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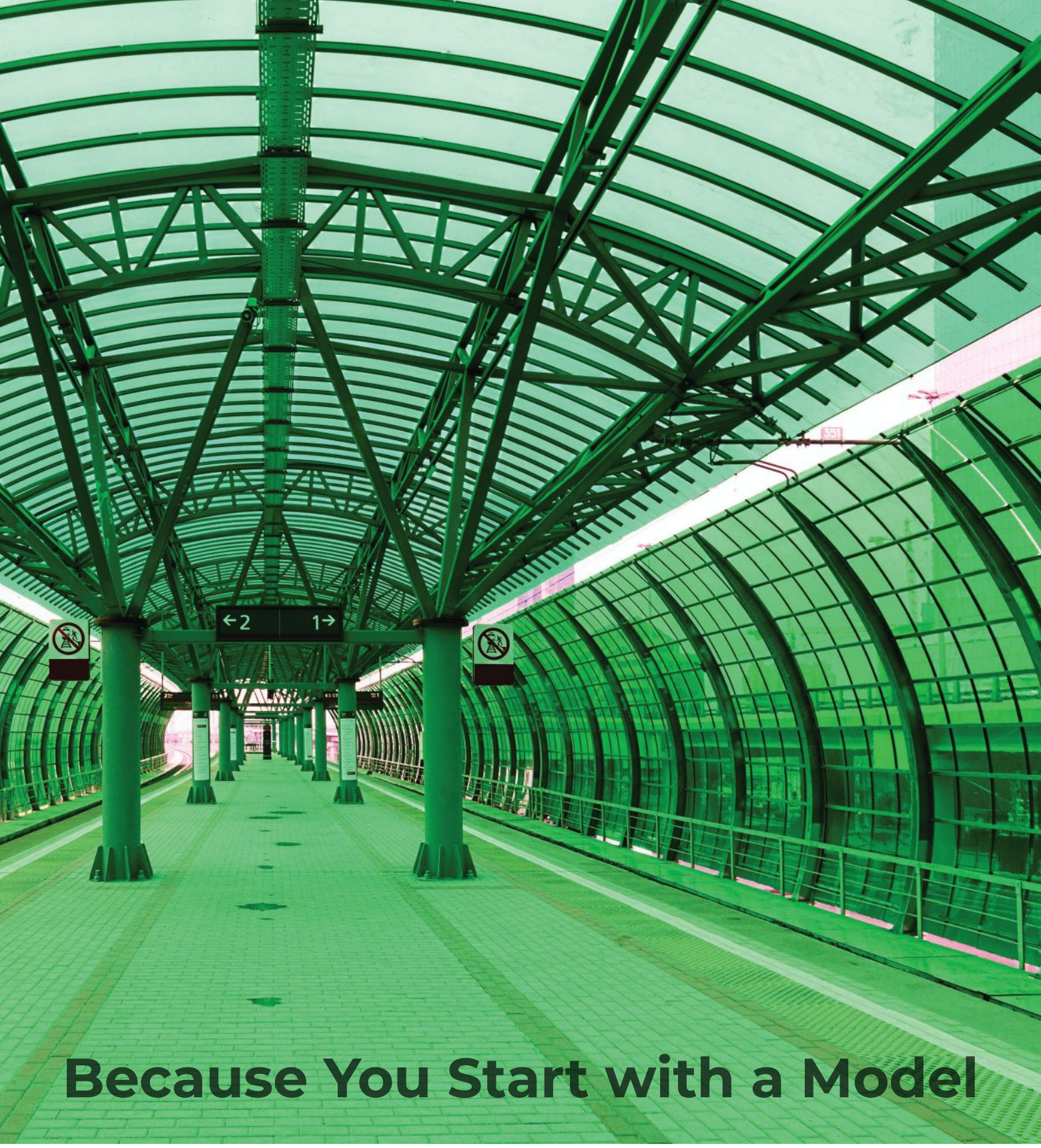

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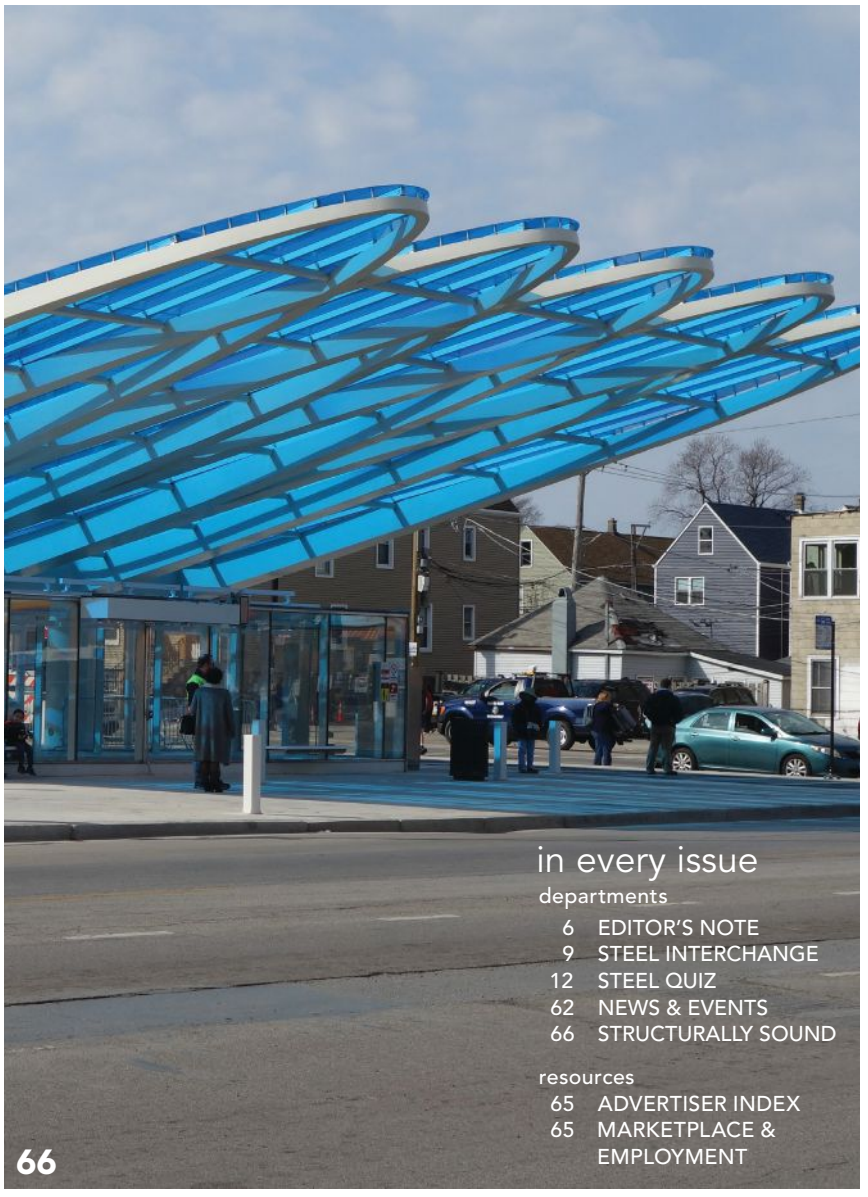

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columns

in every issue

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ON THE COVER: HDR staff collaborate in a new headquarters building they (collaboratively) designed themselves, p. 24. (Photo: Dan Schwalm/HDR)

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editor's note

Almost every year there's a session at NASCC: The Steel Conference that generates heated controversy. This year there are two—and both caught me by surprise.

In the past, we've always included a detailing track within the main conference. This year's conference, scheduled for April 22–24 in Atlanta (visit **aisc.org/nascc** for more information and to register), is trying something a little bit new. We've worked with the National Institute of Steel Detailing (NISD) to create a full conference-within-a-conference (similar to how the Structural Stability Research Council holds the SSRC Annual Stability Conference each year in conjunction with The Steel Conference). Two of the sessions, "Detailing Contracts with Your Domestic and Offshore Partners—What's in Yours?" and "Managing Offshore Detailing," have drummed up controversy.

The gist of the concern about these sessions is the domestic detailing industry is hurting and there's a declining number of young people entering the profession—so why is AISC promoting foreign detailing?

My response to those voicing this concern has usually included three points.

First, we're not promoting foreign detailing. Rather, these sessions are designed to help detailers and fabricators deal with the reality of today's world.

Second, AISC recognizes the issue and has worked with NISD to develop training programs and will continue to do so, especially through groups like the Skilled Trades Coalition.

Third, and more importantly, I ask them if they've contacted NISD or if they've considered getting involved with NISD. NISD is a volunteer organization dedicated to detailer education, certification, and training. I've attended their meetings off-and-on for nearly three decades and as much as I enjoy meeting with longtime friends, I'm also saddened that there aren't enough new faces.

Depending on the size of your company, membership in NISD costs between $290 and $450—and NISD members get a substantial discount on registration to The Steel Conference, so you can recoup much of your cost almost immediately! And once you join, you should attend their annual spring meeting; it's held at the Steel Conference on April 21. Join one of their committees (I know their education and certification committees would love to have you!). Get involved. Be part of the solution and help improve the industry.

And if you're not a detailer, get involved with some other group that interests you—either professionally or personally. I don't know of any volunteer organization that isn't desperate for help. If you're interested in sports, volunteer as a coach or referee (I recommend AYSO for youth soccer, but that's a topic for another day). Or get involved with local STEM activities.

Controversy is exciting, but solutions are even better.

Scott Melnick
Editor

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steel interchange

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

Plumbness and Straightness Tolerance

The general contractor (GC) for a current project has performed a plumbness survey determining that the columns are located at 10-ft intervals. Based on this survey, from top to bottom, the columns are within the overall 1/500 tolerance specified in Section 7.13.1.1 in the AISC *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303) but fall outside of this tolerance at some of the 10-ft intervals that were checked. Does the *Code* require column plumbness to be checked for tolerance at 10-ft intervals?

No. The GC's plumbness survey interval check is not a requirement in the *Code*. Section 7.13 in *Code* states: "Erection tolerances shall be defined relative to member working points and working lines, which shall be defined as follows: (a) For members other than horizontal members, the member work point shall be the actual center of the member at each end of the shipping piece."

Section 7.13.1.1 states: "For an individual column shipping piece, the angular variation of the working line from a plumb line shall be equal to or less than 1/500 of the distance between working points…"

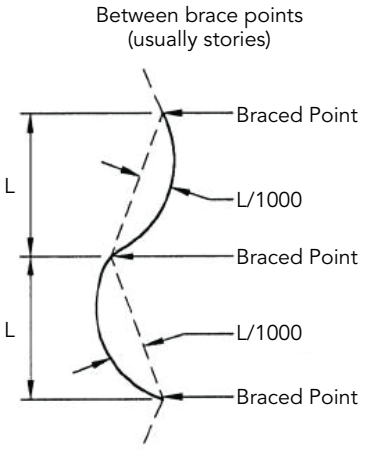

Figure C-7.5 of the AISC *Code of Standard Practice for Steel Buildings and Bridges.*

The 1/500 tolerance should be checked based on the variation between work points located at the end of each shipping piece. The work points of the column would be located at the base and top of the columns and at the column splice locations, since these locations would define the ends of a shipping piece. If the 10-ft intervals do not match up with the shipping piece ends, then what is being proposed by the GC is not consistent with the *Code*.

One potential issue with checking column plumbness at locations between work points (between the ends of the shipping pieces) is that there are also straightness tolerances for straight compression members (1/1,000 per Section 6.4.2 (a) in the *Code*). As a result, it's possible that a column could appear out of tolerance per the 1/500 criteria if checked at additional locations between the work points. This would look similar to Figure C-7.5 in the *Code*, although keep in mind that the work point for a column is not necessarily that same as the brace point shown in the figure.

Carlo Lini, PE

Moderate and Highly Ductile Member Requirements in the *Seismic Provisions*

When designing an special concentrically braced frame (SCBF) Section F2.5a of the AISC *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341) states "Columns, beams, and braces shall satisfy the requirements of Section D1.1 for highly ductile members." However, when beams are intersected by a V-brace, Section F2.4b states: "Beams shall be braced to satisfy the requirements for moderately ductile members in Section D1.2a." When designing an SCBF using a V-braced configuration, does the requirement in Section F2.4b supersede the requirement in Section F2.5a? That is, would the beam only need to satisfy the requirements for moderately ductile members in Section D1.1 of the *Seismic Provisions*?

The requirement in Section F2.4b does not supersede the requirement in Section F2.5a. Both must be satisfied. However, a member satisfying both requirements may be a moderately ductile member.

The two sections provide two different requirements. The beam is required to satisfy the width-to-thickness ratio for a highly ductile member. The beam must also be braced to provide moderately ductile behavior. Keep in mind that Section F2.5a does not require the use of a highly ductile member; it only requires the beam to satisfy the width-to-thickness ratios for a highly ductile member for reasons that I will explain further. The result is that the beam is moderately ductile since by definition, a moderately ductile member is one "that meets the requirements for moderately ductile members in Section D1." A member that satisfies both Sections F2.5a and F2.4b will satisfy D1.1 relative to both highly and moderately ductile behavior, but may only satisfy Section D1.2 relative to moderately ductile behavior.

Section D1.1 of the *Seismic Provisions* addresses the classification of sections for ductility (rotational capacity). It is based on width-to-thickness ratios of the various elements making up a section. Section D1.2 addresses the stability bracing

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Larry Muir is a consultant to AISC.

of beams. This is similar to the situation that exists in the AISC *Specification for Structural Steel Buildings* (AISC 360) where:

- Section B4.1a addresses the classification of sections for local buckling
- Chapter F addresses lateral-torsional buckling

A member could have elements that are sufficiently compact to allow the member "to withstand significant plastic rotation of 0.04 rad or more" (the criterion described in the Commentary to the *Seismic Provisions*) while being braced only "to undergo moderate plastic rotation of 0.02 rad or less" (the criterion described in the Commentary for "moderately ductile"). This is what is required for the beams you are describing. It is similar to having a compact section, per the *Specification*, that could theoretically develop its full plastic section modulus, but which is only braced to permit elastic behavior—a fairly common condition.

Why might the elements of a member be required to only satisfy the width-to-thickness ratios for highly ductile members? Members that have "compact" (used informally) elements are likely to behave better than members that have less than "compact" elements when the members are subject to significant inelastic demands. Vertical braces are expected to undergo large inelastic rotations (likely larger than 0.04 radians) without fracture. Having small width-to-thickness ratios helps this happen. For example, the Commentary to the *Seismic Provisions* states: "Tests have shown fracture due to local buckling is especially prevalent in rectangular HSS with width-to-thickness ratios larger than the prescribed limits (Hassan and Goel, 1991; Tang and Goel, 1989). Even for square HSS braces designed to meet the seismic width-to-thickness ratios of these *Provisions*, local buckling leading to fracture may represent a limitation on the performance (Yang and Mahin, 2005)." This is why, somewhat counterintuitively, HSS members not subjected to bending ("used as diagonal braces") have more stringent limits in Table D1.1 than HSS members subjected to bending.

It should be noted that vertical braces are not required to be (and likely could not practically be) braced to satisfy the requirements for highly ductile members. The vertical braces are therefore not highly ductile members. Similar situations occur throughout the *Seismic Provisions*.

