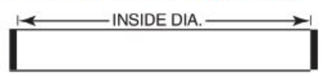


10" x 10" x 1" Angle

3 Flat Bar The Hard Way

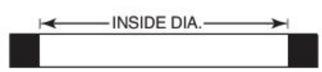
24" x 12" Flat

4 Flat Bar The Easy Way



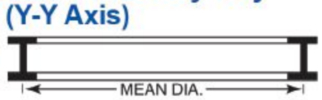
36" x 12" Flat

5 Square Bar



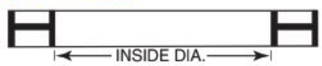
18" Square

6 Beam The Easy Way (Y-Y Axis)



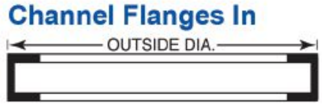
44" x 335#, 36" x 925#

7 Beam The Hard Way (X-X Axis)



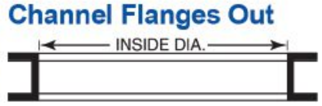
44" x 285#

8 Channel Flanges In



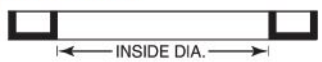
All Sizes

9 Channel Flanges Out



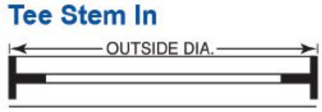
All Sizes

10 Channel The Hard Way (X-X Axis)



All Sizes

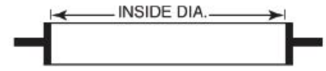
11 Tee Stem In



22" x 142 1/2# Tee

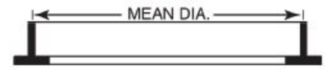
We bend ALL sizes up to:

12 Tee Stem Out



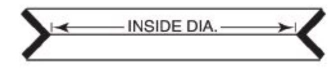
22" x 142 1/2# Tee

13 Tee Stem Up



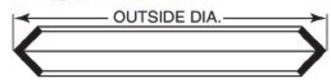
22" x 142 1/2# Tee

14 Angle Heel In



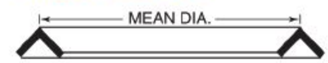
8" x 8" x 1" Angle

15 Angle Heel Out



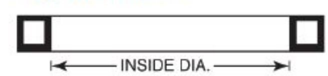
8" x 8" x 1" Angle

16 Angle Heel Up



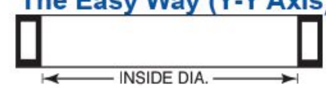
8" x 8"x1" Angle

17 Square Tube



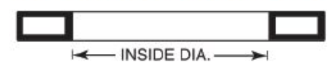
24" x 1/2" Tube

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



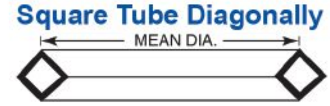
20" x 12" x 5/8" Tube

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



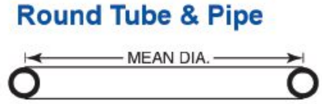
20" x 12" x 5/8" Tube

20 Square Tube Diagonally



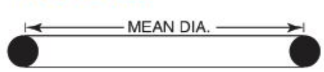
12" x 5/8" Square Tube

21 Round Tube & Pipe



24" Sched. 80 Pipe

22 Round Bar



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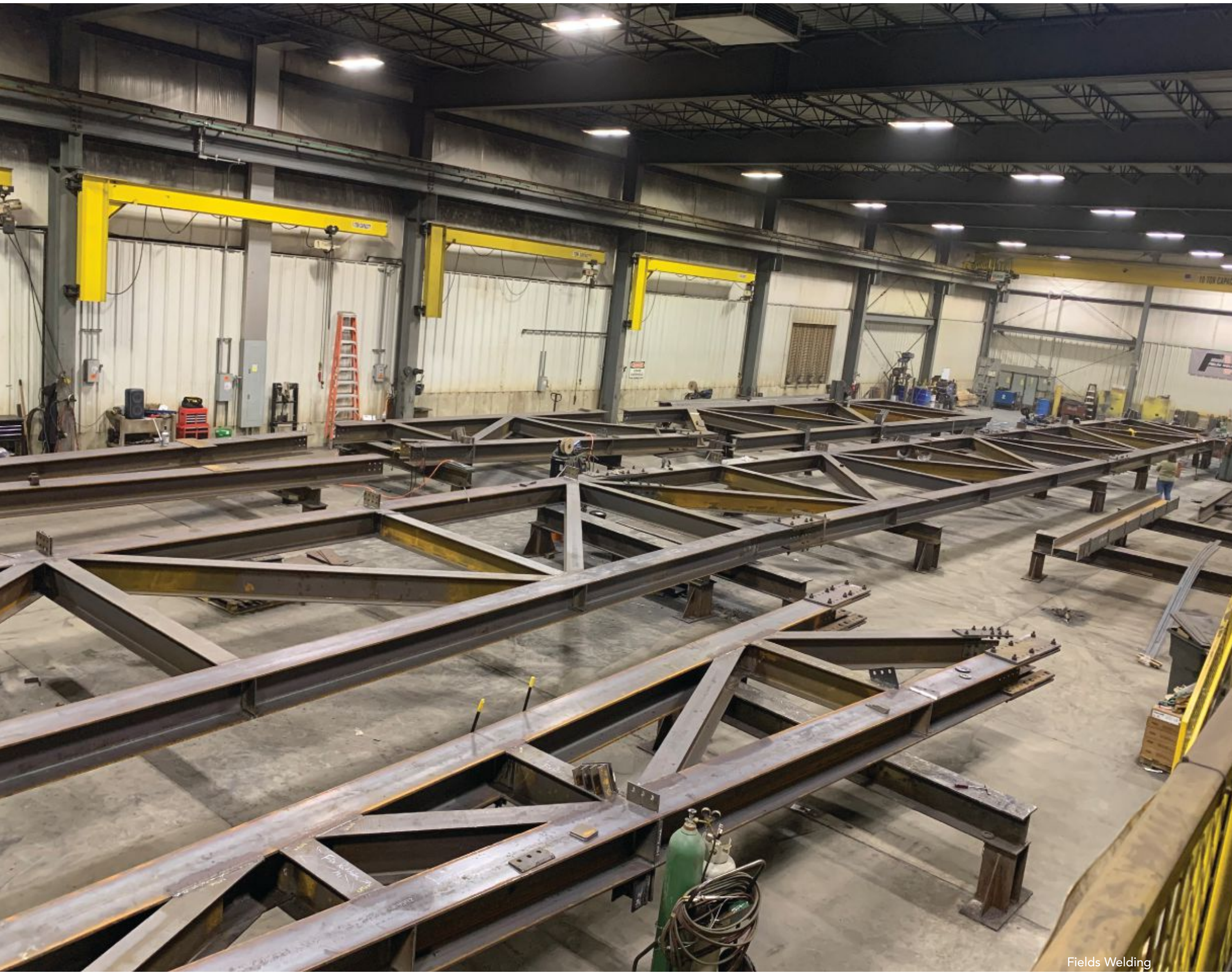
A 200-ft clear span was necessary for fitting a football field indoors.

Fields Welding

The columns are a conduit for the forces of the steel building to lean into the concrete structure.

Fields Welding

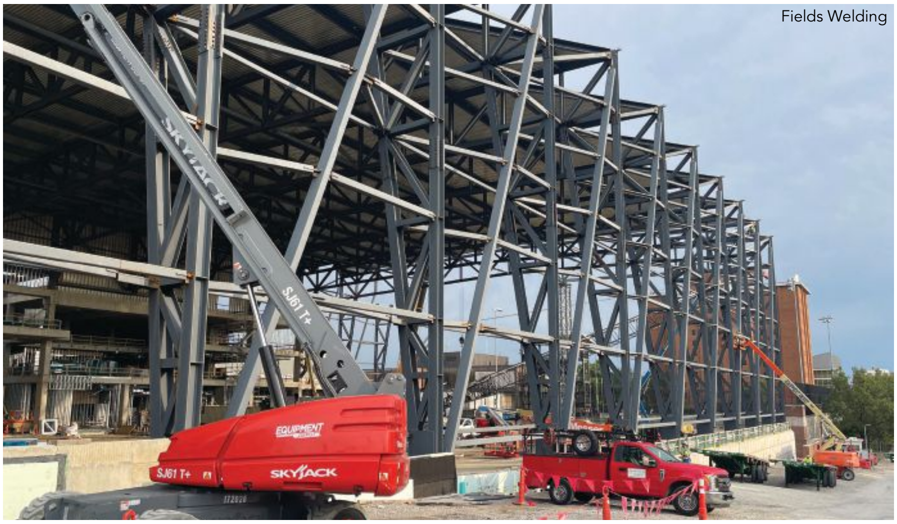

Fields Welding

The constructable and space-conscious erection sequence influenced design, especially in the connections. After setting the truss, infill beams and 70-ft diagonal HSS16×8×½ and HSS20×4×½ tubes were installed for stability. Once the infill and extension supports were connected, the shoring tower was removed and the process was repeated for the rest of the trusses. The erection process was akin to a large steel zipper and ended with less than 20 ft of clearance from an existing bandstand conduction tower on the far side of the facility.

The immense clear spans required for a football practice field created 1,500-kip compression forces at column baseplates and 600-kip axial forces in all standard connections. Each connection was designed for the temporary condition and erection

above: Fabricating the trusses.

below: The trusses are Grade 65 AEOS steel.


Fields Welding

above: A shoring tower used during steel erection.

below: The 13 roof trusses weigh about 50 tons each.

sequence, which both came before completion of the adjacent concrete structure the steel frame uses to transfer its lateral forces by leaning into the concrete floors and translating down into the ground. All bolted connections were designed as double-shear and double-row slip-critical connections to handle these immense forces during the temporary condition.

All connections were also stiffened with between two and four stiffener plates to temporarily resist at least some lateral forces until the building could lean against the concrete structure. Stiffeners were generally standardized at 1 in. thick to help stiffen the structure and simplify construction details.

The structure's complex geometry and extra-strong connections required tolerances that were half as much as those found in the AISC *Code of Standard Practice for Structural Steel Buildings and Bridges* (ANSI/AISC 303-22). These tight tolerances were maintained even in the pitched and sloped connections at the ends of each truss and at the center splice, which were required to accommodate the design geometry. No connections had to be modified in the field because of the great care taken in fabrication and quality inspections on every piece of steel that left the shop.

The University of Cincinnati can be proud to show one of the most advanced examples of what a modern athletic facility can be


Fields Welding


Fields Welding

above: The column line is supported by 83-ft-tall W36×262 columns.

left: Infill beams and square HSS provide stability.

below: The University of Cincinnati invested $160 million into the facility.


University of Cincinnati

when it opens in 2025—and how structural steel can offer a solution to any kind of football practice facility design. ■

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Steel Team

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Detailer
CADeploy, Inc. AISC DETAILER

Ryan Fields (**ryan@fieldswelding.com**) is an estimator at Fields Welding, Inc.

Life In The Fast Lane

These AISC steel bridge resources and tools will help you design faster and design for speed on the jobsite.

AISC'S NEED FOR SPEED initiative was not only intended to help the steel industry create buildings faster. The goal to construct steel structures 50% faster by 2025 also aimed to push the envelope with bridge construction, despite its long-standing competitiveness with other materials in speed.

Major Need for Speed research projects like SpeedCore and FastFloor (described in the "Meeting the Need for Speed" article in the February issue at **modernsteel.com/archives**) do not have a bridge equivalent. But AISC and the National Steel Bridge Alliance, through Need for Speed initiatives, developed a lengthy bridge resource library that enables quick design and answers almost any imaginable question.

This graphic shows the ideal resources for finding guidance, design examples, and much more when designing or fabricating parts of a steel bridge. Turn to page 42 to learn more about them. These free resources are available at **aisc.org/nsba/design-resources**.

Want to see the technologies that help speed up bridge projects?

Check out the Bridge Pavilion in the exhibit hall at NASCC: The Steel Conference, where you'll find more than 30 exhibitors with products related to steel bridge design and construction. In addition, the World Steel Bridge Symposium, which runs in conjunction with the Steel Conference, features two dozen sessions related to bridges.

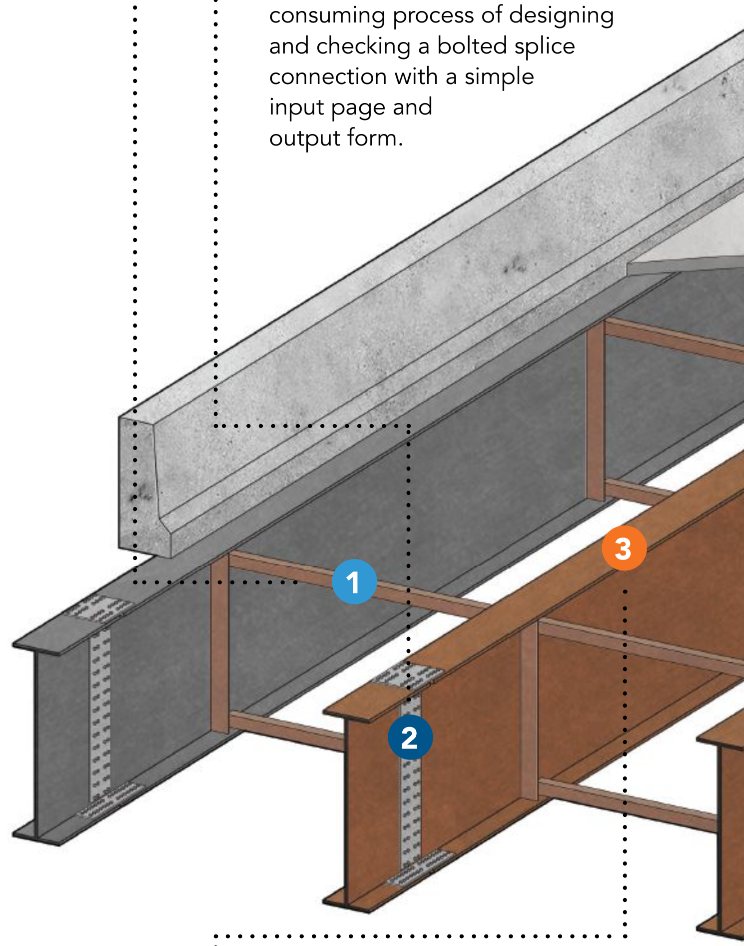
The conference takes place April 2 to 4 in Louisville. To view the Bridge Pavilion companies, WSBS sessions, and more details about the conference—and to register—visit **aisc.org/nascc**.

1 Lean-on Bracing Reference Guide

Using lean-on bracing saves time and money.

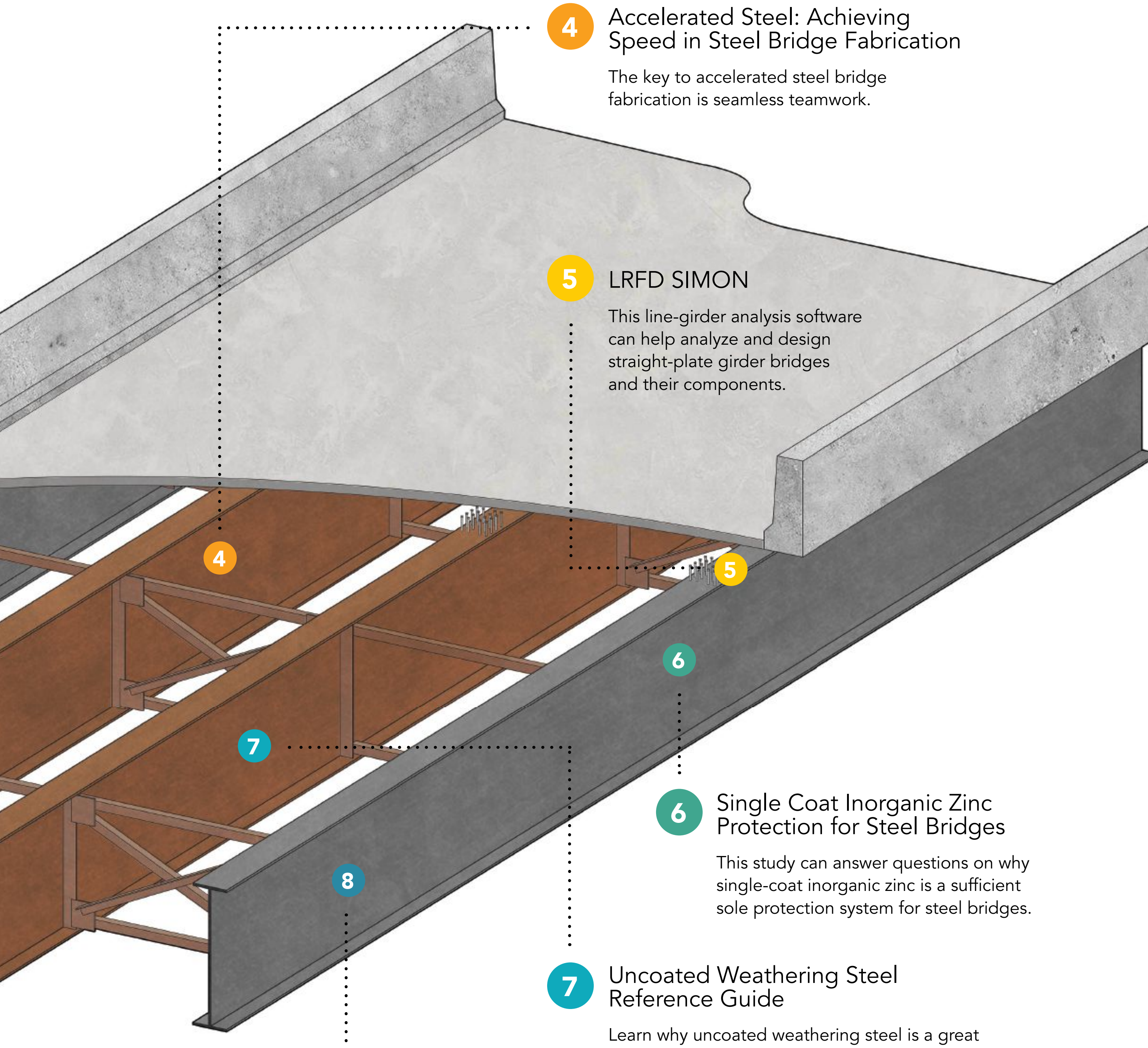
2 Bolted Field Splices for Steel Bridge Flexural Members

This guide, also known as NSBA Splice, rewrites the time-consuming process of designing and checking a bolted splice connection with a simple input page and output form.



3 Navigating Routine Steel Bridge Design

This guide complements the AASHTO *LRFD Bridge Design Specifications*, streamlining the design process for routine I-girder bridges.



4 Accelerated Steel: Achieving Speed in Steel Bridge Fabrication

The key to accelerated steel bridge fabrication is seamless teamwork.

5 LRFD SIMON

This line-girder analysis software can help analyze and design straight-plate girder bridges and their components.

6 Single Coat Inorganic Zinc Protection for Steel Bridges

This study can answer questions on why single-coat inorganic zinc is a sufficient sole protection system for steel bridges.

7 Uncoated Weathering Steel Reference Guide

Learn why uncoated weathering steel is a great choice for speed.

8 Standard Plans for Steel Bridges

If you need a straight steel I-girder bridge design fast, this resource is for you. One-, two-, three-, and four-span efficient full bridge designs are in this latest resource.

NEED FOR SPEED

Speed When It's Needed Most

Perhaps the steel bridge industry's most impressive display of speed comes when bridge emergencies arise. Floods, tanker fires, and truck crashes are among the recent causes of steel bridges being wiped out or compromised, thereby closing crucial thoroughfares.

In December 2024, for example, the new Fairfield Avenue bridge over Interstate 95 in Norwalk, Conn., reopened exactly seven months after a tanker crash rendered the original one structurally unsound. (Read more about it on page 64). New steel girders were erected less than four months after the crash.

Elsewhere, a replacement for a flood-damaged upstate New York bridge opened in October 2023, four months after the storm. A normal replacement often takes more than a year. This one shaved time by repurposing yet-to-be-used girders that New York State Department of Transportation owned. (Read about it in the "Rapid Response" article in the April 2024 issue). Most notably, a June 2023 tanker fire felled an I-95 bridge in Philadelphia, and the full replacement opened eleven months later. The first permanent lanes, though, reopened in late 2023.

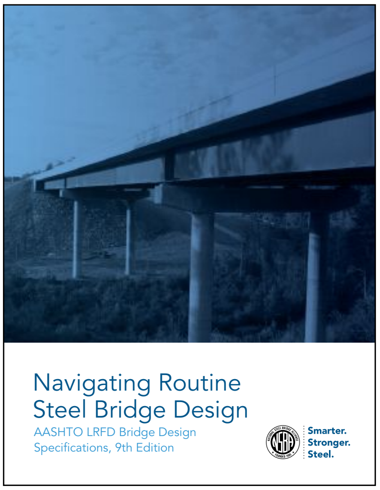
In emergency repair or replacement situations, the steel bridge industry—from state departments of transportation to engineers to fabricators to general contractors—demonstrates its collaborative spirit and dedication. Its common emergency operating procedures are detailed in the "All Hands on Deck" article in the December 2023 issue (**modernsteel.com/archives**). Repairing or replacing a critical bridge becomes the top priority for all parties, who work together to reopen the crossing as fast as possible.

For more examples of rapid steel repair, see the Product Extras section on the *Modern Steel* homepage at **www.modernsteel.com**.


Canam Bridges U.S.

Navigating Routine Steel Bridge Design

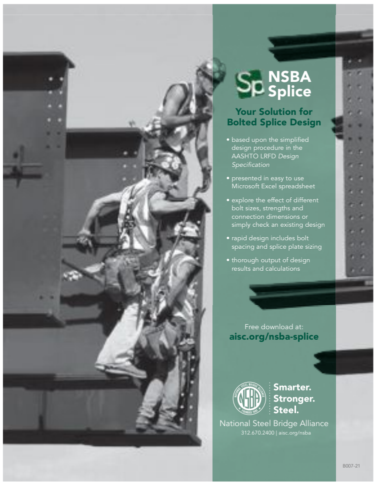
The most familiar designs still have room to go faster. Routine steel I-girder bridges with little or no skew and span lengths below 200 ft are found nationwide. They're not going away either. Use this guide as a complement to the AASHTO *LRFD Bridge Design Specifications* and find its hyperlinked checklists that walk engineers through the process and focus on specific provisions in the *Specifications*. Find it at **aisc.org/nsba/routine**.



Bolted Field Splices for Steel Bridge Flexural Members

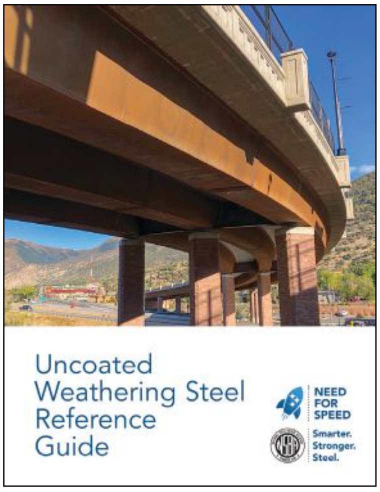
NSBA Splice can be incorporated as a design tool on plate girder bridges, allowing the designer to analyze various bolted splice connections to determine the most efficient bolt quantity and configuration. It allows the user to explore the effects of bolt spacing, bolt size, strength, and connection dimensions on the overall splice design.

NSBA Splice is presented in a Microsoft Excel spreadsheet format. The download includes a blank design spreadsheet and two completed examples drawn from the inputs and solutions for Examples 1 and 2 presented in the *Bolted Field Splices for Steel Bridge Flexural Members* design guide. The design guide and spreadsheet are current to the AASHTO *LRFD Bridge Design Specifications*.



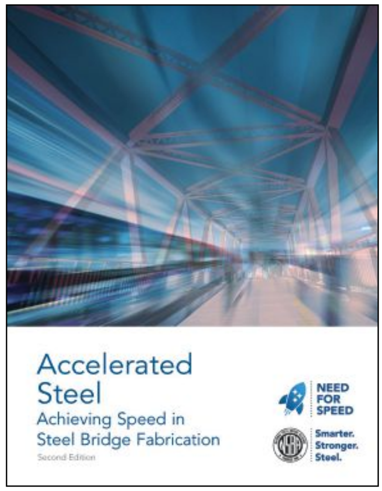
Uncoated Weathering Steel Reference Guide

Uncoated weathering steel (UWS) is a bridge owner longtime favorite because it reduces cost, has low environmental impacts, is an aesthetic boost, and is a speed-friendly option. UWS has inherent corrosion protection and does not require any coating applications, so the steel is ready for erection much faster than coated members—shortening the construction schedule. Find it at **aisc.org/uwsguide**.



Accelerated Steel: Achieving Speed in Steel Bridge Fabrication

Cutting, fitting, welding, drilling, cleaning, and coating are only part of the equation to increase fabrication speed. Fabrication goes faster by optimizing out-of-shop activities like procuring materials, facilitating routine procedures, and coordinating inspection. The key to faster fabrication is creating seamless teamwork between the fabricator, owner, engineer, and contractor. This guide describes how each role affects critical shop support activities, which can make or break the fabrication schedule. It lays out the ideal schedule for every fabrication step and details the responsibilities of owners, designers, and general contractors.



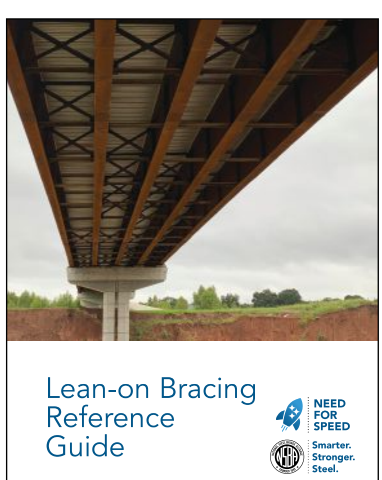
LRFD Simon

NSBA's line-girder analysis and preliminary design program for steel I-shaped plate girders and multiple single-cell box girders allows users to produce complete steel superstructure designs per the AASHTO *LRFD Bridge Design Specifications*. Users will receive a link to the software after filling out the form at **aisc.org/nsba/design/resources/simon**.