V-braced and inverted V-braced frames are designed such that "an unbalanced vertical force must be resisted by the intersected beam, as well as its connections and supporting members." The intersected beam is intended to remain elastic and therefore has little need to be ductile if it remains elastic in service. However, unexpected things can happen when structures are subjected to large inelastic demands. Enforcing tight width-to-thickness limits helps ensure reasonable behavior if the member experiences some unanticipated demands. Also, as stated in the Commentary: "Adequate lateral bracing at the brace-to-beam intersection is necessary in order to prevent adverse effects of possible lateral-torsional buckling of the beam. The stability of this connection is influenced by the flexural and axial forces in the beam, as well as by any torsion imposed by brace buckling or the post-buckling residual out-of-straightness of a brace. The bracing requirements in the *Specification* were judged to be insufficient to ensure the torsional stability of this connection. Therefore a requirement based on the moment due to the flexural strength of the beam is imposed." In other words, there is a lot going on here, so it is best to take some additional steps to promote "good" behavior.

Larry Muir, PE

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steel quiz

This month's Steel Quiz is comprised of reader submissions in response to our Halloween-themed online quiz (see the October 28, 2019, Steel in the News item at **modernsteel.com/news**). Thank you to all who sent in questions!

1 Can you install powder-actuated fasteners (PAFs) in the casing of a buckling restrained brace (BRB)?
- **a.** Yes, PAFs are permitted to be installed along the full length of brace.
- **b.** Yes, but only in the middle third of the casing.
- **c.** Yes, but only as specifically directed by the BRB manufacturer.
- **d.** No, PAFs are never permitted in the casing of a BRB.

2 If a member with a thin-walled open cross section restrained against warping and subjected to a torsional moment will experience pure torsional and warping torsional behavior, which of the following is correct?
- **a.** The pure torsion will produce shear and flexural stresses in the member.
- **b.** The warping torsion will produce longitudinal and normal shear stresses in the member.

3 **True or False:** ASTM F3125 Grade A490 bolts are labeled as Group A, and Grade A325 bolts are labeled as Group B.

4 **True or False:** The AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360, **aisc.org/specifications**) requires slip-critical connection faying surfaces to meet particular requirements to ensure an adequate coefficient of friction.

5 **True or False:** For structures in risk category III or IV, nondestructive testing (NDT) is required by the AISC *Specification* for all complete-joint-penetration (CJP) groove welds subject to transversely applied tension loading.

6 Which of the following backing materials are permissible for prequalified CJP welds found in AWS D1.1?
- **a.** Steel
- **b.** Copper
- **c.** Ceramic
- **d.** All of the above
- **e.** Both "a" and "b"

7 What type of weld could be used to connect structural members that are aligned in the same plane?

8 What year was the first AISC *Steel Construction Manual* (**aisc.org/manual**) published?

TURN TO PAGE 14 FOR THE ANSWERS

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steel quiz ANSWERS

1 **c.** The core steel is considered the protected zone. From the outside of the brace, the core configuration cannot be verified, so there is a possibility of damaging the core steel if using a fastener that penetrates the casing, such as a PAF. This configuration can be coordinated with the manufacturer to allow certain sizes or locations of PAFs. *Submitted by Shauna Kean, Coughlin Porter Lundeen.*

2 **b.** Warping torsion will produce longitudinal and normal shear stresses. *Submitted by Madelleine Grimmer, Simpson Strong-Tie.*

3 **False.** Section J3.1 in the *Specification* categorizes ASTM F3125 Grade A325 bolts as Group A and A490 bolts as Group B. *Submitted by Tracy Donoghue, KPFF.*

4 **True.** The *Specification* states, in Section M3.3: "For slip-critical connections, the faying surface requirements shall be in accordance with *RCSC Specification* Section 3.2.2." Depending on the class of surface required, a slip coefficient is determined. (The *RCSC Specification* is available at **www.boltcouncil.org**.) *Submitted by Nazereth Galecia.*

5 **False.** The *Specification*, in Section N5.5b, states: "For structures in risk category III or IV, UT shall be performed by QA on all complete-joint-penetration (CJP) groove welds subject to transversely applied tension loading in butt, T-, and corner joints, in material 5⁄16 in. (8 mm) thick or greater." *Submitted by Andy Tomiczek, Jezerinac Group.*

6 **e.** Steel backing is "prequalified" by AWS D1.1, but in AWS D1.1:2015 an alternative was introduced that allowed copper backing to be used with prequalified welds if the following conditions were met: The prequalified joint detail does not contain steel backing or spacers, the joint is back-gouged, and the back-gouged joint is back-welded. Ceramic backing may be used for CJP welds, but they are not prequalified and require qualification by testing per AWS D1.1. More information can be found in AISC Design Guide 21: *Welded Connections—A Primer for Engineers* (**aisc.org/dg**). *Submitted by Rick Overgard, Atlantic Steel Detailing Services.*

7 Members to be connected that lie on the same plane can be butted up and welded together using a groove weld. Splice plates with fillet welds are also a possibility. *Submitted by Matthew Webb, CLC Engineering.*

8 The First Edition *Manual* was published nearly a century ago, in 1927. All historic manuals and standards are available for download for members at **aisc.org/publications**. *Submitted by Matthew Shuler, McDermott.*

STEEL SOLUTIONS CENTER

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

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DIPPING DETAILS

BY ALANA FOSSA

A brief look at resources and advice on detailing for hot-dip galvanizing applications.

Alana Fossa (**afossa@galvanizeit.org**) is a senior corrosion engineer with the American Galvanizers Association in Centennial, Colo.

GALVANIZING WORKS.

Hot-dip galvanized steel has helped combat steel corrosion in aggressive environments for more than a century, but it continues to evolve as markets emerge and change. Over time, improvements in design and detailing practices for batch hot-dip galvanizing have allowed for superior corrosion protection, optimized aesthetics, lower initial cost, and increased longevity. Reviewing and understanding the most up-to-date steel details and best design practices will help improve the quality and performance of hot-dip galvanized coatings whether specified for long-term corrosion protection, painting or powder coating after hot-dip galvanizing, architecturally exposed structural steel (AESS), fireproofing, and more.

Optimal corrosion protection is primarily achieved by referring to the recommendations provided in the specification ASTM A385 *Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)*. This specification outlines recommendations for steel selection along with a variety of design details and fabrication best practices to optimize quality. Because trace elements in the steel chemistry affect the structure and appearance of the galvanized coating, recommended ranges are provided for silicon, phosphorus, carbon, and manganese to achieve a coating of typical appearance and thickness. Steels containing elements outside these ranges (known as "reactive steels") are also successfully galvanized, but produce thick, dark, rough, and/or brittle coatings. The specification also identifies design issues such as overlapping surfaces, different thickness of material in an assembly, moving parts within an assembly, and through-holes, which require special attention if the galvanizing is to deliver a coating according to expectations. Additionally, all designs must consider the need for venting and drainage details such as holes and cropped corners on gusset plates to accommodate the free flow of pretreatment solutions, air, and zinc to achieve a smooth and uniform coating.

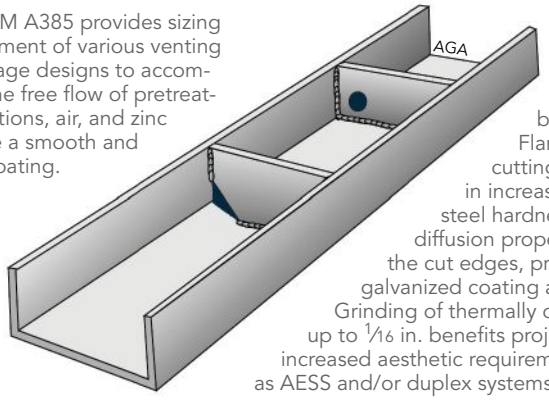
Beyond the recommendations in ASTM A385, recent industry research has influenced the design and specification of hot-dip galvanized structural connections. In the 8th Edition of the AASHTO *LRFD Bridge Design Specifications* for Class C slip-critical connections, the requirement to wire brush galvanized faying surfaces is no longer required. This is presently being evaluated for inclusion in the *RCSC Specification for High Strength Bolts*. If needed, slip testing and tension creep testing of zinc-rich paints applied over galvanized faying surfaces have been performed through the American Galvanizers Association (AGA) in accordance with Appendix A of the *RCSC Specification* to achieve improved slip coefficients of 0.45 and 0.50 without impact to corrosion resistance. In the past, there was some concern that galvanizing a connection would cause a standard hole to become small enough that it would be impossible to insert a bolt. The actual zinc coating thickness on a galvanized member can often range from 3 mils to 8 mils. If a member is galvanized the hole may get smaller by up to 16 mils. The standard hole clearance of $\frac{1}{16}$ in. is equivalent to 62.5 mils, which is a large allowance for these coatings. AISC's *Specification*

above: Improvements in design and detailing practices for batch hot-dip galvanizing have allowed for superior corrosion protection, optimized aesthetics, lower initial cost, and increased longevity.

below: Venting is a crucial step for steel elements that will be put through the galvanizing process, particularly hollow pieces. When moisture trapped inside an element becomes super-heated, it can generate 3,800 psi of pressure and blow a steel piece apart. Galvanizers typically check steel for proper venting before putting it through the process. And in cases where steel isn't vented properly, they contact the fabricator and either have them add venting holes or perform the work themselves on-site using torching or drilling, charging the fabricator accordingly.

for Structural Steel Buildings (ANSI/AISC 360-16, **aisc.org/specifications**) and the *LRFD Bridge Design Specifications* (8th Edition) both include increased standard hole dimensions for nominal bolt sizes 1 in. and larger, which will alleviate this perceived concern for bolt hole clearance when galvanizing.

In addition to current industry standards, additional steel details and elevated quality standards are required for AESS to be galvanized. There is a common misconception that it is not possible to obtain AESS-quality galvanized steel because many surface conditions normally acceptable in the primary galvanizing standards (i.e., runs, skimmings, roughness, excess zinc) are not acceptable for showcase or feature elements. To address these concerns, AGA provides supplemental guidance when using the AESS Custom (C) category to facilitate communication regarding additional steel details required to maximize aesthetics for hot-dip galvanized AESS members (for details on the various AESS categories, see "Maximum Exposure" in the



right: ASTM A385 provides sizing and placement of various venting and drainage designs to accommodate the free flow of pretreatment solutions, air, and zinc to achieve a smooth and uniform coating.

below: Flame cutting results in increased steel hardness and diffusion properties near the cut edges, producing a galvanized coating as shown. Grinding of thermally cut edges up to 1⁄16 in. benefits projects with increased aesthetic requirements such as AESS and/or duplex systems.

November 2017 issue, available at **www.modernsteel.com**). These recommendations include but are not limited to: optimize steel selection with favorable chemistry, use low-silicon welding electrodes, grind thermally cut edges up to 1⁄16 in., increase and/or optimize vent and drain hole placement, and provide designated lift points for galvanizing.

To achieve a desired color or aesthetic, many projects involving hot-dip galvanized AESS also specify a duplex system, where paint or a powder coating is applied over the zinc coating. ASTM D6386: *Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting* provides the necessary practices to prepare galvanized surfaces for painting, while ASTM D7803: *Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating* contains similar practices for powder coating. Many of the same details required for AESS members such as optimized steel selection and venting/drainage details will apply in order to avoid surface conditions that present challenges to coating adhesion.

In a similar fashion, additional details and surface preparations are often required prior to the application of passive fireproofing materials. Where intumescent fire-

resistive materials (IFRMs) require a specific primer to promote adhesion over galvanizing, the surface should be prepared identically to a duplex system. On the other hand, when spray-applied fire-resistive materials (SFRMs) are applied over galvanizing, bonding agents or mechanically fastened galvanized metal lath may be required.

Incorporating the above steel details and best practices for hot-dip galvanizing applications can go a long way to ensuring that a coating meets project expectations. In the meantime, industry updates continue to improve the specification and detailing of hot-dip galvanized steel for a variety of industries and uses. ■

This information will be covered in the presentation "Successful Detailing for Hot-Dip Galvanizing" at the 2020 NASCC: The Steel Conference, taking place April 22–24 in Atlanta. For more information and to register, visit ***aisc.org/nascc****.*

And for more on the hot-dip galvanizing process, see "Galvanizing Illustrated" in the August 2014 issue, available in the Archives section at ***www.modernsteel.com****.*

Yann Weymouth, Salvador Dali Museum, 2011

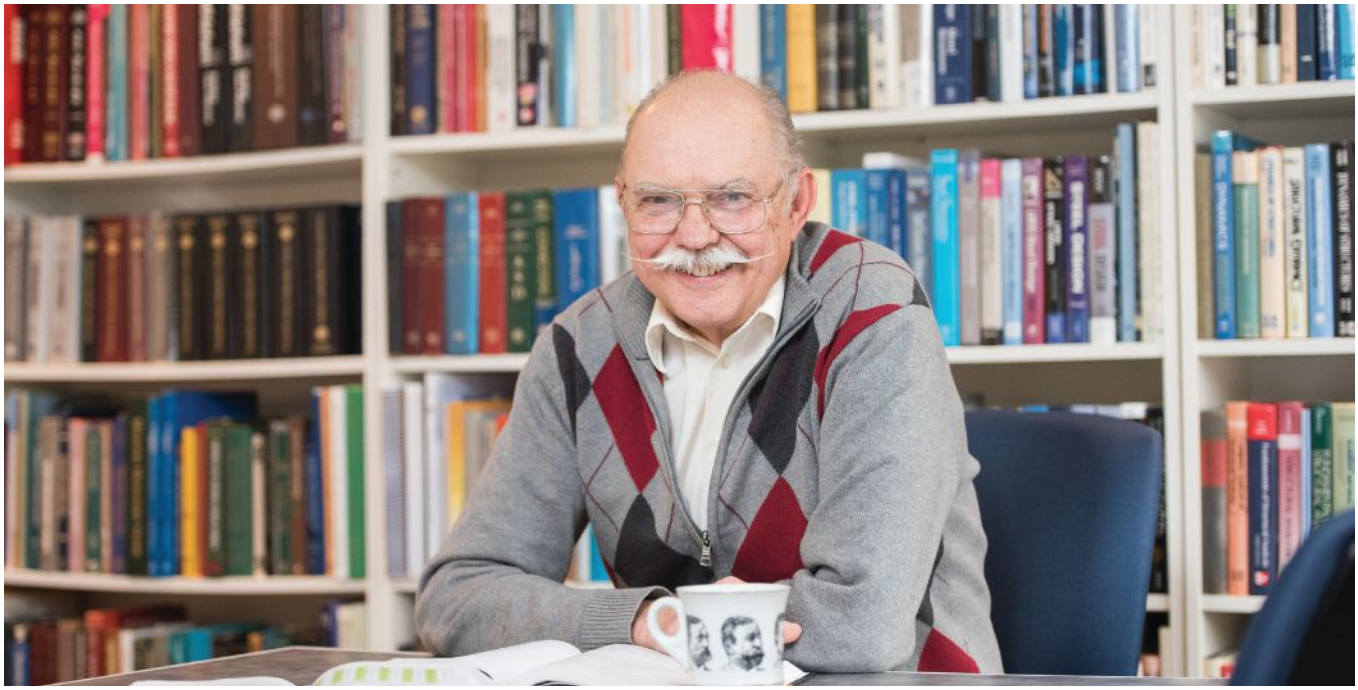
Attention to design details and best practices for duplex systems provided the Salvador Dali Museum in St. Petersburg, Fla., with elevated aesthetics and enhanced measures to protect the steel framing of the outer, artistic glass structure from corrosion.

field notes

LONGTIME LION

INTERVIEW BY
GEOFF WEISENBERGER

Lou Geschwindner has provided plenty of instruction and insight to students and professionals alike in his time as a Penn State professor and a vice president at AISC.



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

To hear more from Lou, including his moustache's origin story, visit **www.modernsteel.com**, where you can listen to the interview podcast in its entirety.

WELCOME TO FIELD NOTES, *Modern Steel Construction*'s podcast series, where we interview people from all corners of the structural steel industry with interesting stories to tell.

Our subject this time is **Lou Geschwindner**, a longtime professor (now emeritus) in architectural engineering at Penn State, a senior consultant with Providence Engineering Corporation in State College, Pa., and a former vice president of engineering at AISC. You'll recognize Lou by his (well-manicured) trademark moustache and his (vast) wealth of steel knowledge. We discussed how teaching was a natural fit for him, observing the various generations of students over the years, how he was genetically destined to design buildings, and more. Below are some excerpts from our interview.

Was there a specific building that you looked at and said, "Ah, that's what I want to do! This is what got me into buildings."

I think what got me into buildings was that my dad was a masonry contractor. He had a small company with three or four people working for him, so the building industry was something I was involved in from that perspective. The thing that probably had the most influence on me in the beginning was Mies van der Rohe and the architecture in Chicago. I had initially planned to go to the Illinois Institute of Technology (IIT), and that was because of Mies van der Rohe. I was accepted at IIT, but I ended up going to Rensselaer for architecture. And along the way, I realized that I really didn't think like an architect. I thought like an engineer.

You taught at Penn State for about 40 years. We like to separate people into generations. In teaching from the 1960s to the 2000s, did you pick up on any distinct differences between the generations?

I don't think I saw the distinct differences where I would say, "This generation does this and this generation does that." Rather, I would see more differences from one class to the next. Every class had a personality, and you would interact with that class in different ways depending on the personality.

Are students today different than they were at the beginning of your career?

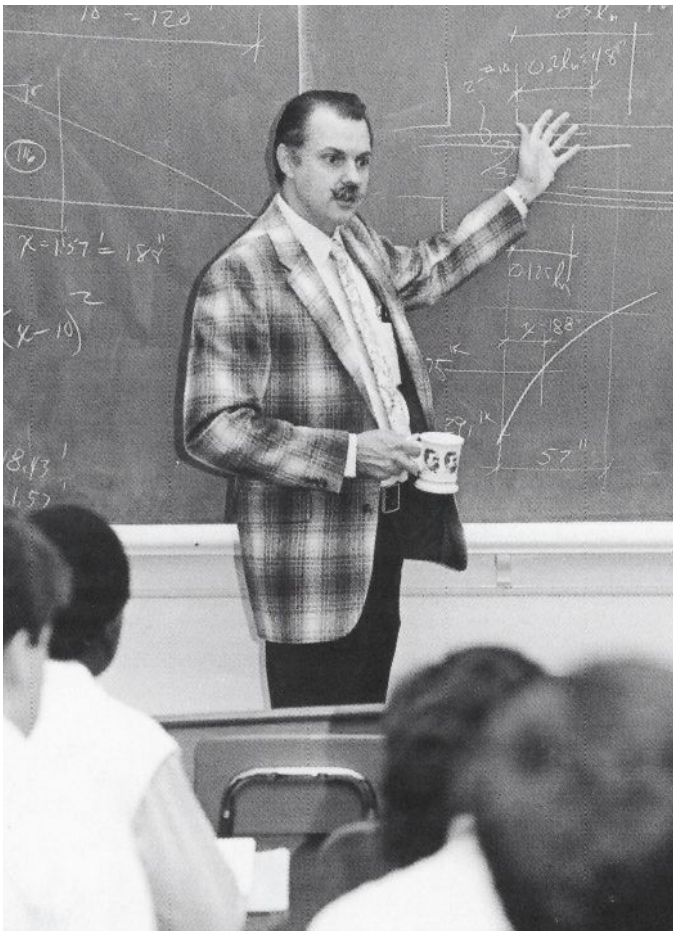
Absolutely, but a lot of that is because of what we have available to us today. One of the first things I did as an undergraduate student working for a faculty member was taking photographs out of magazines and books for him to use in his lectures. And not too long ago, I had a student who was doing a project at Penn State on the football stadium. And I said, "I can get you some slides." So I got her a whole carousel full of slides on what she was working on. And she had no idea what they were. Students today can use their tablet or their iPad. I see all sorts of people taking photographs of the screen as their way of taking notes. A lot has changed, and you get different attitudes towards learning; some want to learn, some don't. I was very fortunate at Penn State because our program was limited in enrollment. And so we always got good students who wanted to learn, and we never had to deal with quite the same breadth of academic preparation as a lot of people do today.

Can you tell me a little bit about your early experiences with getting up in front of a group as a professor?

I can tell you that when I was in grade school and high school, there was no way I perceived that I would be in front of a class. I had more than my share of difficulties in an academic sense. But what I found as an undergraduate student in architecture who enjoyed structures was that I could help my classmates to understand the principles that we were studying, and that is what got me to the point where I wanted to teach because I found that by helping my classmates learn the material, I learned it better. So when I first got to Penn State, it was just sort of an extension of what I had been doing as an undergraduate student with my classmates.

Switching from education and work, I understand that you enjoy reading biographies. Are there certain people or stories that have been particularly inspiring?

I haven't been reading as much as when I was a vice president at AISC. I would travel three to four times each month, and I would always have a book. One book that I've read that I want to recommend to my grandchildren is Tom Brokaw's *The Greatest Generation* because it helped me to understand my father—not that he was hard to understand—but as I read it, I could see the kinds of things that my dad and his brothers and his sisters and my mother's family saw. I have an interest in genealogy, and I really want my grandkids to read it to help them understand their great-grandfather. I think everybody ought to read it and understand what the culture of service was with those people and how they gave so much for our country.



During his storied teaching career, Lou even taught courses in structural materials other than steel.

Speaking of genealogy…

It's something that I've had a long-term interest in, so I've been doing research for quite a while. I had an uncle who was very much interested in it but was never able to make much progress. He did have all of the living family and the recent history pretty well put together. Now we have the Geschwindner family tracked back to the 1500s in Germany, and my mother's family back to the 1500s in England, so that's kind of neat.

Any surprising or interesting findings?

I would say the most interesting thing is that in Germany, the Geschwindners were masons and built the wall around a city. And in England, in my mother's family, there were bricklayers. And I find it so interesting how that has carried through to now. I knew how my father became a mason because I knew that his father-in-law was a mason. But taking it back multiple generations was very interesting. ■

business issues

THOUGHTS ON EXCELLENCE

BY DAN COUGHLIN

The Actions of Leadership Series, Part 3: Talk about big dreams and little details every day.

Since 1998, **Dan Coughlin** has equipped business executives to consistently deliver excellence in management, leadership, and teamwork. He serves as an executive coach, seminar leader, and strategic guide. Visit his Business Performance Idea Center at **www.thecoughlincompany.com**.

PEOPLE NEED TO KNOW what to do and why to do it.

They are willing to work hard. They have great talent. They are passionate. But they need to understand the story they are stepping into and *why* it is important—and they need to know what to focus on in order to be successful.

Theater—and Business—Arts

My daughter, Sarah, is a junior in college, and she is a theater major.

Now that I've learned what the theater arts field is all about, I think every aspiring business executive should have at least a minor in theater.

Theater is about the creation and delivery of a meaningful story in a three-dimensional, human way. There are so many parts to the creation and delivery of a story. A script needs to be written with a purpose, a plot, and characters. Those characters need to be selected and directed by certain types of people who can bring out the best in each person to generate scenes that are worthy of the story being told. Sets need to be designed that serve as the art that the actors step into (this is Sarah's particular skill and passion). Lighting needs to be guided. Costumes and props need to be made. And of course, profits need to be produced so you can do it all over again.

Business is about the creation and delivery of a meaningful story in a three-dimensional, human way. There are so many parts to the creation and delivery of a business. A strategy needs to be written with a purpose. A plan needs to be written for certain types of employees to deliver certain types of products and services to certain types of customers. Managers need to be cultivated who can guide those employees effectively. Relationships need to be developed with certain types of suppliers. A culture needs to be established to sustain the business and help build the desired brand. And, you guessed it, profits need to be produced in order to do it all over again.

Notice that there is the business of theater and the theater of business. They are intertwined.

The Big Picture

If a producer and a director do not know what the end picture is supposed to look and feel like, they can invest a lot of time, energy, and money in creating something meaningless and worthless (not something you want to do all over again). Knowing what the end result is supposed to look and feel like, and how it connects to the purpose of the story, is essential to creating a great theatrical production, TV show, or film.

If a business executive doesn't know what the end picture is supposed to be like for customers in terms of the value they receive and the experience they go through in receiving it, then they can invest an enormous amount of time, energy, and money in creating and delivering something that is meaningless and worthless. (Are you noticing a pattern here?)

Once the producer and director know the desired end result, they need to talk about that big picture, that big dream, every day so that all of the people working on the show can see what they are working toward.

Once the business executive sees the desired end result for customers and for his or her organization, then he or she needs to talk about it every day, over and over and over (and over) so that employees can see what they are working toward creating and delivering.

The Little Details

However, vision alone does not make a great show. Along the way, there are countless details that have to be executed over and over in every part, from the script to the set to the acting and lighting and so on. Details matter in theater, TV, and films. They matter a lot.

And yes, vision alone does not make a great business. There are thousands of details that need to be focused on and executed properly. Every detail matters. They all matter a great deal.

A beautiful example that shows the importance of talking about the big dream *and* the little details was the creation of Disneyland in the early 1950s (you may have heard of it). Walt Disney created a television show, called *Disneyland*, where he talked over and over about a theme park that would become the happiest place on earth. He showed blueprints and drawings of the park, and there are plenty of iconic photos on the internet of him standing on a pile of dirt and explaining what it would become. And then every day, he talked about the details of all of the different parts of Disneyland and what needed to be accomplished.

This is what you need to do in your work. Every day, talk about the vision and the purpose and why the end result is so incredibly important. And every day, talk about the details that need to be executed in order to make the vision a reality. ■

The previous installation of the Actions of Leadership series appeared in last month's issue, available at ***www.modernsteel.com****.*

Dan will present multiple sessions at the 2020 NASCC: The Steel Conference, taking place April 22–24 in Atlanta. To check out the advance program for the conference, which includes a schedule and descriptions of all sessions, visit ***aisc.org/nascc****.*

If you don't know what the end picture is supposed to look like for your customers, then you may be investing an enormous amount of effort into something that is meaningless and worthless.

If you're a global architectural and engineering firm, who better than you to design your own new, steel-framed office?

Inside Job

BY JAMES SAVAGE, SE, PE

WHEN HDR SET OUT to create its new global headquarters—with its own designers—it didn't just want a new office building; it wanted one that could set new standards.

The Omaha-based architectural and engineering firm created a design that reflected how its architects, engineers, and planners sought to push new boundaries, and steel framing—including the state of Nebraska's first implementation of a SidePlate system—played a significant role in doing so.

The project consists of a steel-framed 264,000-sq.-ft, ten-story office building (using roughly 1,700 tons of structural steel) connected to a 1,000-stall parking garage via a steel-framed pedestrian bridge. The latter element is framed with two W36×150 bridge beams tied together with W10×45 infill beams, with a tapered beam canopy covering the walkway. The garage is located 50 ft away from the office tower, creating a plaza lined with retail on both sides. Retail space is also provided on all four sides of the tower, which means there is no "back door" to the building.

The building also features multiple sets of communicating stairs. Starting at level four, every other set of floors is connected by one of these staircases, encouraging employee collaboration between floors. The stairs are composed of exposed HSS12×4×¼ stringers and steel plate treads topped with wood.

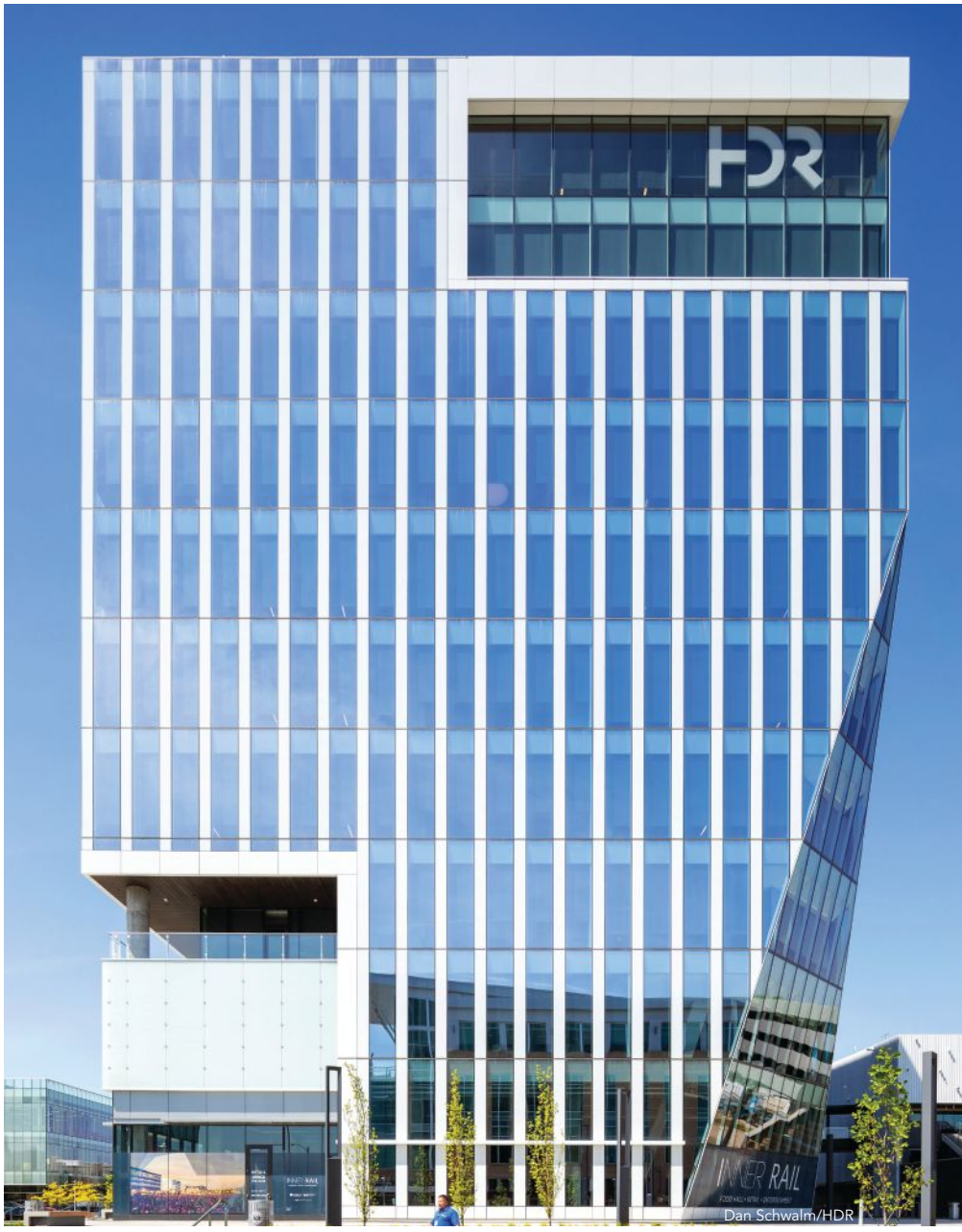
Chamfer Challenge

To encourage pedestrian flow around the building and into the plaza area, the architects carved out the northwest and southeast

HDR self-designed its new global headquarters building in Omaha.


Dan Schwalm/HDR

The project consists of a steel-framed 264,000-sq.-ft, ten-story office building connected to a 1,000-stall parking garage via a steel-framed pedestrian bridge.