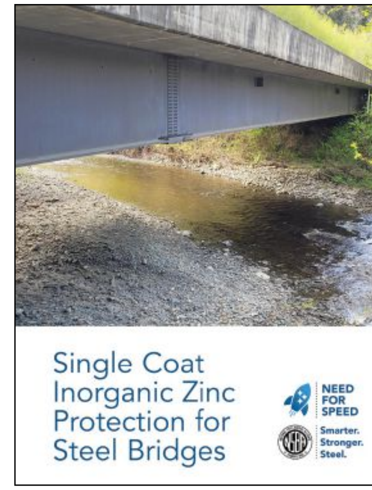
Lean-on Bracing Reference Guide

Cross-frames are one of the costliest elements in a steel bridge on a per-pound basis. Reducing the number and complexity of cross-frames can have a significant impact on the speed of fabrication, speed of erection, and overall bridge cost. Choosing lean-on bracing in a design can potentially eliminate 50% or more of the full cross-frames required for a routine steel I-girder bridge without adding any cost to the girders.

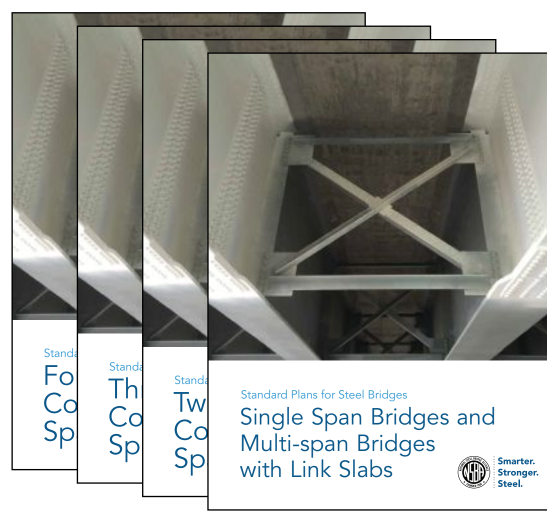
This guide provides design criteria, commentary, and example designs. It also shows how to implement lean-on bracing in routine bridge designs with confidence and minimal additional computational effort. For a recent example project, read the "Leaning on Steel" article in the November 2024 issue at **modernsteel.com/archives**.



Single Coat Inorganic Zinc Protection for Steel Bridges



Inorganic zinc (IOZ) coatings—paints, in other words—are frequently used as a primer layer in paint systems for steel structures. They are sometimes used as a single component of corrosion protection, referenced as single-coat inorganic zinc (SIOZ). This document is a synthesis study report on using SIOZ as the sole corrosion protection system for steel bridges. Find it at **aisc.org/nsba/corrosionprotection**.



Standard Plans for Steel Bridges

The AISC/NSBA *Standard Plans for Steel Bridges* provide straight steel I-girder bridge plans for various span arrangements and lengths. It's optimized for cost-efficiency throughout design, material selection, fabrication, and construction. All designs satisfy the provisions of the newly released 10th Edition AASHTO *LRFD Bridge Design Specifications*, and they cover one-, two-, three-, and four-span configurations with span lengths ranging from 80 ft to 300 ft, and with girder spacings of 8, 10, 12, and 14 ft. All bridge designs consider constructability, including the wind on the steel framing, deck placement sequences, and the loading effects from deck overhang brackets. These standard plans also provide cost-efficient diaphragm and cross-frame standards for the entire suite of bridges. Find them at **aisc.org/standard-bridge-plans**. ■

Sphere is the new star of the Las Vegas Strip, and its supporting cast of hundreds of steel castings is a big reason why.

Casting Light on a Smart Solution

BY CAWSIE JIJINA, PE AND STEVE REICHWEIN, SE, PE

IN STRUCTURAL ENGINEERING, innovation often comes from solving unique challenges. Sphere in Las Vegas, with its awe-inspiring architectural size and record-breaking LED displays, is a shining example of forward-thinking structural design and construction solutions.

Among the tools that brought Sphere to life on schedule were structural steel castings, which offered versatility, precision, efficiency, and strength. Sphere is proof of castings' benefits and an example of design approaches and options that yield an architecturally aesthetic solution and minimize costly and time-consuming field testing, supervision and quality control. (Read more about Sphere in the "Steel Sphere" article in the September 2023 issue at **modernsteel.com/archives**).

Castings Basics

Castings are crafted by pouring molten metal into molds, allowing for intricate shapes that are challenging or impossible to achieve with traditional steel fabrication methods. They provide high strength, seamless transitions between components, near-identical repetition, and the flexibility to address complex geometries.

Sphere's castings used sand molds, which are produced by pouring sand against patterns often made from CNC-machined wood. The sand is treated with a chemical binder that causes it to set, after which time the patterns are stripped from the sand, producing the negative regions of the mold that provide the required shape—in this case the connection node.

Historically, castings have been used sparingly in structural applications, and those uses are mainly decorative or specialized. Advancements in casting technologies and materials have made them a viable option for high-performance structural components in modern projects, especially those with repetition, geometric complexity, and an exposed architectural aesthetic.

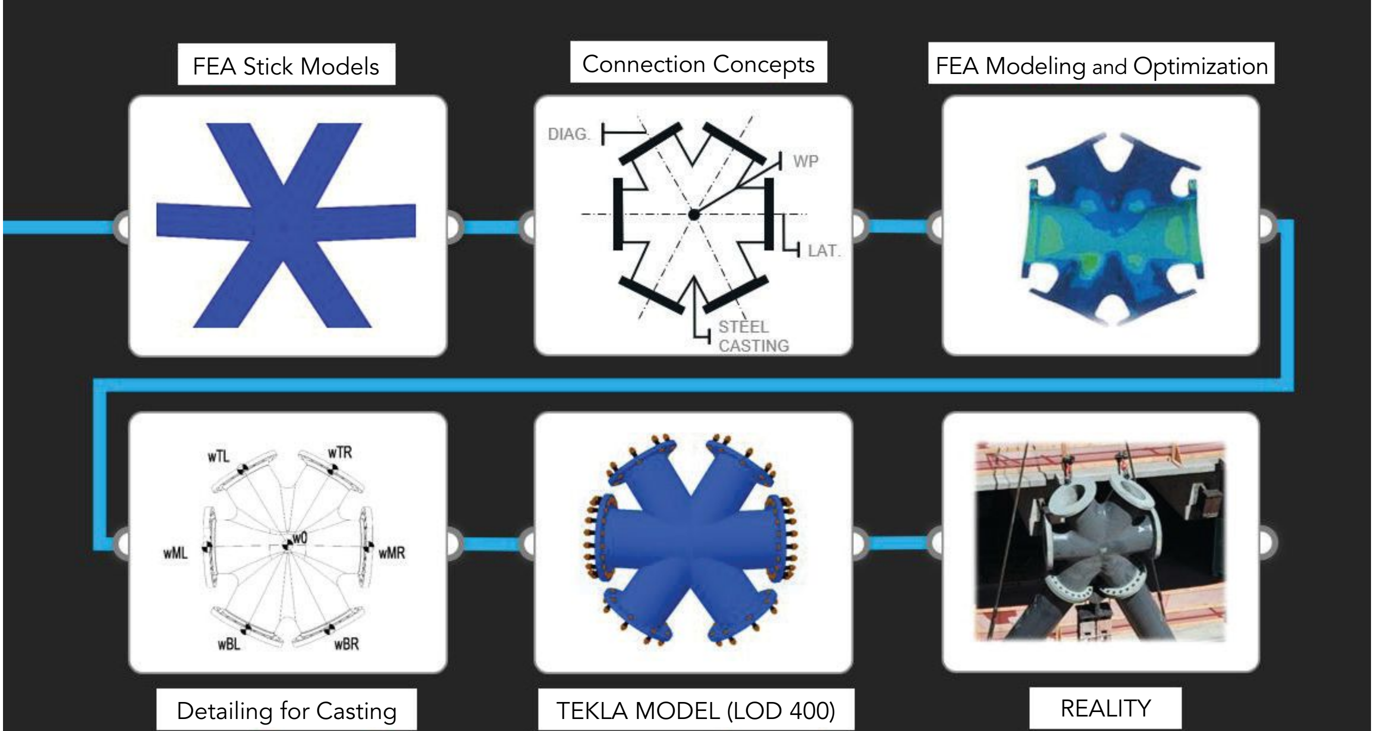
Sphere's Challenges

Sphere's design is as bold as it was complex. Its exterior geosphere measures 525 ft in diameter and supports nearly 580,000 sq. ft of LED screen. Its interior bowl-shaped venue seats approximately 18,000 viewers and encompasses approximately 160,000 sq. ft of 16k LED screen. To ensure that the finished image the viewers see is "stitched" seamlessly, the structure required a level of dimensional tolerance not previously achieved in conventional construction. It brought other challenges that demanded inventive thinking, including:

Complex geometry and extremely tight tolerances: Not only does Sphere's curvature require accurate and precise connections between elements, but the tolerances required for the various video systems are in fractions of an inch. There are also serious thermal considerations due to fluctuations between the day and night desert temperature differentials.

Even with repetition, fabricated plate connections would be challenged to meet such strict tolerances before leaving the fabrication facility. For 32 identical nodes, it's impossible to guarantee identical repetition for a fabricated node because warping from the welding heat would be an issue. There was no possibility that identical nodes would attain the demanding level of precision using conventional fabrication techniques. Time and effort expended in the shop and field evaluating every weld would be significant.

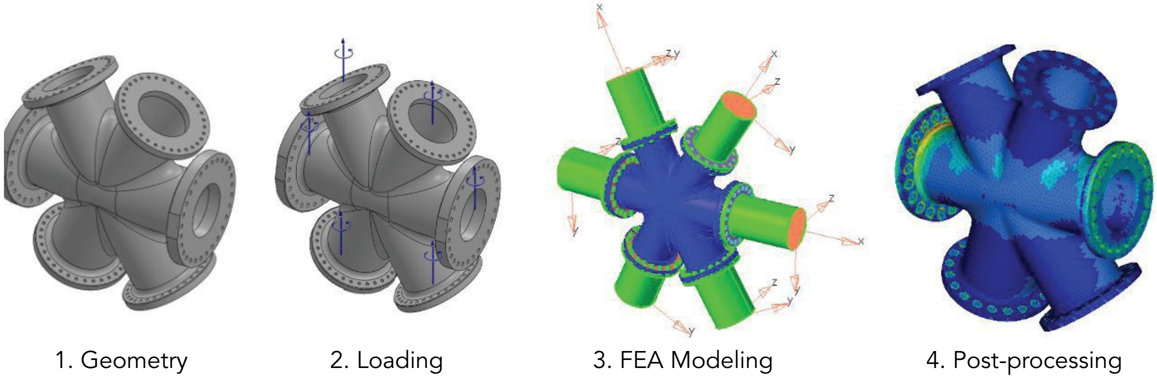
Structural load demand and distribution: Supporting the massive LED display systems demanded exceptional load carrying capacity, especially when considering that six or more members often meet at one three-dimensional node. Due to eccentricities and secondary forces imposed, these nodes needed to resist and transmit forces in all six degrees of freedom. With fabricated nodes, Chapter K provisions in the AISC *Steel Construction Manual* necessitated thick plates and solid steel forgings to transmit the forces.



The workflow for the casting design for the exterior geosphere.

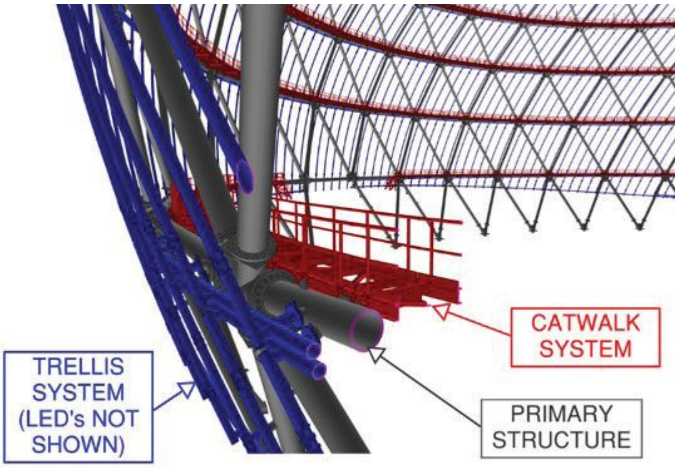
Severud Associates

Structural Design and Analysis—Must establish structural adequacy of all nodes under the combined stress states that result from the multi-axis loading at each location of node used in the geosphere structure.



Sphere Entertainment Group

Sphere on its opening night in 2023.



A snapshot of the BIM model for the exterior geosphere.

Durability: Components needed to withstand environmental forces and heavy operational loads over the structure's lifespan. One factor was the exterior LED grid, which is exposed to the elements. Of paramount importance is the coating applied to the steel, which was a simpler and more reliable integration with a precision cast steel node that yielded savings in the applied coating material quantity.

Why Castings?

Castings were the ideal solution for:

Complex connections. Sphere's structural nodes required multidirectional load paths. Castings allowed for seamless integration of these forces.

Precision. Using sand molds CNC machines allows for near-identical repetition with the castings.

Customization. Each casting could be tailored to meet specific design and load requirements, achieving the required geometry together with an efficient, structurally optimized connection component.

Efficiency. Castings reduced the number of components, welds, and bolts, eliminated potential stress points, and improved structural integrity, durability, performance, and efficiency.

Economy of scale. Due to repetition in structural geometry and structural demand, one casting type was used to create, on average, 32 identical castings. Thus, one pattern was used to produce about 32 castings.