Dan Schwalm/HDR

corners of the building, resulting in tapered chamfers at the base of the building, which created a challenge for the structural engineering team. At the top of the chamfered corners, the upper floors cantilever 30 ft beyond the base of the building, supported by sloping steel columns—consisting of spliced W14×120s and W14×90s to support a W14×90 corner column—placed on both sides of the chamfer. These columns converge at a common point at level six in the northwest corner and level seven in the southeast corner. This places the sloping columns 18.6° out of plumb.

Where the floor framing meets the sloping columns, a horizontal force is generated from the vertical gravity reaction acting on the columns. The structural team quickly realized that there were only two ways to resist these horizontal forces: either provide horizontal framing at each floor to drag the horizontal reactions back to a lateral system located at the core of the building, or provide a lateral system along the faces of the building in line with the sloping columns. In addition to resisting the horizontal forces from the gravity load reactions,

James Savage (**james.savage@hdrinc.com**) is a professional associate and senior structural engineer with HDR in Omaha.

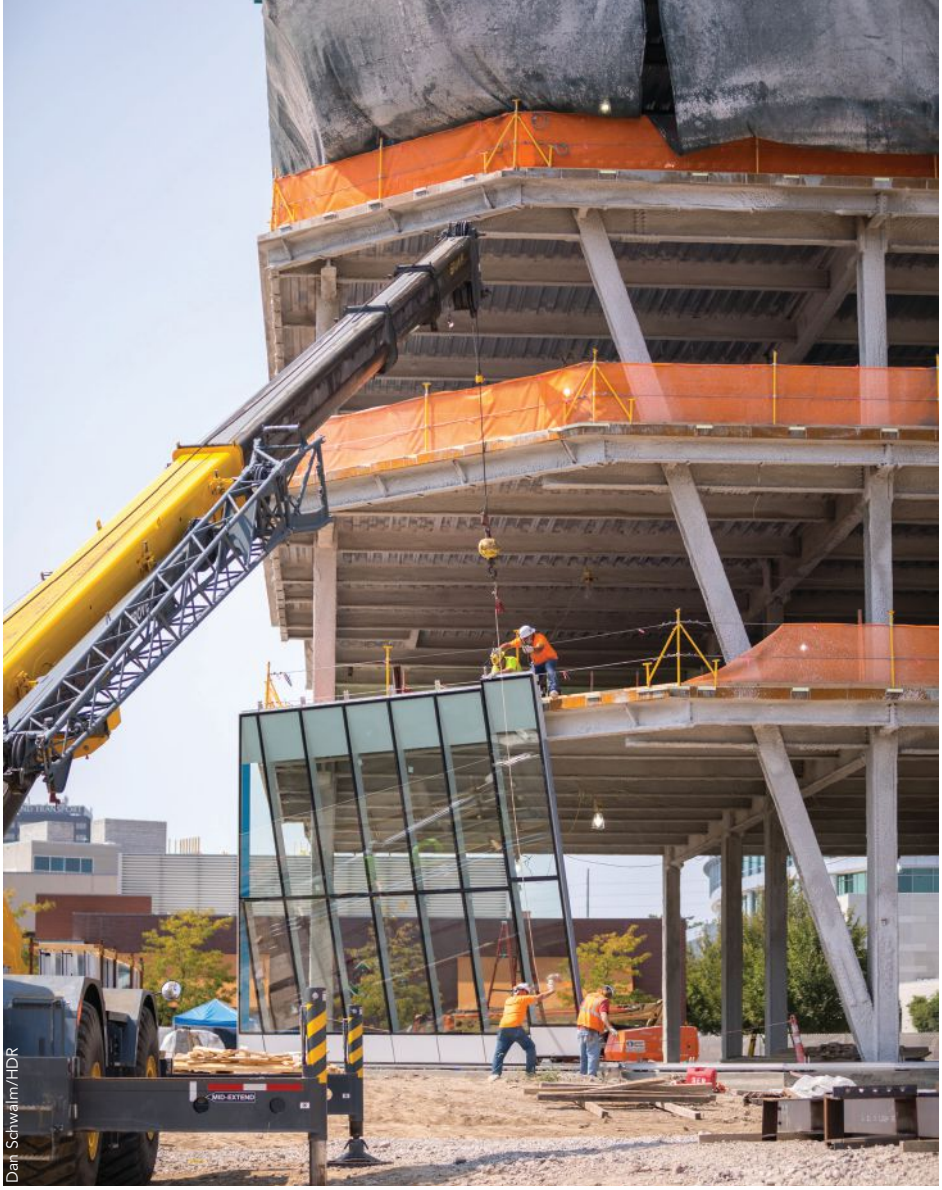
the selected system would need to provide stability to the columns during erection, eliminating the need for temporary shoring.

The idea of providing horizontal framing at each floor to drag the forces back to the core was abandoned due to the increased number of steel members, as well as the additional connections it would require. As such, the structural team opted to align the lateral load-resisting system with each of the sloping columns. Although the moment frames were designed to resist the lateral loads and horizontal forces from the gravity reactions on the sloping columns, these columns also resist lateral loads due to their incline.

HDR selected moment frames using SidePlate's (an AISC associate member) all-bolted moment connection as the lateral load-resisting system, since shear walls or bracing located adjacent to the exterior walls were considered objectionable both functionally and aesthetically. SidePlate is a proprietary connection that uses a shop-welded plate at the girder's top flange and shop-welded angles at the bottom flange. In the field, the girder slides between plates that are welded to both sides of the column. The plate and angles on the girder are bolted to angles at the top and bottom of the column plates to transfer the tension and compression components of the moment out of the girder and into the column plates, and then into the column. The ease of installation quickly frees up the crane to move on to the next framing member while the erection crew continues with connection bolt-up, greatly speeding up steel installation.

There are a total of 375 SidePlate connections in the building. Due to the accelerated schedule, HDR created a RAM Structural System model to share with SidePlate. Concurrently, HDR focused on finalizing the gravity framing design while SidePlate located and optimized the moment frames. Six moment frames resist forces on the long faces of the building while two resist forces on the short faces of the building. The moment frame columns are W21 shapes, and the girders vary in size from W30s at the second level to W21s at the roof level. The building's floor-to-floor height is typically 14 ft but is 20 ft from the first to the second floor in order to provide taller ceilings in the retail spaces. This taller floor-to-floor height at the base required cover-plated W21 columns to provide the required capacity.

As this was the first use of the SidePlate system in Nebraska, steel fabricator Paxton

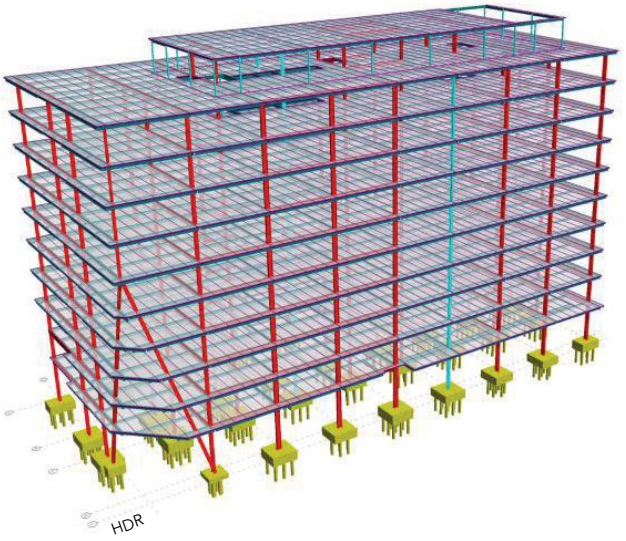

Dan Schwalm/HDR

above: To encourage pedestrian flow around the building and into the retail spaces in the plaza area, the architects carved out the northwest and southeast corners of the building, resulting in tapered chamfers at the base.

below: Exposed beams are protected with spray-applied fireproofing topped with paint.


Dan Schwalm/HDR

Dan Schwalm/HDR



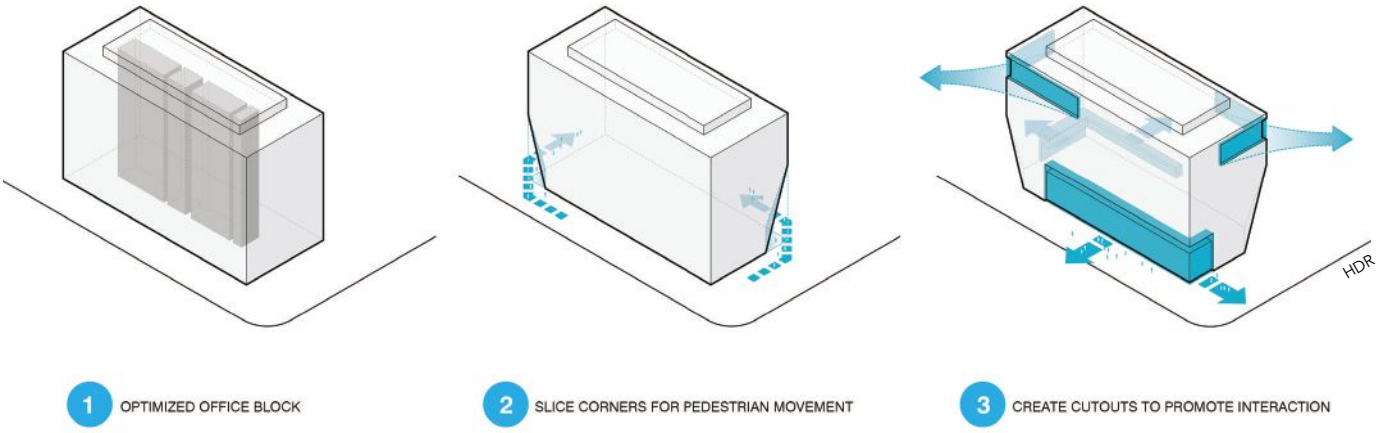
HDR

above: The sloping columns converge at a common point at level six in the northwest corner and level seven in the southeast corner.

left: A 3D framing model of the building, which uses approximately 1,700 tons of structural steel in all.

below: The office tower was built in 23 months, with steel erection lasting four months.

Dan Schwalm/HDR

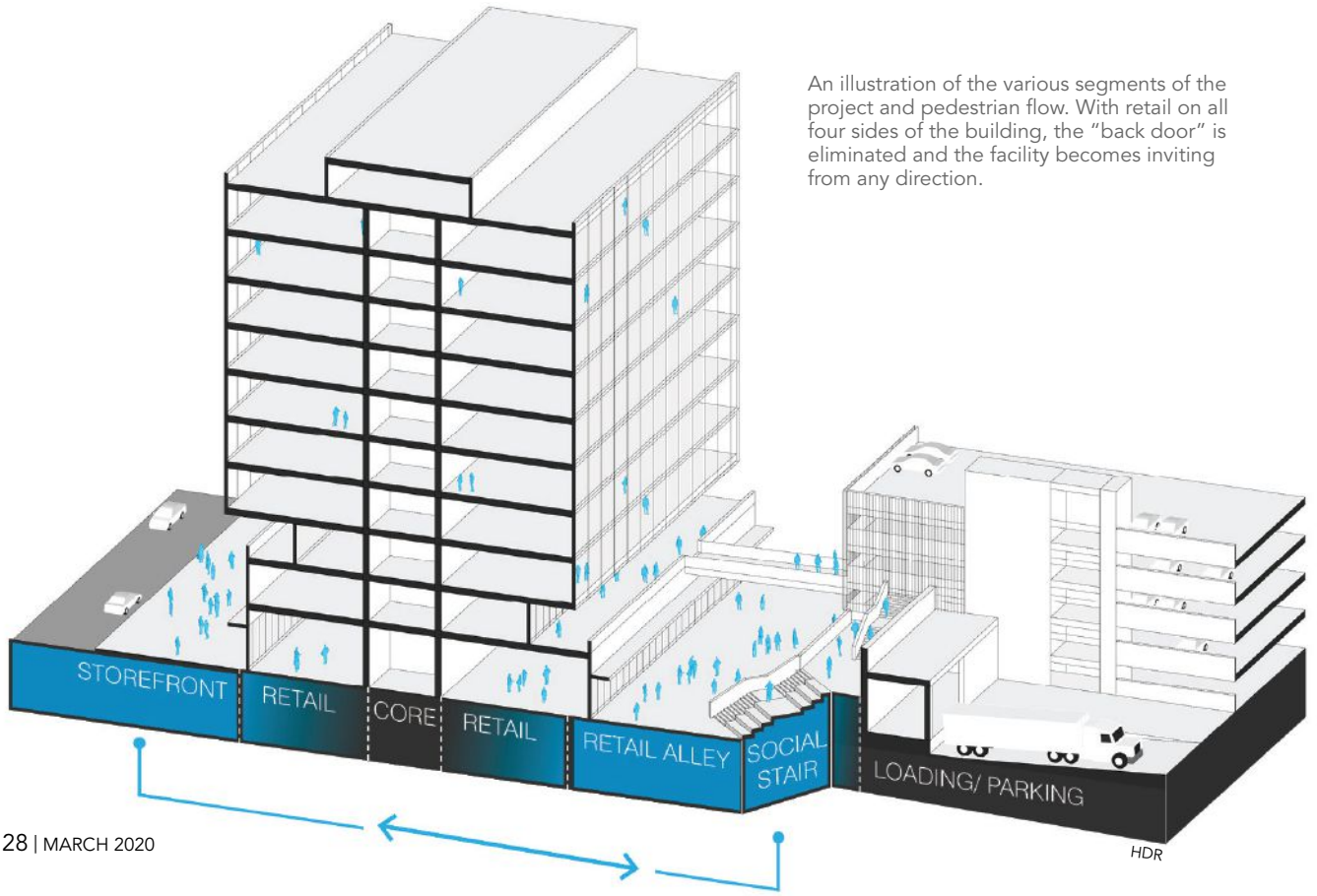


The design of the building evolved from a more traditional "block" format to its final design, which facilitates occupant movement and interaction.

and Vierling Steel (PVS) built a mock-up SidePlate connection in its shop to review constructability with the general contractor, erector, HDR, and owner prior to construction. The SidePlate moment frames ended up saving an estimated 70 tons of steel compared to a conventional moment frame due to their increased stiffness. In addition, the all-bolted connection system accelerated the construction of the steel frame, bringing the erection time down to only 120 days, and also reduced inspection costs. Once the erection crew erected the first few SidePlate columns and figured out how best to remove the temporary channel that kept the connection plates on the sides of the column spread apart, each SidePlate member became just another piece of steel to erect.

Gravity Framing

The building's interior spaces have open ceilings with the steel framing prominently displayed. The beams are protected with spray-applied fireproofing that, to save cost, was painted and left exposed. The framing bays are typically 30 ft wide by 37 ft long (purlins span the short direction and girders span the long direction). To help achieve the architects' desire for the space to feel as open as possible, the floor slabs are constructed of 4½-in. normal-weight concrete fill on 3-in. composite metal deck. The deeper deck allowed the floor purlins to be spaced at 12 ft, 4 in. on center, resulting in a more open feel. The typical floor purlin is a W16 and the typical girder is a W24. In areas where the purlin spans were different, or the beam



An illustration of the various segments of the project and pedestrian flow. With retail on all four sides of the building, the "back door" is eliminated and the facility becomes inviting from any direction.

PVS

above: As this was Nebraska's first SidePlate system, steel fabricator Paxton and Vierling Steel (PVS) built a mock-up of a SidePlate connection in its shop to review constructability issues.

below: One of the building's 375 SidePlate all-bolted connections. The connection is now included in *Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications* (ANSI/AISC 358, **aisc.org/specifications**.)