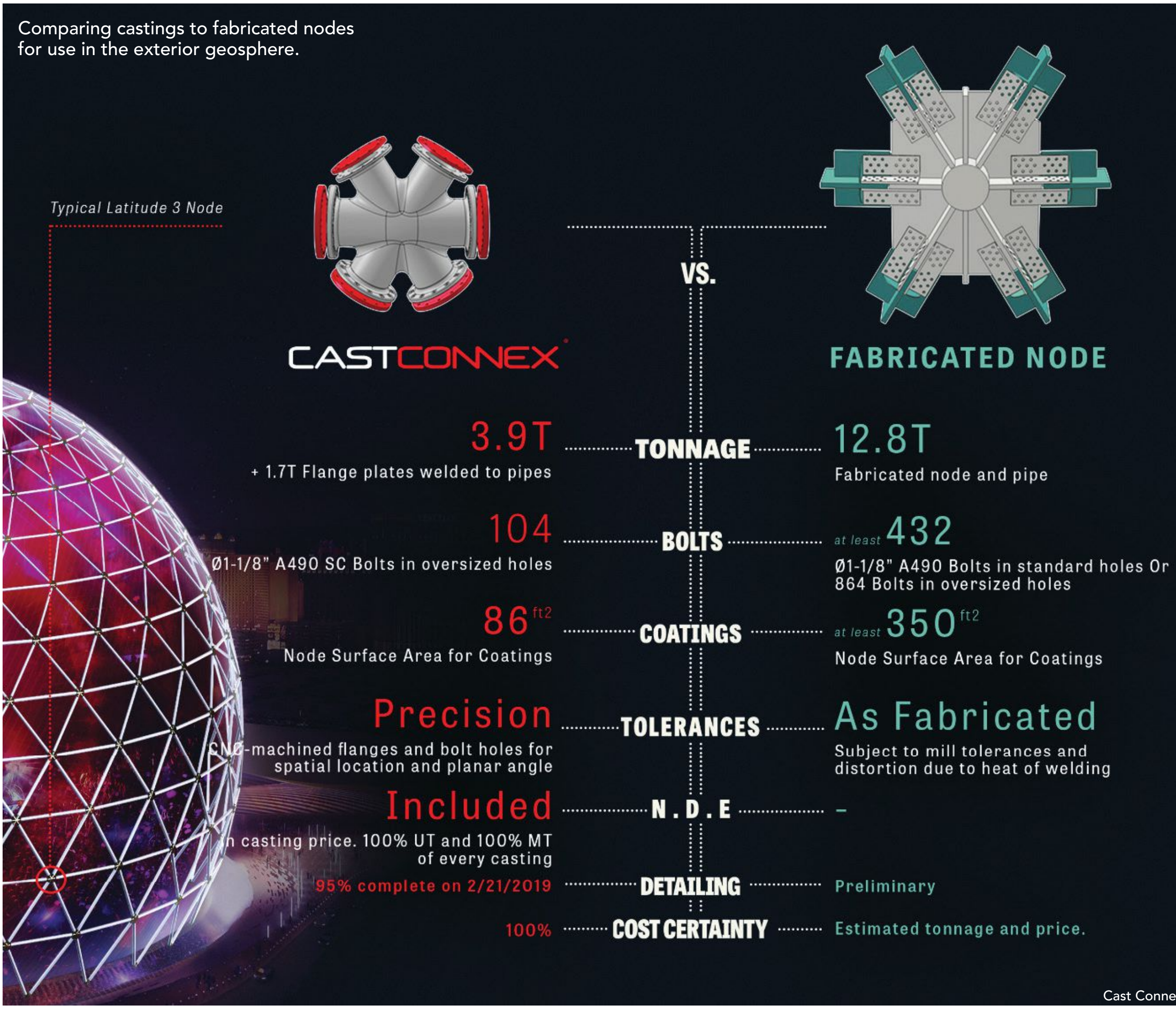
Design and Implementation

The casting design process began with 3D FEA (Finite Element Analysis) modeling and hand sketching to determine the optimal shapes for connections for fabricated and cast nodes. Early collaboration between the design and fabrication teams ensured castings' feasibility versus the fabricated nodes.

The Sphere design team chose high-performance steel alloys capable of meeting strength and durability criteria while allowing for precision casting. These alloys also kept the structural weight of the casting to a minimum and allowed for the casting thickness to be approximately equal to the main member thickness.

Before full-scale production, prototypes were created and subjected to rigorous testing, including stress analysis, and fatigue tests. The iterative process ensured the castings met design specifications, structural requirements, safety standards, and strict tolerances. Installing castings required precise alignment and coordination between fabricators, contractors, and the design

Production of a sand mold for use in steel casting manufacturing.



Cast Connex

team. Digital modeling tools, such as BIM (mainly Revit and Tekla), played a vital role in streamlining this process.

Lessons Learned and Looking Ahead

Early collaboration and integrating casting expertise into the design process from the start ensures that components align with architectural and structural goals. Having all key stakeholders from Sphere's design-construct team, structural engineer Severud Associates, architect Populous, steel fabricator W&W | AFCO Steel, casting manufacturer Cast Connex, and erection engineer SDL, was instrumental in guaranteeing success.

Advanced modeling and analysis tools are essential for designing and testing castings, especially for complex geometries. From the beginning, advanced parametric structural analysis and optimization were later supplemented by state-of-the-art 3D FEA, casting topographical optimization, and BIM, with AIA Level of Detail often exceeding 400.

While castings can be more expensive on a cost-per-ton basis than fabricated steel, their ability to reduce material usage, welds, and assembly time often offsets the higher per-ton material cost.

Sphere's success underscores the growing role of castings in structural steel design. As technology continues to advance, castings are primed to take an even more significant role in solving unique engineering challenges. Using castings for Sphere's structural system was more than a structural design choice; it was a collaborative effort born from the innovative nature of the cutting-edge project requirements and the structural complexity. ■

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Speed Sound-Off

BY PATRICK ENGEL

Steel detailers and erectors discuss their impact on speeding up steel construction and how other industry partners can help them.

PERHAPS THE MOST OBVIOUS PART of any initiative focused on building steel structures faster is, quite literally, building faster. Spending less time on the jobsite and erecting faster is an easy way to measure construction pace, and AISC's Need for Speed initiative had several steel erection-related research projects, such as SpeedCore and FastFloor. Several newer or improved products help ironworkers erect steel faster. (Read about all of them in the "Meeting the Need for Speed" article in the February issue at **modernsteel.com/archives**).

The less tangible parts of jobsite speed are also important. Thorough steel detailing and forward-thinking steel erectors can slash time spent constructing a frame. And to achieve the speed differences, engineers and fabricators have roles in helping detailers and erectors make a significant impact on the project. *Modern Steel Construction* spoke with several erectors and detailers for their perspective on how they contribute to speeding up steel construction and how to help them do it.

What can other companies in the steel supply chain do to help you perform your role more efficiently to speed up a steel project?

John Bettin, CEO, SteelTek Unlimited: From the perspective of a miscellaneous steel detailing company, efficiency and speed in steel projects rely heavily on the support of other companies in the supply chain. Providing clear and accurate design drawings, specifications, and material information ensures the detailing process starts on solid ground. Open communication and collaboration, supported by regular coordination and the use of compatible technology, streamline workflows and resolve issues quickly. Timely approvals of shop drawings and RFIs help avoid bottlenecks, while accurate material data and availability updates prevent rework and delays. These actions enable smoother and faster project execution.

Andrew Dobbie, executive vice president, Dowco, A DeSimone Company: Detailers possess extensive knowledge of diverse project types, standards, and codes. They are an invaluable resource for informed decision-making throughout the project life cycle. Companies can optimize their impact on project progress by changing the way they think about detailing.

The conventional industry approach has been to engage detailers during the later stages of development. But detailers, especially in-house ones like DeSimone's detailing division (borne of DeSimone's 2023 acquisition of Dowco), offer a deep understanding of the entire construction process, which can prove pivotal in helping expedite a steel project by months, depending on the size of the project. Their perspective is worth leveraging.

DeSimone integrating its detailers into the design phase—along with its structural engineers—has fostered effective collaboration between stakeholders, reduced RFIs during fabrication, and increased the likelihood of expediting schedules and meeting or shaving budgets. Engaging detailers early enables them to better identify constructability issues and design conflicts that might otherwise delay a project. A proactive approach accelerates project timelines and minimizes costly rework and change orders.

Mark Hoffa, project executive, Stonebridge Inc.: On the steel erection side, the biggest boost comes when all parties consider how to make the erection process smooth long before it starts. When steel erection goes smoothly, safely, and efficiently, everyone looks good. Stonebridge Inc. has erected many projects that have complex connections, complex rigging, and multiple safety concerns. Working with all parties to simplify those areas while maintaining quality and safety can be a big win for speed of completion.

Albert Marskamp, vice president of engineering and detailing, Walters Inc: We encourage engineers, architects and general contractors to embrace BIM to a fuller extent. Many are happy to use it for collaboration, but then revert to paper drawings as the basis of contract and for all submittals and approvals. If engineers could hand over a Revit model as the basis of contract rather than "only for reference, the drawings govern," it would significantly speed up the start of a project and avoid many RFIs related to member size and geometry. Connection loads in the model provided as metadata would also increase speed and reduce RFIs.

Srinivas Pagudoji, associate vice president, quality assurance & training, Moldtek: As the bridge between design and fabrication, detailers transform architectural visions into precise, workable plans. However, the efficiency of a steel detailer is heavily reliant on the collaborative efforts of the entire steel supply chain. To expedite steel projects, various stakeholders must consider strategic enhancements.

Firstly, accurate and timely communication is essential. Architectural and engineering firms should ensure that design drawings are comprehensive and clear. Ambiguities or errors in initial plans can lead to delays, as detailers spend valuable time seeking clarifications. Providing a well-documented design intent helps detailers create precise shop drawings with fewer revisions.

The fabricator and general contractor can help by adopting advanced technologies. Implementing BIM to review structural, mechanical, electrical, plumbing, deck, joist, concrete, wood, and all other trade models together helps identify conflicts between the trades. Other digital tools can facilitate seamless information exchange. When other trades share 3D models and digital data, detailers can integrate these directly into their detailing software, reducing manual entry errors and speeding up the drawing process.

Establishing standardized protocols across the supply chain can significantly enhance efficiency. Consistent standards in documentation, file formats, and communication channels ensure all parties are on the same page. Harmonization minimizes discrepancies and streamlines the workflow, allowing detailers to focus on precision, not problem-solving.

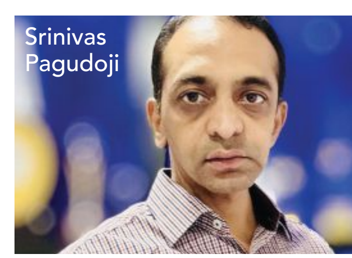
Additionally, fostering a collaborative culture is vital. Regular coordination meetings and feedback loops between detailers, architects, engineers, and fabricators can preemptively address potential issues. Early identification of design conflicts enables proactive solutions, thus preventing project delays.

Delays in the supply chain disrupt the steel detailing process by causing a lack of necessary materials like steel sections, fasteners, custom components, special coating or galvanizing delays, and shipping and logistics issues. They force detailers to make revisions, adjust schedules, and potentially redo drawings, impacting project timelines and efficiency. Reliable material delivery is crucial to keep detailing on track and prevent costly delays.

Greg Riccio, project manager, Danny's Construction Company: Early communication on any project is a critical part of driving structural steel erection success. As a steel erector, the opportunity to communicate with the steel fabricators before drawings are detailed and during connection design allows for early constructability feedback. Depending on the project, certain connections are preferred over others because they would allow for a faster structural framing installation. There are also many times where we would prefer gusset plates, angles, or other miscellaneous items to be delivered to the jobsite in a certain manner, such as loose or bolt to ship. Those preferences build efficiencies during the erection process that speed up the installation.

Another early engagement benefit is establishing strong communication and the development relationships among not only the steel fabricator and erector, but also the general contractor, engineering team, and other trade partners on the jobsite. Good communication, or lack thereof, can alter the flow between all the trades and impact the overall schedule.

Clifford Young, CEO, Anatomic Iron Steel Detailing: The best way to speed up any steel project is to use the design detailing process and start the steel detailing when the structural design is only 50% complete. Further, allowing the steel detailer to communicate directly with the design team permits the detailer to find and help resolve issues that could become RFIs. With weekly meetings, the detailer and the design team can resolve those issues in real time and integrate them immediately into the design. This process and the early start in detailing can combine to accelerate a project by three to six months.



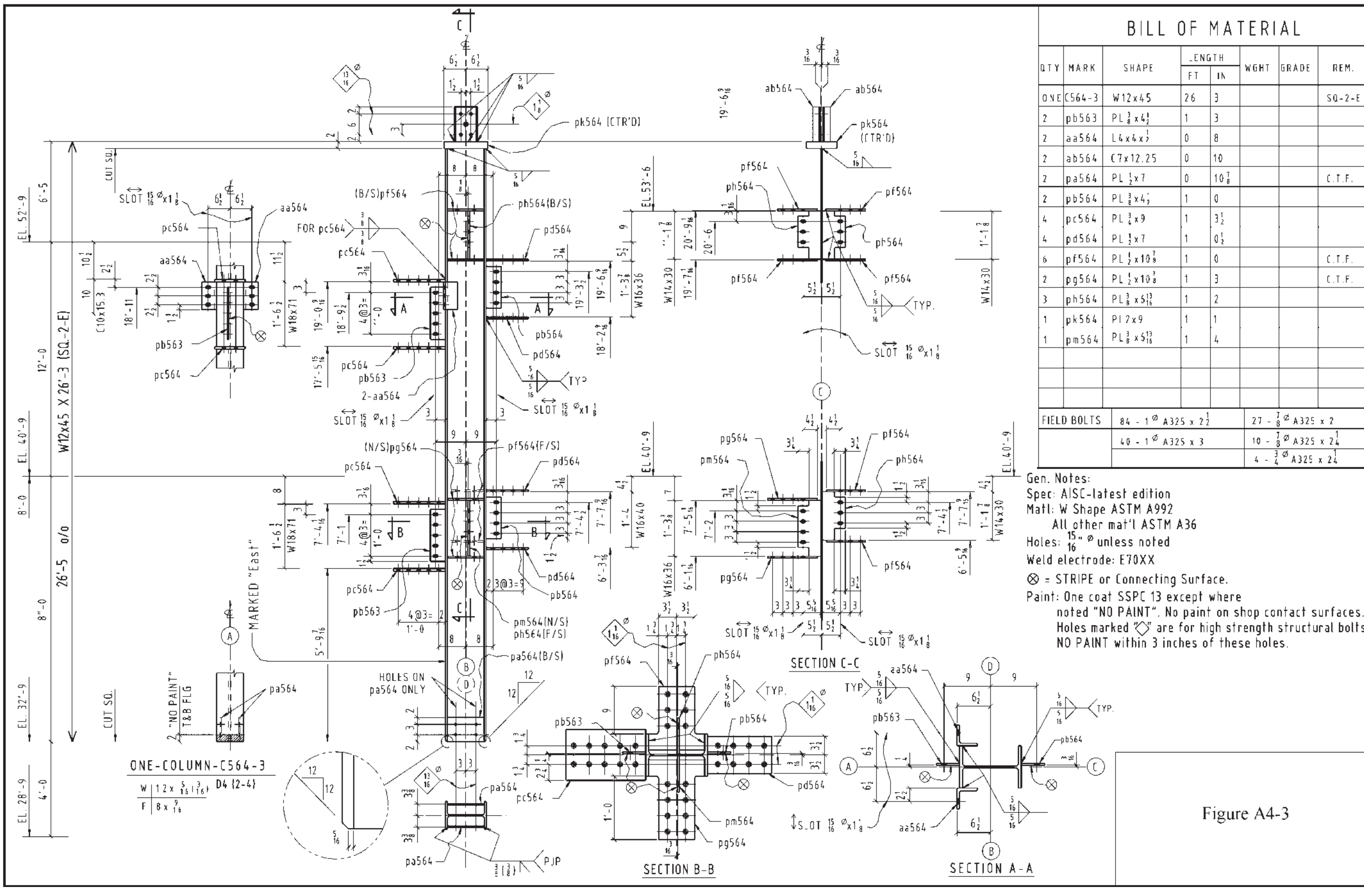


Figure A4-3

Provide an example of how your company helped accelerate a steel project.

Bettin: SteelTek Unlimited recently helped accelerate a large-scale structural steel project by providing custom BIM solutions that streamlined modeling workflows and reduced manual input, leading to faster project completion. Our team developed specialized plug-ins tailored to automate recurring tasks within Tekla, customized export features for seamless integration, and created intuitive issue management tools to track and resolve design challenges in real time.

By training the client's modelers on our software development kit and providing them with ready-to-use templates, we maintained consistent standards across the project that improved productivity and accuracy. The proactive support ultimately helped our client meet project deadlines with fewer revisions, achieving a smooth handover to their customer.

Dobbie: This year, DeSimone Consulting Engineering played a pivotal role in fast-tracking a large casino and hotel project, completing the journey from schematic design to onsite steel erection in just six months. Through a highly effective collaboration between our detailers and structural engineers (as engineer or record) from the outset, our integrated design and detailing team successfully mitigated potential issues early.

During the design phase, we generated nearly 300 proactive RFIs, resolving critical design and constructability concerns before they could impact downstream stages. Our comprehensive pre-construction coordination resulted in a smooth transition to fabrication, with RFIs dropping to just 50 during production, most due to unanticipated, last-minute owner or architect changes.

Ultimately, early collaboration ensured that the project stayed on schedule, with fewer disruptions than a typical process and a seamless path from design to construction. The measurable impact on project and cost highlights the value of early detailer involvement and how enhanced communication enabled by the close, in-house partnership between our detailers and structural engineers can accelerate project delivery and ensure high-quality outcomes.

Hoffa: The Buffalo Bills new stadium—which began steel erection last spring—has a canopy comprised of sloped painted rakers with infill tube steel matching the raker slope. Standard rigging methods would have been slow and unsafe, but OTH Rigging's remote-controlled load release for the infill tube steel eliminated the manual unhooking, drastically reducing lift times and enhancing worker safety through fail-safe technology.

Marskamp: For the past six years, Walters has encouraged a "Model to Truck" mindset with clients, engineers, and architects. The Model to Truck vision is a model-based digital workflow. It starts with the engineer's and architect's models as the basis of contract. The detailers build on the model to add in the steel connections and coordination items, then send the LOD 400 model back for review in lieu of paper or PDF drawings. The 3D model review process is faster and gives the design team much better insight into the final product, because the 3D model is a digital twin of the final product.

We have had many successes with teams who tried the Model to Truck mindset, but it continues to be an uphill battle in a paper-based industry. It requires the general contractor, engineer, and architect to be on board. If even one objects, the process defaults back to paper.

Pagudoji: Moldtek significantly accelerated a high-profile industrial battery plant project involving 47,000 tons of steel and a 3.1 million sq. ft area. With an aggressive timeline, we managed the complex scope, including over 700 trusses, seismic-resistant frameworks, heavy spliced trusses, and extensive miscellaneous steel components. By using advanced 3D modeling software and automated tools, we divided the project into seven 3D models with three teams working simultaneously, enabling precise detailing and early conflict detection. We maintained clear communication through weekly meetings with stakeholders, addressing over 600 RFIs and resolving issues promptly.

Moldtek's rigorous quality assurance and quality control review process ensured high-quality deliverables, reducing errors and speeding up fabrication and erection. The proactive approach allowed the client to meet the tight schedule, demonstrating our capability to enhance project timelines and client satisfaction.

Riccio: We helped accelerate a steel data center project in suburban Chicago. The data center was a retrofit of a partially functioning facility that added a structural steel platform on the roof as a dunnage platform for large cooling units. The platform covered the entire building and had structural framing installed at a radius of 280 ft at its furthest point. The logistics and parameters the crane operated within were tight; the existing building was on one side of the crane, a frontage road was on the other, and the jobsite was near a major airport. The crane had a minimum radius to avoid interfering with airport operations. The crane needed to be reconfigured to reduce the amount of luffing jib to operate within those parameters throughout the structural steel installation.

As planning progressed, we engaged with the general contractor and mechanical subcontractor to sequence the project so steel could be erected from the furthest point away from the crane and so the mechanical subcontractor could use the crane before reconfiguring the luffing jib. The mechanical contractor set heavy cooling units immediately following framing installation and detailing. Once those were set, the luffing jib was reconfigured, and erection could progress on the dunnage platform. Setting the cooling units continued as the framing was installed and detailed.

A Manitowoc MLC 300 crane with 98 ft of main boom and 255 ft of luffing jib was selected because it could accommodate steel erection and the mechanical contractor's work. The two parties' close coordination allowed for smooth framing and cooling unit installation. It also accelerated the schedule for the mechanical contractor and other trades, because the cooling units were set earlier than anticipated.

Young: Anatomic Iron Steel Detailing accelerated the steel fabrication and erection of a university building in Montana with fabricator TrueNorth Steel by using the design detailing process. We communicated directly with the design team to resolve steel issues that would become RFIs under the normal detailing model. With model-based communication and direct collaboration with the design team and TrueNorth Steel, we resolved all issues as they arose, pushing the design and the detailing process forward. The result was TrueNorth Steel having columns already fabricated and erected in the field when the design team approved 100% issued-for-construction drawings.

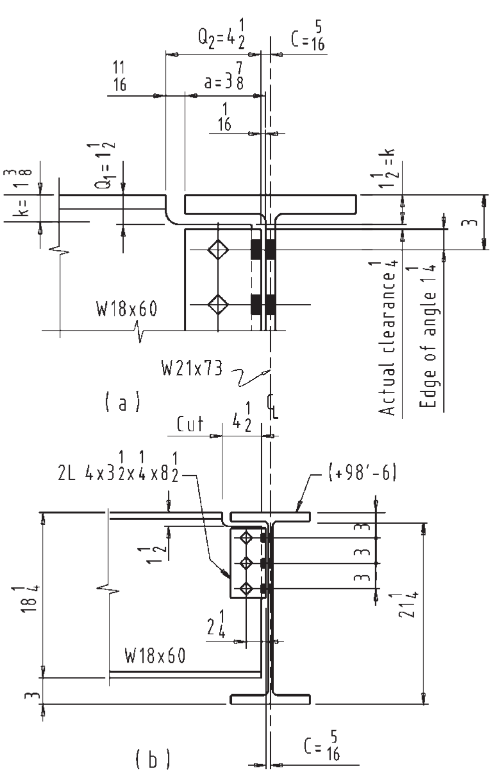


Figure 7-32. Cope, block or cut.

Remote-controlled lifting hooks significantly sped up erection of a steel canopy in the Buffalo Bills' new stadium.

Stonebridge Inc.


Setting airport hangar roof trusses as two assemblies and conducting a mid-air splice eliminated a crane and shoring.

Danny's Construction Company

Provide a brief example of how an erection technique, sequence or plan helped make a steel project go faster.

Hoffa: OTH Rigging remote-controlled lifting hooks significantly sped up the erection of the new Buffalo Bills stadium's steel canopy by allowing rigging teams to unhook loads remotely and efficiently. With their fail-safe design and remote-controlled functionality, the hooks eliminated the need for workers to climb structures to manually detach rigging, enhancing safety and reducing time. Their versatility in handling choker, basket, and direct setups made them ideal for adjusting to varying load types and positions required for the canopy installation. These features reduced downtime and improved productivity during the construction.

Riccio: In 2017, we mobilized onsite at a hangar replacement project at Chicago O'Hare International Airport. The initial project plan incorporated four crawler cranes for installing the door trusses and roof trusses. Two Manitowoc 999 cranes were used for each respective door truss (north and south truss). A Manitowoc 2250 installed the roof trusses, and a Manitowoc 12000 would be used for roof truss pre-assembly in stanchions.

As the planning leading up to mobilization progressed, it was found that the project could be sequenced to allow the two Manitowoc 999's to set the roof trusses as two assemblies and conduct a mid-air splice to eliminate the Manitowoc 2250 and subsequent shoring that was needed to set the trusses as one assembly. The adjustment allowed for a more streamlined installation and eliminated substantial additional work needed for the shoring towers that would have supported the roof trusses in a temporary condition. ■

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

Commitment to Quality

BY CLIFF SCHWINGER, PE

Ensure quality is never compromised in your design drawings with these tips and priorities for establishing a culture of excellence.

ASK ANY STEEL fabricator, estimator, or detailer about the quality of today's structural design drawings, and I suspect most will agree there is much room for improvement.

And I agree. After 48 years working primarily for consulting engineering firms, I believe the biggest challenge facing the structural engineering profession is the need to improve the quality of structural design and its documentation—but it's solvable.

Emphasis on Education

New graduates enter the profession with an understanding of structural engineering fundamentals, but have little practical knowledge. Filling the knowledge gap falls on employers. Surprisingly, I have found many new engineers do not know things as basic as designing a fillet weld.

Years ago, new engineers often spent their first year or two "on the board" drafting and learning the practical knowledge required to design building structures. Their tutelage occurred under the watchful eyes of experienced engineers or senior drafters.

Today, though, many new engineers arrive at their first job, are given a fast computer with the latest software, and are immediately tasked with modeling building structures. After reading the software tutorial, they can quickly model more tonnage of steel in a day than several experienced engineers fifty years ago could have designed in a month. But after modeling their structure, they often do not know if the framing in their model is correct or if their design is constructable.

Inexperienced engineers must be given a minimum of 40 hours of training to learn the practical aspects of steel design (and other materials). They must be taught how to validate the framing in their models and document their designs with high quality and constructable details. Extensive training on connection design must be included. They must learn the fundamentals of structural drafting, how to put together a set of structural drawings, and other things necessary to be productive design team members.

Engineers with at least eight years of experience should conduct the training. AISC has many resources available to facilitate training—most free for AISC members. Two important resources are AISC's design guides and the "Volume 1: Design Examples" publication. The latter has scores of practical member and connection design examples covering nearly every provision in the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360-22). It can be found at **aisc.org/publications**, and design guides are available to download at **aisc.org/dg**.

The reality that change is constant is particularly true in structural engineering, and it means experienced engineers must also stay sharp and be knowledgeable on the latest building codes, design standards, material and construction technologies, and software and design processes. Employers should encourage this learning.

All drawings must be reviewed before issuance for construction to ensure they are complete, correct, and high-quality. Drafters must be trained to better understand what they are drawing, and all engineers and drafters must know the requirements for producing complete and high-quality contract documents. Inexperienced engineers and drafters must be closely supervised to maintain office standards.