Dan Schwalm/HDR

Dan Schwalm/HDR


Dan Schwalm/HDR

above: The floor-to-to floor height is typically 14 ft but is 20 ft from the first to the second floor in order to provide taller ceilings in the retail spaces.

left: The garage is connected to the office tower via a steel pedestrian bridge.

loading differed, beam weight was varied and the W16 depth was maintained so that the purlins have the same visual depth. While the majority of the structural steel was delivered to the site unpainted, the pedestrian bridge was shop painted with a graffiti-resistant finish coat.

The mechanical system uses chilled beams for heating and cooling the building. As the ducts for a chilled-beam system are significantly smaller compared to a forced-air system, 8-in. square penetrations were provided through the girder webs to route the ductwork, allowing the mechanical system to be placed higher in the ceiling space.

The facility was delivered as a phased, fast-track project with an early foundation and mill order package, followed by a structural steel frame package, and finally a core and shell package. It was built in 23 months, and steel erection lasted four months. Although erector Topping Out did not perform a specific study on erecting the SidePlate system, it estimated that it was about 10% faster to erect than a traditional braced frame steel building.

With so much of the steel exposed as part of the architecture, close coordination between the architects and structural engineers was required to ensure the steel designed in the early structural packages worked with the final architectural design. The end result is a modern, open piece of architecture in which structural steel and engineer-architect collaboration are prominently on display.


Dan Schwalm/HDR

The modern, open interior serves as an example of the collaboration between the architects and engineers that now inhabit the building.

Owner
Noddle Companies, Omaha

General Contractor
Kiewit Building Group, Omaha

Architect and Structural Engineer
HDR, Omaha

Collaboration Stair Engineer
Thompson, Dreeson and Dorner, Inc., Omaha

Steel Team

Fabricator
Paxton and Vierling Steel Company, Carter Lake, Iowa

Erector
Topping Out, Inc. (Davis Steel Erection), Gretna, Neb.

Detailer
H & R Steel Detailing, LLC, Liberty, Mo.

conference preview

JOIST CAUSE

BY JAMES M. FISHER, PE, PHD

Designing single-story buildings with lateral load-resisting frames using joists and joist girders.

James Fisher (**jfisher.florida@gmail.com**) is emeritus vice president of CSD Structural Engineers in Milwaukee. He is the author of AISC Design Guide 7: *Industrial Building Design* and a past winner of AISC's T.R. Higgins Award for his work on industrial building design. He has also received AISC's J. Lloyd Kimbrough Award in recognition of his contributions to structural steel design.

Fisher will deliver the Thursday keynote presentation, "Keys for Successful Designs: Quips and Myths," at NASCC: The Steel Conference, taking place April 22–24 in Atlanta. For more information, see the related News & Events item on page 62.

SELECTING THE BEST FRAMING SCHEME for a building depends on several considerations, not the least of which is the owner's requirements.

It's not possible to give a specific list of rules by which the best scheme can be assured, as every project is different. If "best" means low initial cost, then the owner may face major expenses in the future for operational expenses or problems with expansion. Extra dollars invested at the outset can reduce potential future costs.

Again, every project is different. Here, we'll focus on single-story lateral load-resisting frames using open-web steel joists and joist girders. Of course, both can be used for multistory projects, but single-story buildings comprise most projects. Preliminary design considerations are briefly discussed, as these decisions are paramount to the success of the framing system. As a colleague once told me, "You cannot do just one stupid thing in the design, because once you use bad judgment, additional bad decisions will have to be made."

Early Decisions

Let's start with some of those early building geometry decisions that must be made in order to get a project started off on the right foot.

Roof slope. Roof slope is a major factor in roofing performance. For membrane roofs, ¼ in. pitch per ft is generally recommended. For structural steel roofs, the minimum pitches are on the order of ¼ in. per ft for standing seam roofs and ½ in. per ft for through-fastener roofs. The *International Building Code (IBC)* requires a minimum slope of ¼ in. per ft except for coal tar roofs, where a slope of ⅛ in. may be used.

Free drainage. All roofs should be designed and built so that water is not retained on the roof surface. Even in roofs that are constructed with ¼ in. per ft slope, there are instances where free drainage may not occur. A classic example is a roof with no interior drains that drains to an eave gutter. This situation occurs when the first upslope joist or purlin deflects under snow load more than the eave member deflects. Often, the eave member does not deflect as it is supported by the building siding. A check can be made by the specifying professional for ponding stability using the Steel Joist Institute's (SJI) Roof Bay Analysis Tool (read on for more on that tool).

Bay size. The designer may or may not have the opportunity to select the bay size for a proposed project. Owner requirements and functional requirements often dictate a certain bay size. In addition, the building footprint, which is often dictated by the building site, has an impact upon the bay size selected. In general, for single-story buildings, bay sizes ranging from 30 ft × 30 ft to 60 ft × 60 ft have proven economical, and square bays have been shown to provide greater economy than rectangular bays. Gravity loads have the greatest impact on the optimum bay size if the size is not dictated by one of the aforementioned items. Also, lighter roof loads allow larger bays without cost penalty.

When the structure has a high ratio of perimeter length to enclosed area—e.g., a long, narrow building—then a 30-ft by 40- ft or a 30-ft by 50- ft bay, where the 30-ft

dimension is parallel to the long building dimension, often proves to be the most economical. This is because economy is heavily influenced by the wall system when it comes to long, narrow buildings. For example, if a metal wall system is to be used, then the most economical girt system is one in which light-gauge/cold-formed steel girts are used, typically C or Z girts. The maximum span of such girts is approximately 30 ft. If a bay spacing larger than 30 ft is required, then wind columns are required to laterally support the C or Z girts at mid-bay. The wind columns and their attachments to the structural steel at the roof have a significant impact on the cost of the framing system. For metal wall structures with bays larger than 30 ft, the designer should investigate the use of steel joists for the girt system as an alternative to wind columns and cold formed purlins.

For structures with a low ratio of perimeter length to area—e.g., square buildings of significant size (200 ft × 200 ft)—the percentage of steel that would be contained in the wall framing is less of a cost factor, and thus a 40-ft × 40-ft bay often proves to be the most economical system. Larger bays of 40 ft × 50 ft, 50 ft × 50 ft or 40 ft × 60 ft are also economical.

In general, soil conditions will not have a major impact on the selection of the bay size when shallow foundations can be used. However, if very poor soils exist and deep foundations are required, larger bays will tend to be more economical because of the reduced number of deep foundations.

SJI's Roof Bay Analysis Tool. This tool assists the specifying professional with optimizing roof bay size as well as determining joist and joist girder depths, spacing, etc. It can also be used to determine whether it is best to span the joist in the long direction or in the shorter direction when a rectangular bay has been selected. The tool can be downloaded for free at **www.steeljoist.org** under the Design Tools tab. The user can input various scenarios to arrive at the least weight or the least cost bay size. Cost data can be input by the user along with other design data. Bays can be evaluated using either ASD or LRFD. In addition, the bay can be evaluated for roof ponding stability, using an iterative analysis. Pull-down menus allow for easy selection of steel deck, joist (K, LH, DLH- Series) and joist girder selections.

Columns. Interior columns can normally be braced only at the top and bottom, thus square hollow structural section (HSS) columns are often desirable due to their equal stiffness about both principal axes. Difficult connections with HSS members can be eliminated in single-story frames by placing the joists and joist girders over the tops of the HSS. Other advantages of HSS columns include the fact that they require less paint than equivalent W-shapes and are aesthetically pleasing. W-shapes may be more economical than HSS for exterior columns for the following reasons:

- The wall system (girts) may be used to brace the weak axis of the column.
- Bending moments due to wind loads are predominant about one axis.
- It is easier to frame girt connections to a W-shape than to an HSS section.

Serviceability. The design of the lateral load envelope (i.e., the roof bracing and wall support system) must provide for the code-imposed loads, which establish the required strength of the structure. A second category of criteria establishes the serviceability limits of the design. These limits are rarely codified and are often selectively applied project by project based on the experience of the parties involved.

In AISC Design Guide 3: *Serviceability Design Considerations for Steel Buildings* (**aisc.org/dg**) several criteria are given for the control of building drift and wall deflection. These criteria, when used, should be presented to the building owner as they help establish the quality of the completed building.

Joist and Joist Girder Braced Systems

Now let's take a look at some elements of single-story buildings using joists and joist girders.

Roof diaphragms. Roof diaphragms used in conjunction with vertical wall bracing is typically the most economical bracing system. Diaphragms are most efficient in relatively square buildings, but an aspect ratio of three to four can be accommodated economically.

Vertical bracing. In braced buildings, the roof diaphragm forces are transferred to a vertical braced frame, which in turn transfers the loads to the foundation level. In most cases the vertical bracing is located at the perimeter of the structure so as not to interfere with plant operations. The vertical bracing configuration most frequently used is a X-braced system using angles or rods designed only to function as tension members. However, in areas of high seismicity, a vertical bracing system that incorporates tension/compression members is often required. In these cases, other bracing forms may be used, such as chevron bracing or eccentrically braced frames.

A typical vertical brace using joist girders. The top chord extension is used to eliminate bending in the chord caused by the eccentricity of the shear at the joist seat.

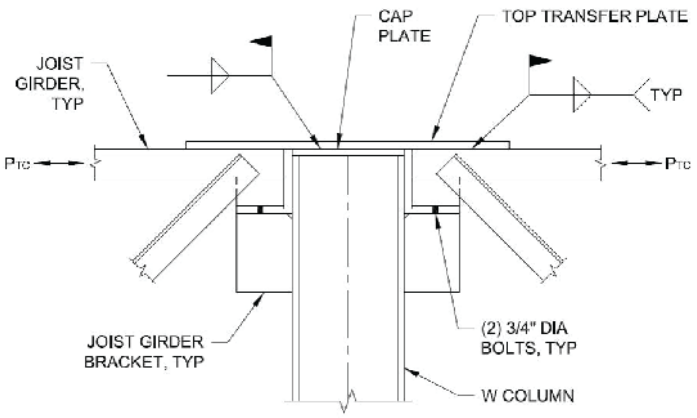


Fig. 1. Force transfer using top plate.

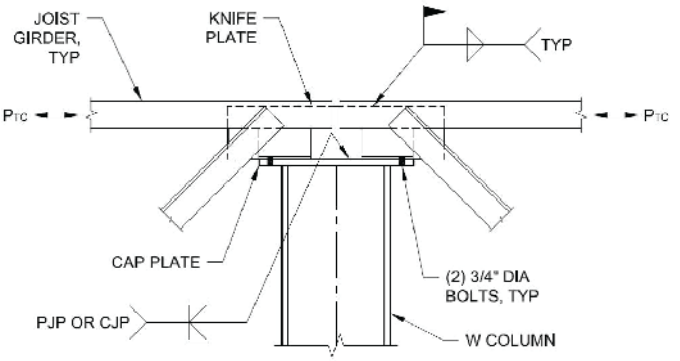


Fig. 2. Force transfer using knife plate.

A typical vertical bracing using joists or joist girders is shown in Figure 1. The top chord extension is used to eliminate the bending in the top chord caused by the eccentricity of the shear at the joist seat.

In buildings with large aspect ratios, bracing may be required in internal bays to reduce the brace forces and to reduce foundation overturning forces. The joist girder details shown in Figures 1 and 2 are ideally suited for diaphragm shear collectors (drag struts). Similar details can be used for joists. And Table 1 shows a typical schedule that can be used to convey loading criteria to the joist manufacturer.

Table 1. **Axial Load Joist Girder Schedule**

JOIST GIRDER SCHEDULE [1 2 3 4 5]					
Girder Mark Number	Designation (Total Load/ Live Load)	Axial Load [6]		Add-Load (kips)	Notes
		Seismic Load 1.0E (kips)	Wind Load 1.0W (kips)		
G1	56G 7N 12.5K/5.8K	160	85	2.0	
G2	56G 7N 14.4K/5.8K	160	85	4.0	

1 Manufacturer to design joist girders using ASD. Nominal design loads shown are to be used in the applicable ASD code load combinations.
2 Deflection criteria: Live load deflection ≤ L/240 .
3 See net wind uplift diagram for uplift loads on girders.
4 See framing plan for additional loads to be included in joist girder design, including mechanical loads.
5 See framing plan for joist spacing along girder.
6 Top chord axial load, tension, or compression load.

Joist Girder Framing Systems

If ordinary moment frames (OMF) are used, lateral stability parallel to the frame is provided by the frame. For loads perpendicular to the frames and for wall bearing and "post and beam" construction, lateral bracing must also be provided. It is important to reemphasize that future expansion may dictate the use of an ordinary moment frame or a flexible (movable) bracing scheme.

Since most single-story structures are light and low in profile, wind and seismic forces are relatively low. Frame action can be easily and safely achieved by providing moment frames on each column line. The most economical situation is to provide the moment frames only at the sidewall columns.

There are several situations for which ordinary moment frames are likely to be superior as compared to braced frames.

- Braced frames may require bracing in both walls and roof. Bracing frequently interferes with plant operations and future expansion. If either consideration is important, ordinary moment frames may be the answer.
- The bracing of a roof system can be accomplished through X-bracing or a roof diaphragm. In either case the roof becomes analytically a large horizontal beam spanning between the walls or bracing which must transmit the lateral loads to the foundations. For large span-to-width ratios (greater than 3:1) the bracing requirements become excessive. A building with dimensions of 100 ft by 300 ft with potential future expansion in the long direction may best be suited for moment frames to minimize or eliminate bracing, which would interfere with future changes.
- Consideration must be given to future expansion and/or modification, where columns are either moved or eliminated. Such changes can generally be accomplished with greater ease where simple-span conditions exist.

However, I would caution designers on the following points:

- The design loads (wind, seismic, and continuity) must be given on the structural plans so that the proper design can be provided by the joist manufacturer. The procedure must be used with conscious engineering judgment and full recognition that standard joist girders are designed as simple-span members subject to concentrated panel point loads (see the SJI *Specification*). Bottom chords are typically sized for tension only. The simple attachment of the bottom chord to a column to provide lateral stability will cause gravity load end moments that cannot be ignored. The designer should not try to select member sizes for these bottom chords since each manufacturer's design is unique and proprietary.
- It is necessary for the designer to provide a well-designed connection to both the top and bottom chords to develop the induced moments without causing excessive secondary bending moments in the joist chords.
- The system must have adequate stiffness to prevent drift related problems such as cracked walls and partitions, broken glass, leaking walls and roofs, and malfunctioning or inoperable overhead doors.