Go for the "Go-By" Drawings

Engineering offices must maintain a comprehensive library of high-quality typical details, a series of "go-by" framing plans, and a written list of drafting and modeling standards. Experienced engineers must develop and vet those standards and details. Go-by drawings are framing plans illustrating how to present information on framing plans.

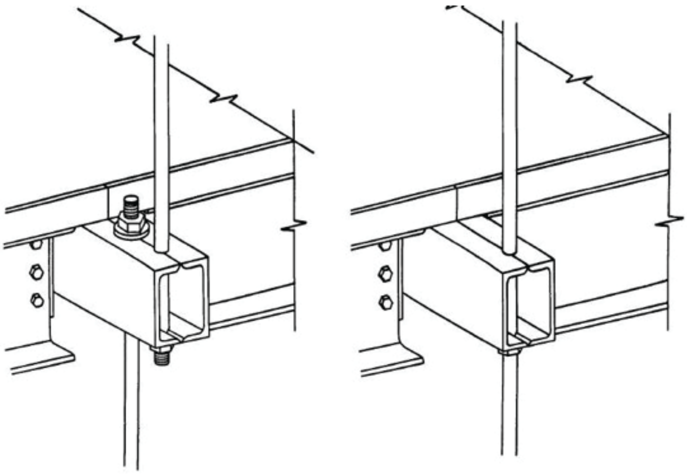
A structural steel go-by framing plan must illustrate examples of anything that might occur on a framing plan: trusses, joists, composite framing, roof framing, transfer girders, floor slabs, top of steel elevations, hangers up, hangers down, elevators, escalators, slab steps, braced frames, expansion joints, moment frames, suspended pits, sloping columns, drag struts, sections, details, moment connections, joists, rooftop dunnage framing, and the many other intricacies that commonly occur on framing plans. For simplicity, a single go-by framing plan is recommended over several plans. Similarly, there should be go-by drawings for column schedules and braced frame elevations.

Referring to go-by drawings is preferred over referencing a previous project's drawings. Relying on the last project will lead to gradual deviation from established standards, thereby degrading drawing quality. Likewise, the last project may not always contain examples of everything that may occur on the current project. Written drafting standards and go-by drawings ensure everyone is following the same rules for producing framing plans, details, elevations, and schedules.

Eye for Validation

There is often a disconnect between modeling software and engineers' understanding of how the software works. While most engineers can quickly create working structural models, they must also know how to spot mistakes and modeling errors. Everyone must understand the software limitations and assumptions, which software tutorials don't emphasize. Likewise, everyone needs to know how to validate a model's accuracy quickly and manually. Blind reliance on software to think for us must be avoided. Technology should be used as a tool, not a crutch.

Skill in validating models is developed over time, and until it's developed, models created by inexperienced engineers must be closely reviewed by senior engineers.

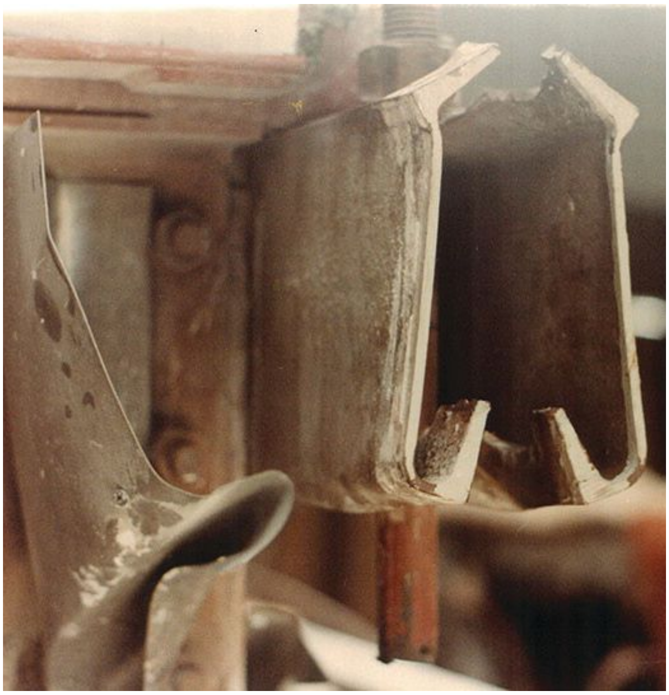


As Built

Original Detail

above: A comparison of interrupted and continuous hanger rod details.

right: The failed connection in the 1981 Kansas City Hyatt Regency skywalk collapse.

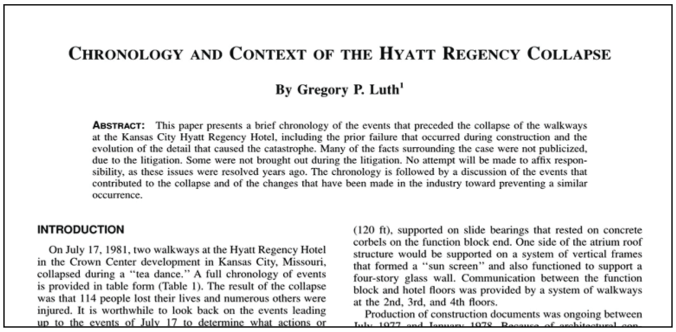


Stick to the Standards

New engineers must learn the minutia of the *Specification*. Most students do not learn about *Specification* Sections A4 (Structural Design Documents and Specifications) and A5 (Approvals). Likewise, most students do not learn about the *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303-22) in school. All engineers must read and understand these documents to learn their responsibilities and others' responsibilities.

Specification Section A4.1 lists information required on the design documents. Section A5 discusses the engineer of record's (EOR) responsibilities during the review of approval documents. *Code* Section 3 is important because it discusses the EOR's options and responsibilities for dealing with connections. *Code* Section 3.1 lists information required on the structural design documents and specifications issued for construction.

Code Sections 3.2.3 and 3.2.4 describe the EOR's responsibilities regarding connection design and member reinforcement design at the connections. Section 4.4 summarizes the EOR's responsibilities regarding approval of shop drawings and approval of delegated connection design calculations. The commentary to Section 4.4 clarifies that the EOR is the final authority in the event of a disagreement between parties regarding the design of connections. That clarification can be interpreted to mean the EOR is ultimately responsible for the safe design of all connections, even when delegating connection design.



Chronology and Context of the Hyatt Regency Collapse

By Gregory P. Luth[1]

Abstract: This paper presents a brief chronology of the events that preceded the collapse of the walkways at the Kansas City Hyatt Regency Hotel, including the prior failure that occurred during construction and the evolution of the detail that caused the catastrophe. Many of the facts surrounding the case were not publicized, due to the litigation. Some were not brought out during the litigation. No attempt will be made to affix responsibility, as these issues were resolved years ago. The chronology is followed by a discussion of the events that contributed to the collapse and of the changes that have been made in the industry toward preventing a similar occurrence.

INTRODUCTION

On July 17, 1981, two walkways at the Hyatt Regency Hotel in the Crown Center development in Kansas City, Missouri, collapsed during a "tea dance." A full chronology of events is provided in table form (Table 1). The result of the collapse was that 114 people lost their lives and numerous others were injured. It is worthwhile to look back on the events leading up to the events of July 17 to determine what actions or

(120 ft), supported on slide bearings that rested on concrete corbels on the function block end. One side of the atrium roof structure would be supported on a system of vertical frames that formed a "sun screen" and also functioned to support a four-story glass wall. Communication between the function block and hotel floors was provided by a system of walkways at the 2nd, 3rd, and 4th floors.

Production of construction documents was ongoing between

Gregory Luth's article on lessons from the skywalk collapse.

A helpful but somber teaching moment occurred in 1981, when a skywalk at the Hyatt Regency in Kansas City, Mo., collapsed and killed 114 people. A hanger failed in the skywalk, caused by a series of errors related to development of a flawed and then a revised-but-still-flawed hanger connection detail. The fabricator's connection design engineer proposed the revised detail. That engineer did not lose his PE license, but the engineer of record did. Gregory Luth, an early career engineer on the project, later wrote an article titled "Chronology and Context of the Hyatt Regency Collapse." That article should be required reading for all structural engineers because it shows how quickly things can go wrong when changes are made after design and during construction.

An important change in 2022 *Specification* Section A5 is the EOR is now responsible for requiring mandatory submittal of connection design calculations when delegating connection design and for reviewing the calculations for compliance with contract document requirements. The EOR is required to review the calculations and individually annotate them as either approved or approved subject to corrections noted.

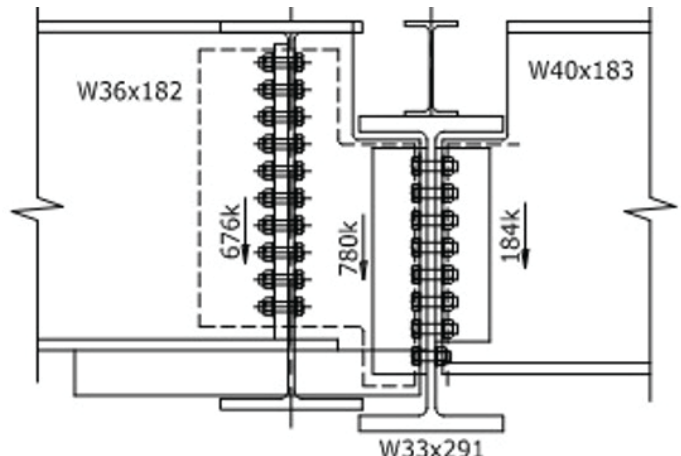
Engineers must thoroughly read the latest *Specification* and *Code* to keep up with the revisions made to improve the quality and safety of steel structures. The *Specification* and *Code* list information that must be shown on the design drawings. Failure to provide this information can result in mistakes, omissions, RFIs, disputes, and change orders.

All About Connections

Most structural failures are connection failures. Accordingly, engineers must pay close attention to connections and connection details. Software used to model building structures may not check connection strength. If connections are not modeled, the software will not check them. Because EORs are ultimately responsible for safe design of all connections, they must know as much about connection design as the fabricator's connection design engineer. Failure to pay attention to the EOR's responsibilities regarding documentation of connections as mandated in the *Specification* and the *Code* can result in arguments, delays, and change orders.

The EOR is also responsible for ensuring adequate member strength at connections. Where member reinforcing at the connections is required (such as reinforcing at large beam copes), the EOR is responsible for identifying the locations where member reinforcing is required. The EOR must design, detail, and document all member reinforcing at connections per *Code* Section 3.2.4(2)(a) or locate where member reinforcing is required, provide conceptual details of that reinforcing, and delegate design of the member reinforcing at the connection to the fabricator's connection design engineer per *Code* Section 3.2.4(2)(b).

For beam shear connections, some engineers rely on typical details and specify full-depth shear connections on all beams. Some rely on tables listing "one-size-fits-all" details requiring a single connection strength for each nominal beam depth. Others



A concept connection detail for a beam-to-girder connection for which connection design and member reinforcement at the connections was delegated to the fabricator's connection design engineer.

require shear connection strengths based on a percentage of a beam's uniform load capacity based on Table 3-6 in the 16th Edition AISC *Steel Construction Manual*.

All three procedures are flawed and are usually wastefully conservative. However, in some situations, these methods could result in specification of seriously understrength connections—every structural engineer's worst nightmare. *Manual* Part 2 (page 2-33) and Part 3 (page 3-11) recommend showing actual beam and girder end reactions on the framing plans. Showing reactions is by far the best, safest, and most cost-effective method for specifying required beam and girder shear strengths.

The *Code* provides EORs with three options for dealing with connections. Option 1, as described in *Code* Section 3.2.3, requires all connection details to be fully designed and detailed by the EOR on the design drawings so the connections can be detailed without any engineering design by the steel fabricator. Beam reactions are not required to detail the connections, but it is still a good idea for the EOR to show those reactions. If the EOR designed the connections with ¾-in. bolts, but the low bidder offers the owner significant cost savings using ⅞-in. bolts, the fabricator will be asking for the reactions.

If Option 2 is used, the EOR will need to show the beam reactions for the detailer to select the appropriate connection detail (also provided by the EOR). When Option 3 is selected, the beam reactions must be shown to allow the fabricator's licensed connection design engineer to design their most economical connections. Regardless of which *Code* connection option is used, showing reactions usually results in the most economical connections and makes errors easier to find. Designers can more easily follow the flow of the load when reactions are shown, making serious load path and connection strength errors easier to spot.

Ready for Review

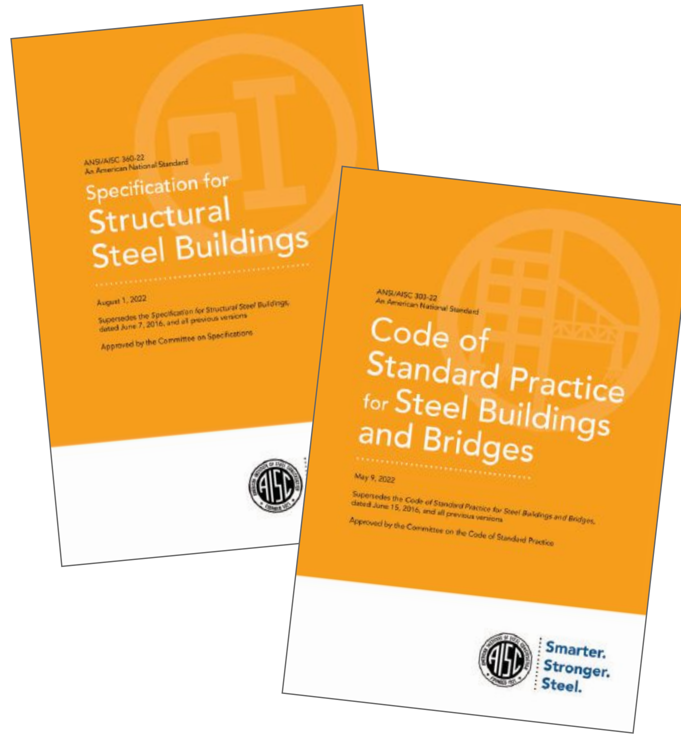
All engineering firms must schedule and perform in-house quality assurance (QA) reviews (also called in-house peer reviews) for all projects to ensure designs are correct and the drawings are complete and well-detailed. I have observed that far too many firms do not conduct such reviews, and if they do, the reviews occur at the end of the project design before the drawings are issued for construction. A single QA review at the end of design is not a QA review, it's a damage control review.

Large projects may require five or more QA reviews during design. Mistakes must be caught early when they can be easily corrected and before they create a chain reaction of other corrections that must be made due to the initial mistake. The QA process must start at the beginning of a project and continue throughout design with a mindset of "ongoing quality assurance." QA reviewers must be experienced, detail-oriented engineers with at least ten years of experience. QA reviewers provide a redundant set of eyes on the drawings; but they must not be the only experienced reviewer.

A minimum amount of "simmer time" is required to allow designers to review, understand, think about, and digest their design and details. One of the ongoing challenges in the profession today is finding that simmer time on fast-paced projects.

Detect "Normalization of Deviance"

After the space shuttle *Challenger* disaster in 1986, NASA performed a study to address process-related causes of the tragedy. It identified and named a problem called the normalization of deviance. Normalization of deviance describes situations where a gradual degradation of adherence to formal processes and procedures occurs, leading to complacency and deviation from strict adherence to those processes and procedures. That deviation and complacency increases the likelihood of undetected mistakes. Normalization of deviance can occur during design due to fast schedules, inadequate design budgets, scope and design creep, lack of experienced personnel on the project, lack of design team continuity, unrealistic expectations that technology will solve all problems, and an assumption that a single engineer reviewing the drawings will find all errors.



Firms must budget adequate time for design and detailing. Design teams must be well-staffed with well-trained and experienced personnel. Less experienced engineers must be closely supervised. Everyone must be mindful to avoid shortcuts, stray from established processes and procedures, or cut back on the time needed to perform the necessary QA reviews.

Other Considerations

Engineers are not always the best communicators, and recognizing that weakness can help mitigate problems. Experienced engineers must review the details, calculations, and models created by inexperienced engineers. Young engineers must be closely supervised so they stay on track and avoid time-wasting redesign to correct mistakes.

With increasingly complex projects, building codes, and software, now may be the time for the profession to consider requiring mandatory third-party peer reviews. While some firms may already have strict policies for in-house QA reviews, many do not. An objective and new set of eyes reviewing a project may see errors that those working on the project daily might have missed.

We will likely soon see advertisements from software manufacturers claiming their software do everything, including design connections, check constructability, find all errors, and unburden designers from the need to hunt for problems. Some engineers reading these advertisements may be tempted to think they can give this software to inexperienced engineers with less oversight because the software will allow novice engineers to produce flawless and efficient designs. That will not be true for the foreseeable future. AI software will likely do little to make inexperienced engineers more productive until those engineers gain experience, learn the art of structural engineering, and develop engineering judgment. When a claim sounds too good to be true, it usually is. AI tools, however, will prove to be valuable for experienced structural engineers.

Firms committed to producing high-quality structural design and high-quality design documents will inevitably be able to leverage technology to produce higher-quality structural designs and higher-quality design documents than their competition. Ultimately, there is no better form of business development than producing a high-quality product.

This article is a preview of the 2025 NASCC: The Steel Conference session "Recommendations for Improving the Quality of Structural Engineering Design and Construction Documents." To learn more about this session and others, and to register for the conference, visit ***aisc.org/nascc****. The conference takes place April 2 to 4, 2025 in Louisville, Ky.*

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new products

This month's new products include several fabrication machines and a jobsite tool that allows for smoother and safer installation of mezzanine level panels.

AKS PLASMATIC Pro

Are you looking for high-quality cuts without the laser price tag? The PLASMATIC Pro from AKS Cutting Systems is what you need. Using the most advanced technology, this plasma-cutting machine offers high-quality parts and laser-like finishes. This made-in-the-USA machine features an accuracy of 0.005 in. per 3 ft of motion and a travel speed of 1,200 ipm. It's ideal for cutting materials up to 3 in. thick, 6 ft wide, and 12 ft long. It also features X-axis and Y-axis helical rack and pinion drive systems that provide precise motion control, increased stability, and high-speed cutting. Combined with Hypertherm SureCut technology, the PLASMATIC Pro applies optimized cutting parameters every time.

Large shops love this entry-level machine to supplement their cutting operations. Small shops prefer the PLASMATIC Pro because of its low price point and high quality. Wondering if it's right for you? Contact an AKS representative at **www.akscutting.com/contact**.

Controlled Automation BFC-4

Controlled Automation has unveiled the BFC-4, its latest innovation in beam punching technology. Designed to redefine efficiency, the BFC-4 delivers unparalleled speed and precision for high-volume applications. Whether you're fabricating solar beams, highway guardrails, or warehouse rack systems, the BFC-4 offers batch production capabilities by punching multiple holes simultaneously. With off-the-shelf punches and dies for cost-effective tooling, it achieves average speeds of multiple holes every six seconds—outpacing drilling and plasma cutting systems.

Like all Controlled Automation equipment, the BFC-4 is built with American-made parts, ensuring decades of reliable, robust performance. For those pushing the boundaries of steel fabrication, the BFC-4 is the ultimate solution. Visit **www.controlledautomation.com/bfc-custom** to learn more.

Tecoi USA THOR

Tecoi USA's powerful and versatile THOR (Tecoi Hyper Operative Range) plate processing machine is designed for heavy-duty thermal cutting applications. THOR integrates plasma cutting and a beveling system, and oxyfuel cutting with an auxiliary tube and profile lathe. THOR also integrates mechanical cutting with the capability to manufacture parts using multiple operations, including milling, drilling, tapping, countersinking, and marking.

THOR includes one or two plasma-cutting heads and an optional beveling system, as well as oxyfuel cutting with up to 12 torches and an auxiliary tube and profile lathe. THOR has a central XX axis with a path of 24 in. working on a robust double-beam design. It completes machining tasks with a fixed gantry and the option to fit up two machining heads.

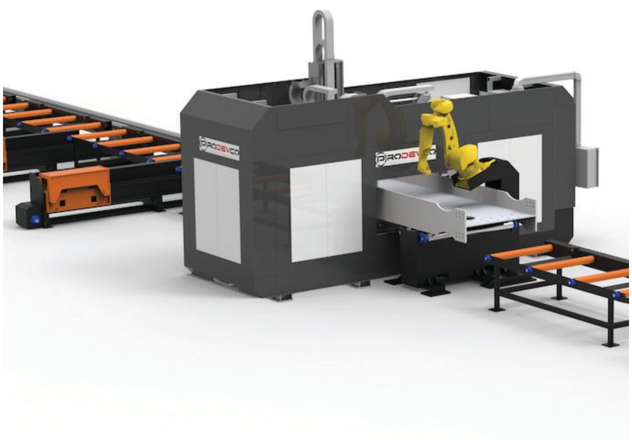
THOR features Tecoi's exclusive Bevel Arc beveling system, accommodating angles of ± 50° with maximum precision, and Tecoi's DrilTec system for drilling and tapping with the option of an automatic tool charger. For more information, visit **www.tecoiusa.com**.

BZI MezzMaster

BZI's MezzMaster is a from-scratch solution reshaping how mezzanine panels are lifted and placed. Mezzanines are traditionally stick-built, but the MezzMaster offers a panelized solution. The product was developed by BZI to address challenges specific to multilevel projects and emerged from a drive to improve safety and efficiency in panel installation.

The MezzMaster's creation was organic, complementing and building upon the efficiencies of BZI's PanelTable, a transportable, self-contained table system consisting of two work platforms less than 6 ft from the ground. The PanelTable allows workers to assemble joists, bridging, frames, and deck into modules that can be transported or lifted into place to complete a structure. The MezzMaster permits full jobsite staging without limitations related to equipment location, resulting in substantial gains in logistics and speed.

Beyond time savings, the MezzMaster's design prioritizes safety, allowing teams to work efficiently without needing to make manual adjustments in challenging positions. This unique combination of speed, safety, and adaptability has been transformative for jobsites. To learn more about this construction solution, visit **www.bzi.com**.



Prodevco PCR51

Prodevco Robotic Solutions has unveiled the PCR51, a cutting-edge combination drill and robotic plasma coping machine designed to revolutionize structural steel fabrication. With four-face processing, laser measuring, and advanced sub-axis drilling capabilities, the PCR51 is capable of drilling, coping, and plasma cutting with unparalleled precision and efficiency. Features like an automatic tool changer and high-speed 3D vision measuring system make it a low-maintenance solution that maximizes productivity for fabricators.

Prodevco now offers a complete line of steel fabrication machinery, including robotic plasma cutting, beam lines, angle machines, plate drilling, band sawing, and shot blasting solutions. Each machine is engineered for precision and reliability, leveraging state-of-the-art technologies such as Hypertherm plasma systems and Fanuc robotics. By integrating these innovations, Prodevco empowers fabricators to meet increasing industry demands with speed, accuracy, and efficiency. For more information, visit **www.prodevcoind.com**.

HSG Laser GV Series

The new GV Series laser cutting machine from HSG Laser sets a new benchmark in fiber laser cutting technology, providing up to 60kW of power to meet a wide range of fabrication needs. The powerful GV Series provides high production cutting of materials up to 3.9 in. thick, positioning the machine to be a viable and more productive alternative than plasma and even flame cutting. Its exchange table supports up to 11,023 lb, accommodating a broad spectrum of applications. With high-power output, the GV Series machine significantly increases the efficiency of cutting medium-thick plates. With a 30kW system, it provides cutting speeds that are up to 400% faster than traditional 12kW systems, resulting in increased output per unit time and reduced cost per piece. Visit **www.hsglaser.com** to learn more.

NASCC
Registration for The Steel Conference Remains Open

NASCC: The Steel Conference is heading to Louisville, Ky., April 2 to 4.

There's still time to register for the industry's top education event, featuring more than 270 technical sessions full of must-have practical information that you can implement as soon as you get home, an exhibit hall packed with 230-plus innovations you need to know about right now, and a chance to network with thousands of the world's best designers, fabricators, erectors, and other steel fans. Nearly 7,000 participants are expected to addend the main conference and specialty subconferences.

"NASCC: The Steel Conference is the only place to talk with the professionals who work on a given product, from the design process to steel erection," said Scott Melnick, AISC senior vice president and the conference's main organizer. "Year after year, participants tell us that they made valuable connections they couldn't have made anywhere else—and that attending The Steel Conference helped them do their jobs better.

"That's because we focus on giving actionable information participants can put into practice right away. Rather than issue a general call for papers, we talk to experts to find out what's important now and what's on the horizon and invite the innovators changing the industry right now to speak at The Steel Conference."

The Steel Conference is the must-attend educational event of the year and provides actionable information to put into practice right away. It also has six specialty conferences: the World Steel Bridge Symposium, QualityCon, Architecture in Steel, SafetyCon, the SSRC Annual Stability Conference, and the NISD Conference on Steel Detailing. For more details on The Steel Conference and specialty conferences—and to register—visit **aisc.org/nascc**.

The Steel Conference attendees can earn up to 20.0 PDHs or 12 hours of AIA continuing professional education credit. These are just a few of the technical sessions at this year's conference:

- Legal Lessons Learned with Building Information Modeling (BIM)
- Ethics in Negotiation: Crafting a Path of Integrity in the Art of Negotiation
- A Landmark Case Study on Steel Reuse: the Boulder Community Hospital
- Technology, Machine Learning, and AI in Steel: Current Applications and Future Innovations
- Women in Construction: How to Mentor Them and How They Mentor Others
- AISC Research: Innovations and Applications with Asymmetric Shapes
- Recommendations for Improving the Quality of Structural Engineering Design and Construction Documents
- Connection Design: The Checks Not To Forget!
- Practical Considerations for Shear Connections and the Single Angle Connection
- Efficient Steel Joist Design – Floors
- And much, much more!

People & Companies

The **National Institute of Steel Detailing (NISD)** Annual Meeting will be held March 31 to April 1 in Louisville, Ky., preceding NASCC: The Steel Conference. It includes speaker presentations, networking opportunities, and the president's banquet. This year, the event has a virtual option with webinars during the conference.

Attending the NISD Annual Meeting allows steel detailers to enjoy social time with like-minded individuals and share thoughts and ideas with people who understand the trade like you do. Annual Meeting attendees can also stay for The Steel Conference, which has several popular and well-attended detailing tracks.

To learn more, visit **www.nisd.org**. Membership, sponsorship donations and volunteer work have supported NISD since its founding in 1969. NISD's industry involvement continues to grow the steel detailing trade with help from AISC, the Steel Erectors Association of America (SEAA) and the American Council of Engineering Companies (ACEC).