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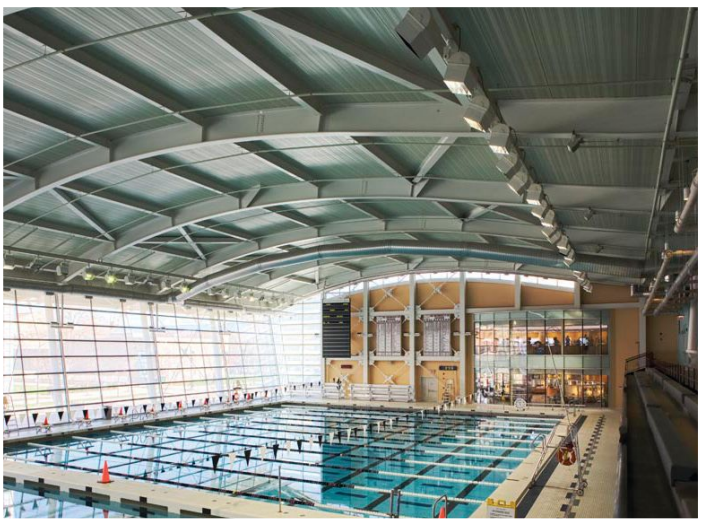

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12. **Tee Stem Out** — INSIDE DIA. — 22" x 142½# Tee
13. **Tee Stem Up** — MEAN DIA. — 22" x 142½# Tee
14. **Angle Heel In** — INSIDE DIA. — 8" x 8" x 1" Angle
15. **Angle Heel Out** — OUTSIDE DIA. — 8" x 8" x 1" Angle
16. **Angle Heel Up** — MEAN DIA. — 8" x 8"x1" Angle
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Table 2. **Joist Girder Moment Schedule**

JOIST GIRDER END MOMENTS (kip-ft) [1] – PART 1 (ROOF)						
Girder Mark Number	Dead Load Moment D		Roof Live Load Moment L_r		Snow Load Moment S	
	Left	Right	Left	Right	Left	Right
G1	34.0	34.0	30.7	30.7	–	–

JOIST GIRDER END MOMENTS (kip-ft) [1] – PART 2 (ROOF)						
Girder Mark Number	Rain Load Moment R		Wind Moment 1.0W		Seismic Moment 1.0E	
	Left	Right	Left	Right	Left	Right
G1	–	–	±105	±105	±120	±120

[1] End Moment Sign Convention, Positive moments: + ⟲ +

SJI TD 11: *Design of Lateral Load Resisting Frames Using Steel Joists and Joist Girders* suggests analysis models that can be used to determine the required joist girder moments. Tables 2 and 3 include schedules that can be supplied to the joist manufacturer for designing the joist girders.

Table 3. **Joist or Joist Girder Additional Requirements**

Joist Mark Number	J2
Min. Moment of Inertia Ichord (in.^{4})	1300
Min. Top Chord Thickness (in.)	0.5
Min. Top Chord Horiz. Leg (in.)	5
Min. Bottom Chord Thickness (in.)	0.375
Min. Bottom Chord Horiz. Leg (in.)	4
Min. Seat Angle Thickness (in.)	0.31
Additional Requirements*	Design Joist Girder Webs to transfer Axial loads from Top Chord to Bottom Chord

*Additional Requirements row is for additional information the engineer of record wishes to convey to the joist manufacturer. The note shown is just one example of the information that can be provided in this column.

SJI provides six different spreadsheets to assist in the design of moment conditions. Each spreadsheet can be used to calculate the strength of connections based on the necessary limit states, includes a reference manual explaining the calculations, and provides for the design of joist girder framing into one side or both sides of the column. The six connection spreadsheets provided are:

- Connection to the Strong Axis of Wide Flange Columns
- Connection to the Strong Axis of Wide Flange Columns–Intermediate Levels
- Connection to the Weak Axis of Wide Flange Columns
- Connection to HSS Columns–Top Plate
- Connection to HSS Columns–Knife Plate
- Connection to Wide Flange Columns–Knife Plates

conference preview

Although the spreadsheets are specifically written for designing moment connections, they can also be used for cases where joist girder chord axial load transfer is required. As with the Roof Bay Analysis Tool, all of these resources can be downloaded from **www.steeljoist.org** under the Design Tools tab.

Seismic Joist Girder Frames

The AISC *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341, **aisc.org/specifications**)—which apply when the seismic response modification coefficient, *R*, (as specified in the applicable building code) is taken greater than 3—require that the joist-girder-to-column moment connections in an OMF be designed for a moment equal to $1.1R_yM_p$ of the girder, (see Chapter E, Section E1). The limit associated with the maximum moment level in the girder assumes that the columns have more flexural capacity than the girders (i.e., strong column, weak beam). In this system, where the joists typically have more flexural strength than the columns, the fuse in the system would be the column, and the maximum force that can be developed by the system is that force which generates the maximum expected moment (M_{pe}) in the column. This moment is equal to $1.1R_yM_p$ of the column. **Note that this is only required for Seismic Design Categories D, E, and F.** The *Seismic Provisions* requires that the girder- (joist girder in this system) to-column connection has the capacity to resist forces generated in the connection when the column develops this moment. The premise of the OMF frame design for this type of system (strong beam, weak column) is that all columns participating in the lateral load-resisting frame have hinged (or developed M_{pe}) just below the bottom chord of the joists. ■

Want to learn more about key considerations when using open-web steel joists and joist girders in lateral load-resisting systems for wind and seismic loads? Attend the session "A Primer on Lateral Load-Resisting Frames Using Steel Joists and Joist Girders" at the 2020 NASCC: The Steel Conference, presented by Bruce Brothersen with Vulcraft–Nucor and Walter Worthley with Valley Joist. This year's conference takes place April 22–24 in Atlanta. For more information and to register, visit ***aisc.org/nascc****.*

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STREAM-LINED DESIGN

BY BRIAN VOLPE, SE, PE

There are plenty of design and detail issues that can unnecessarily add cost to structural steel projects. Here's how to alleviate some of the more common ones.

Brian Volpe (**bvolpe@cives.com**) is Chief Engineer at Cives Steel Company and Cives Engineering Corporation in Alpharetta, Ga.

LET'S FACE IT: There are plenty of usual suspects in the form of inefficient or unnecessary steel details that can add cost to projects.

Luckily, there are also plenty of ways to improve details from a cost perspective without compromising safety. Here, we'll look at some examples, including specifying stiffeners only where required, being overly restrictive about specifying bolt types, proper use of complete joint penetration (CJP) welds, when to require full capacity connections, and others. In addition, we'll also discuss the importance of communication between professionals from both the design and construction sides of a project, the obstacles to this communication, and strategies to assure that essential technical communication is not avoided for commercial or other reasons.

Fabrication Efficiencies

First, let's take a look at some shop-related advice for avoiding inefficiencies.

Avoid specifying stiffener locations where not required. When stiffeners are required for a job, it is important that they are properly specified. Adding stiffeners in locations that are not required can significantly add to the final cost of the steel solution. While this might seem like a no-brainer, it is fairly common for unnecessary stiffeners to be added to designs. In these instances, the column may never be checked for stiffener requirements and then project documents, not calculations, are driving their inclusion.

As an example, consider a 22-ft, two-story W14×90 column with two beam moment connections at two different levels—with four (unrequired) stiffeners at each location required by a design detail. Assume the W24×55 beams are part of a frame with end moments of 200 kips, an axial load of 50 kips, and a shear load of 50 kips. Also assume these members are connected to the W14 column flange. These forces would not require column stiffeners. The W14×90 would constitute about $1,300 of cost whereas the eight stiffeners would incur a cost of $1,200—a large percentage of the total cost. With this in mind, the cost of stiffeners that are not required could have a drastic effect on the final cost of the put in place structure.

A good tool for selecting a cost-efficient column size that doesn't require stiffeners is "Clean Columns," an interactive spreadsheet available at **steeltools.org/column.php**. After selecting your column and beam size, simply input the moment loads at the end of the beams, and the spreadsheet will calculate whether stiffeners and doubler plates are required—and will also suggest a column size that doesn't require stiffening.

Use bearing bolts whenever possible. Bolt shear values are important to the economy of steel structures. Reducing the number of bolts not only reduces the field labor but also reduces the amount of material, as the joints are more compact. As an example, consider a 1-in.-diameter F3125 Grade A325 bolt. This bolt has a shear strength, with threads included (N value), of 31.8 kips in standard holes and an equivalent shear strength in a standard hole of a slip-critical Class A bolt of 17.3 kips. This 183% reduction in equivalent bolt strength will require the joint to have almost twice the bolts. The increase in bolts will yield an increase in connection material because of the required geometric modifications. All of these issues will increase the cost of the

structure, not to mention incur the ire of the project's architect, as these joints can become large. Most bracing connections are allowed to use bearing bolts to resist bracing forces subject to load reversal. An alternative to requiring a slip-critical joint is to use pretensioned bolts with bearing bolt values. This keeps these joints performing with limited slip for most normal demands.

Specify welds required to meet demand and do not specify CJP welds needlessly. Specifying efficient welds is, of course, crucial to creating efficient steel framing systems. It's also important to understand the demand at key non-redundant critical joints in the structure, as well as the fact that certain joints may require extra capacity to satisfy the design requirements. In practice, it is important to limit the CJP welds to the locations required by stress or certain non-redundant joints. Providing the actual demands will empower the fabricator to provide the most cost-effective and safest solution.

Allow single-sided standard and extended shear tabs. Single-sided connections are a well-tested simple shear system used in steel construction. Oftentimes, they are not allowed by the engineer of record (EOR). It would be most useful if this type of system selection was left to the fabrication industry. A proposed improvement to omitting their use altogether on a project would be for the EOR to allow these connections while also denoting specific locations where there may be technical concerns.

Allow "finish to bear" joints for heavy axial connections. Heavily loaded compression joints for columns and trusses can often be spliced most easily using a "finish to bear" joint. The splice is generally configured with an end plate or flange plate for heavily loaded truss-type compression connections. Column connections may just have the two column sections bear onto one another with nominal connectors to hold the column sections together. This load path is an economical method to transfer compressive forces and reduces the amount of bolts or welds. Alternative methods to connect these compression elements using only bolts or welds, and without material bearing, will require the connection to be configured to resist the entire force through the connectors. This can create a connection solution that can be costly to fabricate and construct. Section J1.4 of the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360, **aisc.org/specifications**) outlines the proper procedure to be followed.

Make every attempt at using single-pass fillet welds. It is commonly known that fillet welds are the more preferred method of welding for most fabrications. Fillet welds require limited material preparation, especially for 90° joints, and quality control of these joints is simpler in practice. Specifying engineers should also differentiate between multi-pass fillet welds and single-pass fillet welds. The most eco-

Heavily loaded compression joints for columns and trusses can often be spliced most easily using a "finish to bear" joint.

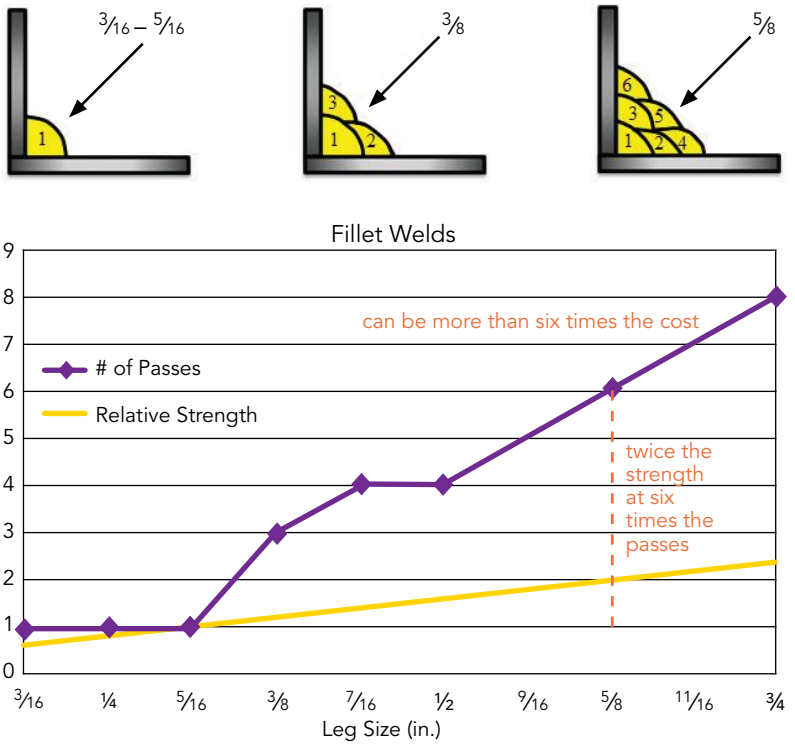

Fig. 1. The most economical welds are those that can be made in a single pass.

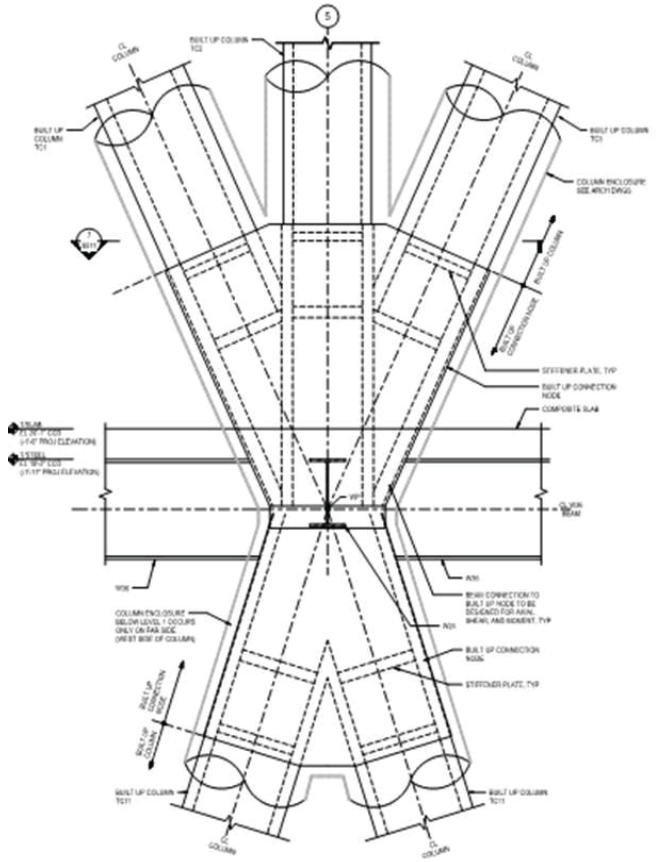

Fig. 2a. An indicative detail from the engineer of record.

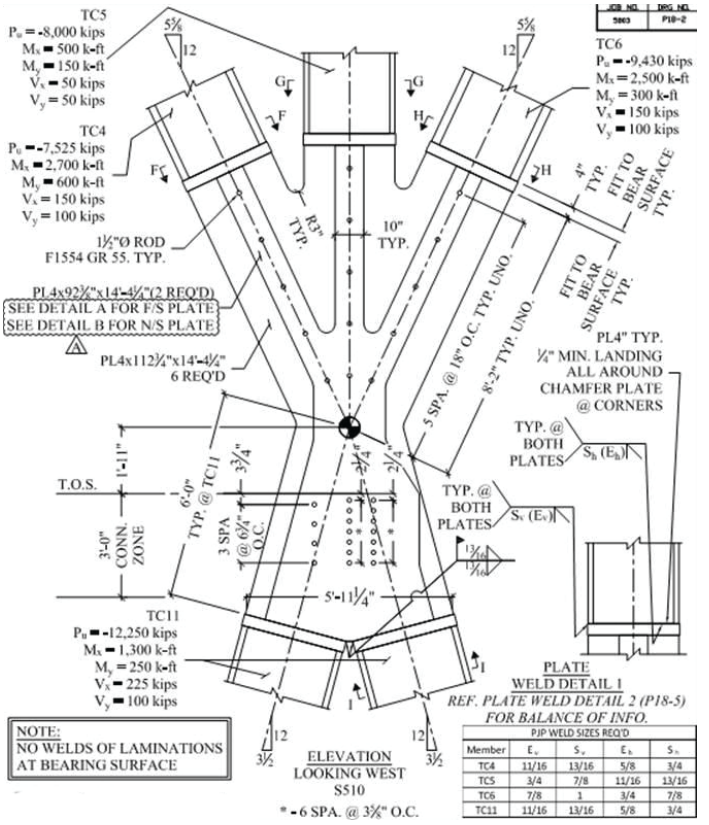

Fig 2b. A fabricator detail submitted for approval.

nomic fillet welds are those that can be made in a single pass. Most often, stretching the weld out so that a single-pass weld can be accomplished is more economical than bumping the weld throat. As an example, per Figure 1 (on page 39), increasing a weld from a 5/16-in. single-pass weld to the 3/8-in. multi-pass weld requires three times the weld metal volume and labor for a 20% increase in strength. And a 5/8-in. weld requires six times the weld metal and labor for twice the strength.

Communication Improvements

Now that we've highlighted some efficiency tips from the shop floor, let's look at some communication advice that can improve projects.

Provide adequate design information to complete delegated scope of work. Delegated connection design is an important part of the steel construction process in much of the U.S. The AISC *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303, **aisc.org/code**) dedicates a portion of the text to guidance on how connections are delegated and the required information to adequately perform that scope of work. It is incumbent upon the EOR to ensure there is adequate design information at the start of the project to complete the delegated scope of work. Key to this effort is for the EOR to produce design documents that contain the information outlined in Section 3 of the *Code*. It is also incumbent upon the delegated design professional to review the provided information and define RFIs early on in the project to clarify any and all information that may be missing.

As the EOR, take the opportunity to draw adequate indicative design details of the most critical structural joints. Complicated structures often have joints with critical load paths that require focus and understanding from many different perspectives. These joints require adequate force documentation and often fabricator involvement to fully develop the detailed solution. Crucial to developing these complex joints, especially when the final details are delegated to the fabricator, is for the fabricator's engineer to understand the design intent. It is often not critical for the final design to exactly match the initially prepared indicative details. The EOR's effort in developing these design details will assist the fabricator and their engineer in *completely* understanding the EOR's design intent. See Figures 2a and 2b for an example progression of a well thought-out EOR indicative detail to the final delegated design solution detail, and then Figure 2c for an image of the fabricated product.

Limit the specification of full capacity connections to only *required* locations based on analytical demand. Full-capacity connections specified where not required add costs to a project without adding much value. As an example, if the EOR specifies a full capacity connection for a joint with a demand of 0.5 ϕM_p, it may drive this connection to have field-welded CJP flanges or potentially a bolted connection with flange reinforcement. In many areas of the U.S., bolted moment connections are more economical to erect or preferred because of the associated costs of field welding. Providing the actual forces will allow for a proper connection to be developed by the delegated design professional, reducing needless reinforcing and extraneous cost.

Keep communication open between design and construction team members. There are times in today's project marketplace where it seems a "virtual Great Wall of China" is placed between professionals on the design and construction sides of the project. The goal of this is to make sure that a third party can manage the scope of work or communication. While managing project change is an important task for general contractors, construction managers, and owners, over-managing important technical discussions between professionals or worse, eliminating the opportunity for these discussions to occur at all, can be a hazard to the project. The previous discussion on indicative engineering information presents a project success where the EOR and the delegated design professional were able to discuss the direction of some major nodes on a project to find a cost-efficient fabrication solution. The efficiencies weren't due to material weight but rather to welding access, volume, and placement. In this case and often in general, the delegated design professional will find a concern and request a discussion with the EOR. These discussions are important even if nothing becomes of them. It offers the two professionals the ability to discuss critical parts of the structure so that both have a firm understanding of the outcome. Guessing in these situations, especially when communication is intentionally inhibited, just extends the approval process or, worse yet, runs a major risk of having something technically important get missed, creating an unsafe condition.

Structural steel is a dynamic material and specifying it properly, including the forces, connection material, and bolting and welding strategies, is an integral part of assuring cost effective steel solutions. Equally critical is ensuring that efficient and effective technical communication continues to occur so that the structures we design and build are safe for use. ■

Want to learn more about improving communication and avoiding unnecessary costs? Attend the session "Design and Detail Issues that Add Cost to Structural Steel Projects and Suggestions to Improve" at the 2020 NASCC: The Steel Conference, taking place April 22–24 in Atlanta. For more information and to register, visit ***aisc.org/nascc****.*

Fig. 2c. The as-fabricated weldment.

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Greenbrook Engineering specializes in Steel Detailing, 3D Modeling, Connection Design and B.I.M. coordination services for the steel industry. With offices in New Jersey and a production center in Bangalore, India, we serve the Structural Designers, Steel Fabricators and Architects. We have in-house engineering capabilities to design connections in several states across the country.

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GWY has been a global leader in bolt fastening tools since 1975. Our Turn of Nut series of wrenches are custom designed in partnership with the global leader in electric tool companies, Tone. Using our years of experience in bolt fastening with Tone's years of quality wrench manufacturing, we have created a wrench that meets the high standards of the federal government for structural fastening. Our other line of tools include the popular TC wrenches for shear bolts, and our torque wrenches for snug tightening, calibration, and other duties. We also offer repair services, rentals, and spare par

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Haydon Bolts manufactures headed bolts, threaded rods, anchor bolts, u-bolts and swedge bolts, in plain and galvanized finish, with full mill cert traceability. Haydon also carries the largest inventory of A325 and A490 Heavy Hex Head, Tension Control (TC) bolts, weld studs and wrenches, on the east coast.

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HI-Q is a global Structural Steel and Mechanical Design and Detailing company established in 2004. We have teams of qualified and experienced engineers and detailers, who specialize in Structural Steel Design and Detailing, Connection Design, Mechanical Design and Piping Design. We have completed small, medium and large sized projects for our international customers in all the continents of the world. HI-Q has the capability to produce complicated 2D and 3D Models for Structural and Mechanical Design and to generate Fabrication and Erection drawings, which are accepted by Steel Fabricators and Erectors.

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IAPMO Uniform Evaluation Service is a not-for-profit, public benefit company that evaluates building products, components, methods, materials and systems for conformance to codes and standards and certifies continued compliance. Upon completion of the evaluation, IAPMO UES publishes reports that summarize conformance, which are available free of charge to users, regulators, and specifiers. Current steel related activities include steel deck, steel wall and roof cladding, structural steel members, cold-formed steel framing, steel connectors, and steel fasteners.

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JMT Consultants Inc. is an innovative structural consulting firm that specializes in steel detailing, rebar detailing, panel book detailing, connection design, fabrication estimates, estimate models and providing consulting specifically related to the use of Tekla Structures and Tekla PowerFab. We are also committed to providing a quality design and detailing service in both the Commercial and Industrial sectors while maintaining a reputation for excellence both in services provided and as a place to work.

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Over 85 years, Lindapter has pioneered the design and manufacture of Structural Steel Clamping Systems and HSS Blind Fasteners, enabling faster steel construction. Products include the Hollo-Bolt, the HSS expansion bolt approved by ICC-ES for all Seismic Design Categories (A through F); while the Girder Clamp is approved for quickly connecting W & S beams. Lindapter connections eliminate the need for time-consuming drilling or welding in the field and reduce time and labor costs.

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Modern Steel Construction magazine

booth 1761
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Modern Steel Construction magazine is the official publication of the American Institute of Steel Construction. By focusing on innovative and cost-effective steel designs and applications, *Modern Steel Construction* brings its readers in-depth information on the newest and most advanced uses of structural steel in buildings and bridges. *Modern Steel Construction* is the leading magazine for professionals involved in the design and construction of steel-framed buildings and bridges. Advertising in *Modern Steel Construction* is the best way for you to reach your customers directly.

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National Institute of Steel Detailing, Inc.

booth 1158
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ph: 925.294.9626
www.nisd.org

The National Institute of Steel Detailing (NISD) is an international association that advocates, promotes and serves the interests of the steel detailing industry. We are comprised of company owners and professionals in the steel industry and offer membership to steel detailing firms and associated companies and individuals. By fostering a professional approach to business and advocating improved quality through member networking, education and certification, our members are highly regarded by fabricators, architects, engineers and contractors.

National Steel Bridge Alliance

booth 1557
Chicago, Ill.
ph: 312.670.2400
www.aisc.org/nsba

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

exhibitors

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ph: 260.969.3582
www.newmill.com
New Millennium engineers and manufactures steel building systems ranging from standard steel joists and deck to architecturally unique steel joist and deck systems, including long-span composite slab floor systems, for dramatic cost savings to the building owner. The company also manufactures steel stay-in-place forms for steel and concrete bridge decking. New Millennium is a leader in BIM based design for steel joists and decking.

Nickel Institute/IMOA
booth 1716
Toronto, Ontario, Canada
ph: 416.591.7999
www.nickelinstitute.org
ww.imoa.info
The Nickel Institute (NI) is the global association of leading primary nickel producers. Our mission is to promote and support the use of nickel in appropriate applications. Stainless steels account for about two-thirds of nickel produced. The International Molybdenum Association (IMOA) is a similar organization, representing the worldwide molybdenum industry. NI and IMOA have been actively involved in the Architectural, Building and Construction industries, and instrumental in the writing of the AISC Design Guide 27 and the new AISC *Specification for Stainless Steel*.

Nitto Kohki U.S.A., Inc.
booth 1146
www.nittokohki.com

Nucor – Beam Mill Group
booth 811
Blytheville, Ark. | Huger, S.C.
ph: 870.762.5500 | toll free: 800.289.6977
www.nucoryamato.com
www.nucor.com
Our Nucor-Yamato facility is the only N.A. producer of high-strength, low-alloy beams. We manufacture wide flange structural steel shapes (up through W14730 columns & W44 beams), H-piles (incl. HP16 & HP18), sheet piling, angles, channels, and car building shapes. Grades include ASTM: A36, A572, A588, A690, A709, A992, 913; and CSA G40.21-13 Grades 345WM & 345WMT.

NUCOR® BEAM MILL GROUP

Nucor – Corporation
booth 811
Charlotte, N.C.
ph: 704.366.7000
www.nucor.com
Nucor and its affiliates manufacture steel and steel products, with operating facilities in the U.S., Canada & Mexico. Products produced include carbon and alloy steel in bars, beams, sheet and plate; hollow structural section tubing; electrical conduit; steel piling; steel joists and joist girders; steel deck; fabricated concrete reinforcing steel; cold finished steel; precision castings; steel fasteners; metal building systems; steel grating; and wire/wire mesh. Nucor is N.A.'s largest recycler.

NUCOR®

Nucor – Fastener Division
booth 811
St. Joe, Ind.
ph: 260.337.1600
toll free: 800.955.6826
www.nucor-fastener.com
Manufacturer of 100% made in the USA carbon and alloy steel hex head cap screws, heavy hex structural bolts, dome head Tru-Tension tension control assemblies, nuts and build-to-print specials in inch and metric sizes in various grades with finishes and thread coatings to meet fastening requirements.

NUCOR® FASTENER

Nucor – Plate Mill Group
booth 811
Cofield, N.C. | Tuscaloosa, Ala.
ph: 252.356.3700
toll free: 877.626.8267
www.nucorhertford.com
www.nucortusk.com
Manufacturer of carbon, alloy, high-strength low alloy (HSLA), pressure vessel and heat treated (normalized and quench and tempered plate) that is available as discrete, cut-to-length and coiled plate. Nucor Steel Hertford County produces discrete plate through 3 in. thick, 124 in. wide and 1,035 in. long. Nucor Steel Tuscaloosa Inc. produces hot rolled coil and temper-leveled plate up through 1 in. thickness and discrete plate up through 2.5 in. thickness, 96 in. in width and 720 in. long.

NUCOR® PLATE MILL GROUP

Nucor Grating
booth 1014
Tinley Park, Ill.
toll free: 800.334.2047
www.nucorgrating.com
Nucor Grating is a full-service grating manufacturer with facilities across the United States and Canada. Our estimating and drafting departments can take your requirements from structural drawings to detailed grating drawings to completely fabricated grating. We can also detail within the BIM model. As a manufacturer/fabricator we offer complete one source responsibility. Products include standard, heavy duty, press locked and hand welded bar grating in carbon and stainless. We also produce swaged and press locked aluminum bar grating.

NUCOR® GRATING

Nucor Tubular Products
booth 915
Chicago, Ill.
ph: 708.496.0380
toll free: 800.376.6000
www.nucortubular.com
Nucor Tubular Products is committed to taking care of our customers through unmatched quality and service. With eight locations located across the United States and a wide variety of sizes, we are ready to help you get the job done. NTP manufactures high quality HSS, piling, A53 pipe, fire protection sprinkler pipe, and electrical steel conduit. Our value added offerings include: in-house band saw cutting and mechanical properties testing, I.D. flash removal, Charpy V-notch testing, pipe beveling, and miter cutting. Together, let's build something bigger.

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Nucor Vulcraft/Verco Group
booths 1016, 1011
North America
www.vulcraft.com
www.vercodeck.com
Nucor, Vulcraft/Verco engineers and manufactures steel joists and steel roof and floor deck for structural roof and floor systems. Nucor, Vulcraft engineers and manufactures RediCor. Please see website for contact information.

NUCOR® VULCRAFT/VERCO

Ocean Machinery, Inc.
booth 211
Fort Lauderdale, Fla.
ph: 954.956.3131
toll free: 800.286.3624
www.oceanmachinery.com
Ocean Machinery delivers versatile and affordable solutions for the small to medium fabricator. Including: *OCEAN AVENGER and AVENGER PLUS—the world's best-selling CNC beam drill lines *OCEAN CLIPPER II—the most compact CNC angle line *OCEAN LIBERATOR—the most affordable CNC beam coping machine *OCEAN BLASTER—the smallest footprint shot blasting solution *OCEAN CHALLENGER—a compact, automated welding robot, as well as several other game changing solutions that improve the efficiency and profitability of fabricators worldwide!

Ohio Gratings, Inc.
booth 1615
Canton, Ohio
ph: 330.477.6707
toll free: 800.321.9800
www.ohiogratings.com
Ohio Gratings, Inc. is a leading manufacturer of aluminum, carbon and stainless steel bar grating products—all proudly made in the U.S. By delivering a blend of artistry, safety, and seamlessness that's unmatched in the grating market. From design to manufacturing to custom fabrication services, we offer the complete solution. Our drive to keep looking ahead separates us from other grating makers. And it's this search for the unexpected that helps us repeatedly surprise and satisfy customers. Let our people, processes and vision move your next project A Step Ahead.

OpenBrIM Platform
booth 1450
Hauppauge, N.Y.
ph: 212.991.8956
openbrim.org
OpenBrIM Platform provides cloud-based, all-inclusive, collaborative information modeling software designed to seamlessly integrate with your everyday work-flow. OpenBrIM Platform includes fully parametric detailed 3D modeling, advanced 3D finite element analysis, powerful structural design modules, 2D/3D drawing generation, mapping, inspection management, health monitoring, document management and more. OpenBrIM offers a truly integrated, enterprise level Information Modeling (BIM/BrIM) platform for the AEC industry.

Ovation Services, LLC
booth 1151
Copley, Ohio
ph: 330.400.2833
www.4ovation.com
Ovation Services is a leading provider of engineering services. Combining experience, technology and a client-centric approach, Ovation Services provides Structural Steel Detailing, Connection Design and BIM Services across the United States. The Acquisition of MMW, Inc. a detailing firm with over 30 years experience in the steel industry, gives Ovation Services a talented project management team to ensure a quality product. Strong leadership, global resources and U.S. based checking uniquely qualify Ovation to be your preferred partner.

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

Pacific Stair Corporation
booth 1635
Salem, Ore.
ph: 503.390.8305
toll free: 800.477.8247
www.pacificstair.com
Pacific Stair Corporation, a leader in advanced stair system technology, has been located in Salem, Oregon for over thirty years. Pacific Stair develops, manufactures, and provides a stair system that meets or exceeds current international building codes. Our stair systems are engineered to make the most efficient use of materials and labor, reducing costs and improving delivery times. Our customers know that we care about their schedule and required delivery dates.