Registration remains open for a one-of-a-kind event for any architect who designs with steel. **Architecture in Steel**, incorporated into NASCC: The Steel Conference, is April 2 in Louisville, Ky. Architects can save more than $500 off the regular registration price. Architecture in Steel combines insightful education sessions and up to 12 hours of AIA continuing education credit with networking that's not possible anywhere else.

"Architects know the engineers they work with. They may know the general contractor. But they've probably never met a steel fabricator or steel erector, and they've never been able to talk with all of those people in one place," said AISC director of architecture Nima Balasubramanian, AIA, NOMA. "The Steel Conference is the only place those industries come together, and those conversations give architects an understanding of the whole process, from brainstorming through construction."

DESIGN GUIDES

SOM-Led Team to Write Forthcoming AISC Sustainability Design Guide

Designers looking for a one-stop shop for sustainable design will soon have a fantastic resource written by true experts.

AISC has selected a team led by Skidmore, Owings & Merrill to draft its newest design guide, which will focus on sustainable steel design. Experts from Skanska USA Buildings, Inc. and Nucor Steel Corporation, as well as Northeastern University professor Jerome F. Hajjar, PE, PhD, round out the list of authors.

"This is a fantastic team," said Brian Raff, AISC vice president of sustainability and government relations. "There is a lot of confusion out there about sustainable materials and designs, and these experts are perfectly positioned to provide clarity and guidance."

Like all AISC design guides, this one will help architects, engineers, other designers, and project teams establish and apply best practices for sustainable design and construction with steel—including cutting-edge sustainability practices like steel deconstruction and reuse. AISC expects to release the new guide in early 2026.

"SOM is thrilled to author AISC's transformative sustainability design guide alongside our esteemed collaborators Nucor, Skanska, and Professor Jerry Hajjar," SOM associate principal David Shook said. "This partnership unites leading industry expertise to equip designers with practical, actionable insights for advancing sustainable design."

AISC design guides can be found at **aisc.org/dg**, and they are free to download for AISC members. The most recently published one is Design Guide 40: *Rain Loads and Ponding* (read more about it in the monthly Steel Quiz on pages 10 and 12).

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 December 1 to 31, 2024.

Newly Certified Companies
(December 2024)

Ashton and Company, Inc., Creola, Ala.
Barone Steel Fabricators, Brooklyn, N.Y.
Certified Pipe Service Houston, Inc., Channelview, Texas
CommScope Technologies, LLC, Euless, Texas
D&D Welding & Fabrication, LLC, Fort Pierce, Fla.
D.A. Collins Companies, Wilton, N.Y.
Diligent Welding and Fabrication, Boca Raton, Fla.
Division 5 Steel, Starke, Fla.
Ideal Steel, West Jordan, Utah
JackRabbit Manufacturing, LLC, Bryan, Texas
Oregon Steel Fabrication, Eugene, Ore.
ProSteel, LLC, Preston, Idaho
Roen Salvage Company, Sturgeon Bay, Wisc.
S&S Welding, Bartow, Fla.
Spartan Steel, Pocatello, Idaho
SPUR Industrial, LLC, Cresson, Texas
Vulcraft Indiana, St. Joe, Ind.

Certification Renewals
(December 2024)

A&H Steel, LLC, East Peoria, Ill.
Able Steel Fabricators, Inc., Mesa, Ariz.
Akins Manufacturing Inc., Algondones, N.M.
Allstate Steel Company, Inc., Jacksonville, Fla.
Arrowhead Steel Fabricators, Grand Island, Neb.
Ben Hur Steel Worx, LLC, St. Louis
Caddo Fab, Inc., Shreveport, La.
Capone Iron Corporation, Rowley, Mass.
cHc Manufacturing, Inc., Cincinnati
Clark Industrial, Inc., Missoula, Mont.
Con-Fab Engineering & Welding, Shreveport, La.
G&G Steel, Iuka, Miss.
Hapco Pole Products, Abingdon, Va.
Jentgen Steel Services, LLC, Columbus, Ohio
JGM Fabricators & Constructors, LLC, Sinking Spring, Pa.
JHDS LLC, Lincoln Park, N.J.
Jimco Sales & Manufacturing, Fort Worth, Texas
Kelly Iron Works, Inc, Hazleton, Pa.
McGregor Industries, Inc., Dunmore, Pa.
Mezzanines By Design, Humble, Texas
Mobil Steel International, Inc., Houston
Monitor Canopies, Inc., Sherman, Texas
Northern Valley Erectors, Inc., Kutztown, Pa.
Nucor Tower & Structures, West Hazleton, Pa.
Parsons Steel Builders, Marana, Ariz.
Parsons Steel Builders, Tucson, Ariz.
Parsons Steel Erectors, Tucson, Ariz.
Pederson Bros., Inc., Bellingham, Wash.
Professional Metal Works, LLC, Freeburg, Ill.
PTMW, Inc., Topeka, Kan.
QMF Steel, Inc., Campbell, Texas
RSL Contractors, Spring, Texas
Sabre Industries, Alvarado, Texas
Schuff Steel Company, Humble, Texas
Selvaggio Steel, Inc., Springfield, Ill.
Shane Felter Industries, Inc., Uniontown, Pa.
Shawnee Steel & Welding, Inc., Merriam, Kan.
Simpson Strong-Tie Company, Inc., Stockton, Calif.
Specialty Construction, LLC, Addison, Ill.
Speedway Steel Fabrication Inc., Crystal City, Mo.
Tru Steel LLC, Bethel, Minn.
Turner Construction Company, Huntsville, Ala.
Utah Ornamental & Iron, Inc., Salt Lake City, Utah
Wag Steel, Washington, Va.

BRIDGES

Fast-Moving Steel Team Completes Emergency Replacement in Just Seven Months

An inferno from an oil tanker compromised a bridge over Interstate 95 near downtown Norwalk, Conn., last May, ensnarling a significant transportation artery in closures and detours. The steel bridge industry's swift response, though, limited highway disruptions to mere days and put a replacement bridge in motion almost immediately after the fire.

That replacement bridge, which carries Fairfield Avenue over I-95, reopened Dec. 2, exactly seven months after the incident. It's the latest example of the steel bridge industry's collaboration and capacity to mobilize quickly in emergency repair and replacement situations.

"Every partner on this project overperformed the ambitious deadlines we set in May," said Garrett Eucalitto, Connecticut Department of Transportation commissioner. "This is a remarkable achievement and demonstrates what we can get done for the traveling public when federal, state, and local partners share a common purpose."

One crucial partner was AISC full member fabricator Canam Bridges U.S., Inc. About a week after the fire, project general contractor Yonkers Contracting approached Canam to fabricate the replacement. Canam's swift coordination with steel producers and prioritized and speedy fabrication helped it deliver the new bridge spans in mid-August, three months after the fire and less than two months after fabrication began. Girders were erected August 15 and 16 with two days of around-the-clock work.

"This is a great example of what can be accomplished when government, contractors, and local leaders work together with a sense of urgency and purpose," Connecticut Gov. Ned Lamont said. "Thanks to the extraordinary efforts of the Connecticut Department of Transportation and our partnering contractors, we've been able to reopen the Fairfield Avenue bridge ahead of schedule, under budget, and with a more modern design that will better serve the community for years to come."

The new bridge has two spans, one with six 67-ft, 8-in. girders and the other with six 93-ft, 3-in. girders. All girders were metalized with a three-coat paint system, and their combined weight is 132.35 tons.

"The project success stems from the cooperation of all team members, the mill, our subcontractors, the contractor, and the owner," said Tony Matutis, Canam Bridge's national sales director. "Canam Bridges U.S. rescheduled other projects to make room for Fairfield and recognized the importance of that crossing to be reopened for the public as soon as possible. We are very proud of our Canam Bridges U.S. team in Claremont, N.H., who expedited this project."

IN MEMORIAM

Eddie Williams, SEAA Co-founder and Preeminent Steel Erector, Dies at 90

Edward "Eddie" Williams, one of the nation's most recognized and respected structural steel erectors, died on January 13 at age 90. Williams was one of the founders of the Steel Erectors Association of America (SEAA) and was known for hundreds of notable and challenging projects, including the Dean Smith Center in Chapel Hill, N.C., and Bank of America Stadium in Charlotte.

"To say we lost an industry icon with the passing of Eddie Williams is a large understatement," said Chip Pocock, safety and R&D manager at Barnett Steel Erection, Inc., in Graham, N.C. "I honestly cannot think of anyone who had a greater positive impact and influence on the steel construction industry than Eddie Williams. From his contributions and work with OSHA on the Steel Erection Safety Standards to his contributions with trade associations like AISC, SEAA, AGC [Associated General Contractors of America], ASA [American Subcontractors Association], and others, his efforts helped to make our industry so much safer and better for everyone from the ironworker to the owner and everyone in between."

Among his many awards was SEAA's William Davis Service Award (2006); a decade later he was named SEAA's Person of the Year. At that time, Alan Sears, the awards chair, stated: "Eddie is our senior statesman, and his counsel and suggestions over the course of more than 60 years have shaped this association and the industry as we know it today."

In 2005, Williams received an AISC Lifetime Achievement Award in recognition of his contributions to both the erection and fabrication industries.

"I first met Eddie when I joined the NASCC Technical Planning Committee, the group responsible for developing the conference's technical sessions," said Mark Trimble, AISC senior vice president and the former chair of The Steel Conference planning committee. "Eddie's presence was invaluable; he was the voice of the erectors, ensuring their perspective was heard during our deliberations. Beyond the committee work, Eddie was incredibly generous with his time, whether championing training initiatives for erectors or sharing his deep knowledge of the steel industry with me—insights for which I'm incredibly grateful."

Added AISC president Charles J. Carter: "Eddie Williams was smart, shrewd, and gracious—a combination that made him a force in building his business and our industry. We all enjoy the impact he had, including through his work to build the SEAA and his contributions to AISC."

Williams was also a well-regarded expert on erection. In addition to his erection work, his company grew to be the third-largest crane rental company in the world.

"Eddie walked the legislative halls in Raleigh and in Washington, D.C., working to ensure steel erection subcontractors were treated fairly regarding issues such as retainage, indemnity, and other contractual issues," Pocock said. "Eddie's work ethic was mirrored only by his humility and kind demeanor. Eddie was always willing to stop and share a memory or to tell a tale or a joke. He was a wonderful human being who left our world a much better place."

Williams grew up on a farm in Chapel Hill where he and his brother, Buddy, cultivated a love for nature. He attended North Carolina State University and became a lifelong fan of the school's Wolfpack athletic teams. At age 19, he went to work for his father-in-law at Buckner Steel Erection. Eddie started his career there in the field as a rod-buster, ironworker, and crane operator, but grew to become a true corporate leader of his industry. He is survived by his wife, Patricia Williams, his daughter, Teri Atkins, his son, Doug Williams, as well as his grand- and great-grandchildren.

marketplace & employment

advertiser index

AGT Robotics	59	Machitech	59
Applied Bolting	27	Moldtek	21
Arena International	51	New Millennium	5
Automated Layout Technology	55	Peddinghaus	2
Birmingham Fastener	17	Precision Steel Systems	27
Cast Connex	9	SDS2 By ALLPLAN	7
Chicago Metal Rolled Products	insert	SEAA	57
Controlled Automation	10	Sherwin-Williams	13
Infra-Metals/Delta Steel/Sugar Steel	11	SteelCoded	3
Integrated Engineering Software	53	St. Louis Screw and Bolt	53

Roaring into Regionals

SINCE FALL, student engineers from more than 200 colleges and universities across North America have been designing, fabricating, and assembling steel bridges in hopes of advancing to National Finals in the annual Student Steel Bridge Competition (SSBC), sponsored by AISC and the American Society of Civil Engineers.

First, though, are regional competitions, which run through late April at 20 college campuses across the country. They begin March 6, with the University of Georgia and Mississippi State University hosting the Gulf Coast and Southeast regional competitions, respectively. The last regional is the Metropolitan Regional, to be held April 25 to 27 at the New Jersey Institute of Technology.

The 20 regionals will produce 40 to 45 teams who advance to National Finals, held May 30 and 31 at Iowa State University in Ames. The University of Florida's steel bridge team is the reigning John M. Parucki National Champion, the school's fourth straight first-place finish.

Since SSBC's inception in 1987, student engineers have applied skills learned in classes to designing a scale steel bridge that is assembled in a timed environment and load-tested with 2,500 lb. Competitive timed assembly and load testing begins at regionals, and for advancing teams, culminates at National Finals. The bridge must span about 20 ft and is also judged on aesthetics, cost, and economy.

Many SSBC alumni have called the event the highlight of their college careers and credit it for birthing professional opportunities and long-lasting relationships. Some of them remain involved with SSBC as volunteers and judges—and you can join them.

AISC and ASCE are seeking volunteers to help host schools provide a memorable and rewarding experience for competing teams. Volunteers do not need to be bridge engineers and can assist with setup, event judging (preceded by brief training at the various events), and other crucial tasks, such as helping with the registration desk and distributing lunch. Previous SSBC experience is not required. And it's a lot of fun!

Anyone interested in helping must complete the volunteer interest form found at **aisc.org/ssbcvolunteers**. To find a list of all regional competitions and their dates, visit **aisc.org/ssbc**. ■