Pan Gulf Technologies Pvt., Ltd.
booth 1257
www.pangulftech.com

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

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

Peddinghaus Corporation
booth 611
Bradley, Ill.
ph: 815.937.3800
www.peddinghaus.com
Peddinghaus Corporation, headquartered in Bradley, Illinois, U.S., is an American manufacturer of CNC controlled equipment for the structural steel and heavy plate fabrication industries. With two manufacturing locations within the U.S., Peddinghaus focuses on providing highly innovative, and long lasting solutions to fabricators of all shapes and sizes. These solutions are designed to increase the production of steel components, and reduce costs for fabricators thus enhancing profitability. Beyond just machinery, Peddinghaus offers a 24 hour customer help line and consumables department.

PPG Protective & Marine Coatings
booth 1309
www.ppgpmc.com

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

PythonX, A Lincoln Electric Company
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www.pythonx.com
Lincoln Electric has combined the resources and expertise of several leading companies to expand the PythonX® product line to address every possible customer need. In addition to the PythonX STRUCTURAL, we are now offering PythonX PLATE, PythonX SPG, PythonX SPG+, and PythonX CARE. From round pipe to 3D processing of structural sections to 2D plate processing, we're the one source and the one partner you'll ever need.

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

Qualis Solutions, LLC
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www.qualissolutions.com

Quality Emphasis Steel Solutions
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Thane, Maharashtra
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www.qessindia.com

Qubatic Steel Detailing & BIM Services
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Aurangabad, Maharashtra
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ph: 91.98230.45476
www.qubatic.com
One of the fastest growing and ISO 9001:2015 certified engineering services company serving the steel industry from last 10 years. We had been working for our U.S. based clients in the domains of Estimation, structural steel detailing, connection design and BIM Services. We have a dedicated and passionate team of 70+ Engineers/Detailers with hands on experience on SDS/2, Tekla Structures, AutoCAD, and Revit. What makes us an ideal choice is our focused management system and technically sound Managers which ensure excellent quality control, timely, accurate and affordable detailing services.

QuickFrames USA
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www.quickframes.us

Radley Corporation
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www.radley.com
Radley's solution platform for the Steel Industry provides a variety of software options to integrate to your EARP/MP. Streamline and automate work flows with simplified barcode/RFID scans and reads while reducing errors with real-time data validations. Increase visibility to materials with Jobsite Tracking and Traceability while maximizing your workforce with Labor Tracking.

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

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

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

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Shop Data Systems, Inc.
booth 600
Richardson, Texas
ph: 972.494.2719
www.shopdata.com
Shop Data Systems (SDS) has been servicing the steel fabrication industry for more than 30 years with CAD/CAM software solutions. The system will import flat plate components directly from your structural design software. System features: imports file-embedded quantity and material; import multiple files in seconds; import DSTV or DXF files; machine tool paths are applied automatically; tools with or without piece mark; automatic shape nesting; chain cutting; common line cutting; automatic plate trim; personalized training and support; and remnant inventory tracking.

Short Span Steel Bridge Alliance
booth 1458
Washington, D.C.
ph: 202.452.7100
www.shortspansteelbridges.org
A group of bridge industry leaders, who have joined together to provide educational information on the design and construction of short span steel bridges up to 140 feet in length.

SidePlate Systems, Inc.
booth 1205
Mission Viejo, Calif.
ph: 949.238.8900
toll free: 800.475.2077
www.sideplate.com
At the 2020 Steel Show, SidePlate commemorates 25 Years of the industry's best moment frame designs by introducing the next level in SidePlate technology—it is exactly what the industry needs right now. SidePlate is a design optimization process that puts steel exactly where it is needed in a building. Our process reduces overall tonnage, minimizes required connections and accelerates erection times. The SidePlate team gets involved early and stays involved through the engineering, detailing, fabrication and erection phases to ensure a simple and successful project.

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Skidmore-Wilhelm
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SKM Industries, Inc.
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ph: 570.383.3062
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www.skmproducts.com
Established in 1980, SKM Industries, Inc. is a manufacturer of Super Met-Al Markers and Metal Pro Galvanized Steel markers, specially formulated to come completely off in the tank during the galvanizing process.

SlipNOT Metal Safety Flooring
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SOFiSTiK North America Corp.
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Soitaab USA, Inc.
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Since 1938, Soitaab has been a world leader in the manufacture of CNC Plasma, flame, Laser and Water Jet cutting machines. Soitaab's equipment offerings range from simple plug-and-play machines to highly engineered all-in-one heavy fabrication lines. Our machines can be equipped with several accessories such as drilling and taping units, surface and hole milling, bevel heads for welding prep, countersinking, marking, pipe and dome cutting, sophisticated handling systems and many others.

Southern Association of Steel Fabricators
booth 400
www.sasfonline.com
The Southern Association of Steel Fabricators, a not-for-profit corporation, incorporated for the purpose of promoting the use of Structural Steel and Allied Products, to meet and discuss better methods of design, shop practice, field practice, and any other appropriate matters of general interest to the Steel Fabricating Industry.

SRG Onesource, LLC
booth 1634
www.srgonesource.com

St. Louis Screw & Bolt
booth 1239
Madison, Ill.
ph: 314.389.7500
toll free: 800.237.7059
www.stlouisscrewbolt.com
Selling direct to structural steel fabricators, St. Louis Screw & Bolt is one of the oldest structural bolt manufacturers in the USA. Specializing in ASTM F3125 heavy hex and tension control structural bolts in grades A325/F1852/120ksi and A490/F2280/150ksi, types I and III, plain, mechanically galvanized, hot dip galvanized, F1136 and F2833 coatings. St. Louis Screw & Bolt also has a very large inventory of other construction fasteners including anchor bolts, weld studs, and concrete anchors just to name a few.

exhibitors

Stainless Structurals America
booth 1531
www.stainless-structurals.com
Stainless Structurals is a global producer and supplier of stainless steel structural shapes and special custom profiles. Our structural sections are available from stock in both 304/L and 316/L. We also offer profiles in other alloys, including duplex, straight from production. Our innovative Laser Fusion technology is certified to ASTM A-1069 and allows us to offer profile solutions where others cannot. Start with the Solution. Start with Stainless Structurals.

Steel and Pipe Supply
booth 1648
www.steelandpipe.com

Steel Deck Institute
booth 1748
Glenshaw, Pa.
ph: 412.487.3325
www.sdi.org
Founded in 1939, the Steel Deck Institute (SDI) is a trade association representing steel deck manufacturers and those manufacturing products used in conjunction with steel deck. The SDI actively publishes design manuals, develops standards for steel roof and floor deck, offers website tools, provides an industry standard EPD, offers educational opportunities, and supports research related to steel deck.

Steel Dynamics Structural and Rail Division
booth 1129
Columbia City, Ind.
ph: 625.625.8100
toll free: 866.740.8700
www.stld-cci.com
Steel Dynamics, Inc. is one of the largest domestic steel producers and metals recyclers in the United States based on estimated annual steelmaking and metals recycling capability, with facilities located throughout the United States and in Mexico. Steel Dynamics produces steel products, including hot roll, cold roll, and coated sheet steel, structural steel beams and shapes, rail, engineered special-bar-quality steel, cold finished steel, merchant bar products, specialty steel sections and steel joists and deck.

SDI Steel Dynamics®

Steel Erection Bid Wizard
booth 1711
www.steelestimatingsolutions.com

Steel Erectors Association of America
booth 1646
www.seaa.net

Steel Founders' Society of America
booth 1927
ph: 815.455.8240
www.sfsa.org
SFSA, akin to AISC, is a technical association. Members of SFSA are steel foundries who supply a range of cast steel products for demanding environments such as railroad, mining, construction, military, and nuclear. SFSA can assist you in utilizing steel castings for building construction. Steel castings offer performance, aesthetics, design freedom, and green manufacturing.

exhibitors

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Steel Joist Institute
booth 1560
Florence, S.C.
ph: 843.407.4091
www.steeljoist.org
The Steel Joist Institute (SJI), a nonprofit organization of active joist manufacturers and other organizations and companies connected to the industry, was founded in 1928 to address the need for uniform joist standards within the industry. Today, the Institute continues to maintain the standards for steel joist construction. In addition, the SJI provides educational opportunities for construction professionals utilizing a library of printed publications and both live and recorded webinars. We also offer assistance in identifying existing joists in buildings undergoing retrofit.

Steel Plate Akron/Atlanta
booth 651
Pendergrass, Ga.
ph: 888.894.8818
www.steelplate.us
Steel Plate Akron/Atlanta offers decades of experience with Steel Plate fabrication and production. We have a work force that is second to none when it comes to knowledge and expertise. We are known for our ability to cut heavy A36 and A572-50 up to 22 in. thick, giving us the name of the "Heavy Weights" of the Steel Market. Outside of the shop and into the office, our administrative and sales team boasts a combined experience of over 20+ years in the Steel Industry. Relationships are founded on meeting deadlines, supplying superior product and competitive pricing.

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www.steelplus.com

Steel Projects Corp.
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Steel Studio, Inc.
booth 1753
www.steelconnectionstudio.com

Steel Tek Unlimited
booth 1442
Eden Prairie, Minn.
ph: 612.258.7531
www.steelteku.com
Steel Tek Unlimited is a leading-edge company in the steel industry that specializes in customizing CAD programs and offers steel detailing to fit your needs. We are proud to say that all of our work is done in the U.S. with an experienced team of people from the Bridge, Industrial and Commercial industries who understand today's construction market.

Steel Tube Institute
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www.steeltubeinstitute.org

Steelweb, Inc.
booth 1558
Coral Springs, Fla.
www.steelweb.com
Steelweb Inc. has offered comprehensive steel detailing services for over 25 years. Based in Florida the company specializes in 3D detailing of medium to large industrial and commercial projects such as schools, hospitals, offices, with the occasional small scale jobs or difficult revamps. Our Mission is to deliver the highest quality, error-free shop and erection drawings in a timely and efficient manner. Our team of 50 engineers and detailers provide the best services including project management, BIM coordination, connection design and estimating. We work with both Tekla and SDS/2 software.

Strand7 Pty, Ltd.
booth 1539
www.strand7.com

Stronghold Coating Systems
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Structural Bolt and Manufacturing, Inc.
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Structural Engineering Institute of ASCE
booth 1527
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www.asce.org/sei
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Structural Stability Research Council
booth 1642
Chicago, Ill.
ph: 312.670.7015
www.ssrcweb.org
The Structural Stability Research Council is a technical organization that focuses on the state-of-the-art understanding of the impact of stability related issues on the analysis, design, and behavior of metal structures. SSRC is comprised of engineers, educators, and industry members with an interest in stability related issues.

STRUMIS, LLC
booth 1215
Collegeville, Pa.
ph: 610.280.9840
www.strumis.com
STRUMIS, LLC is the world's leading developer of steel fabrication management software. The most comprehensive and powerful end-to-end solution available to fabricators globally, the result of this is that we now operate in over 50 countries. Our products, which include steel estimating, fabrication information and production management, and project collaboration tools work seamlessly with third party software and have consistently transformed our customers business within the structural steel construction supply chain.

Stubbs Engineering, Inc.
booth 1934
Las Cruces, N.M.
ph: 575.993.5228
www.stubbseng.com
Stubbs Engineering, Inc. is a full service structural engineering firm specializing in providing creative, economical structural designs that provides our clients with the aesthetics they desire at the most cost efficient means possible. Our vast experience in both design and construction methods gives our firm the unique ability to provide our clients with a level of service beyond that of our competition. We work diligently to ensure our clients receive the best structural designs, communication, cost awareness, and project management possible.

Sugar Steel Corporation
booth 1622
Chicago Heights, Ill.
ph: 708.757.9500
www.sugarsteel.com
Sugar Steel Corporation has been in business since 1966 serving our customers with exceptional service. Here at Sugar Steel we pride ourselves in our own ability to develop and establish long lasting partnerships with our customers. Our ability to save you time and money is something we pride ourselves on each and every day. Supplying stock material is easy and is what all service centers do daily. At Sugar Steel we can also supply stock material, but we believe in first stage processing. First stage processing has been the key to our continued growth and success since 1966.

Sumter Coatings, Inc.
booth 1831
Sumter, S.C.
ph: 803.481.3400
toll free: 888.471.3400
www.sumtercoatings.com
Sumter Coatings is a manufacturer of premium industrial and specialty coatings, with a strong emphasis on corrosion resistant primers, intermediates and topcoats for structural and miscellaneous steel. Sumter Coatings is dedicated to producing coatings that protect, beautify, renew and extend the life of our customer's assets while meeting or exceeding the stringent specifications required by today's architects and engineers.

Taylor Devices, Inc.
booth 1345
North Tonawanda, N.Y.
ph: 716.694.0800
www.taylordevices.com
Taylor Devices is the world leading manufacturer of Fluid Viscous Dampers, Lock-up Devices, Shock Transmission Units, Shock Absorbers, Cable Dampers and custom Tuned Mass Damping systems. These devices and systems can be used to protect building and bridge structures from the devastating vibrations caused by earthquakes, wind, hurricanes and other vibrational disturbances.

TDS Industrial Services, Ltd.
booth 1535
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Canada
ph: 604.599.1570 ×10
www.tdsindustrial.com
TDS is celebrating its 40th business anniversary with a renewed vision on how to service its steel fabrication customers by providing exceptional value through risk management that adds elements of certainty and confidence.

Techflow, Inc.
booth 1347
www.techflowengg.com

Tectonix Steel, Inc.
booth 1157
www.tectonixsteel.com

Terracon Consultants, Inc.
booth 1647
Olathe, Kan.
toll free: 800.593.7777
www.terracon.com
Terracon is a 100 percent employee-owned consulting engineering firm that has provided quality engineering services to clients since 1965. From its roots in geotechnical engineering, Terracon has evolved into a successful multidiscipline firm specializing in environmental, facilities, geotechnical, and materials services for private and public sector clients. Terracon currently provides services in all 50 states with more than 4,500 employees and ranks 24th on Engineering News-Record's list of the Top 500 Design Firms.

TFe Connection
booth 1714
Portland, Ore.
ph: 503.841.2643
www.tfeconnection.com
TFe Connection is a direct mill representative company who supports North American fabricators with high quality, custom built up sections. We individually roll our plate orders to each projects requirement, and use our Submerged Arc Welding lines to build up a variety of bespoke members such as WWFs, Boxes, Castellated beams, Plate Girders, and more. We handle any complex shipping logistics and our lead times are unmatched. We take pride in our quality and make sure meticulously check each project and provide a full suite of supporting documents and full traceability. AWS D1.8 DCW available.

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

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MEMBER NEWS

New Hampshire Governor Visits AISC Member Fabricator

New Hampshire Governor Chris Sununu showed his support for American-made fabricated steel during a recent visit to Novel Iron Works. Governor Sununu spent time with workers and their families at Novel's holiday luncheon and toured the plant.

Novel Iron Works is a third-generation, family-owned company that, along with sister company Rose Steel, employs 140 American workers, part of the 115,000 fabricated steel jobs nationwide. The Governor's visit isn't the only cause for celebration at Novel Iron Works, which was recently named one of the top women-led New Hampshire businesses.

"We were honored to have Governor Sununu join us at Novel Iron Works for our holiday luncheon and have him meet with our workers and their families," said Hollie Noveletsky, CEO of Novel Iron Works. "As one of New Hampshire's top women-led businesses, Novel Iron Works plays an essential role in the construction of America's critical infrastructure. With more than 115,000 fabricated structural steel jobs across the United States, facilities like ours are truly the backbone of local communities in New Hampshire and beyond."

"It was a great privilege to meet with New Hampshire's fabricated structural steel workers yesterday at Novel Iron Works," said Governor Chris Sununu. "Novel Iron Works serves as a jobs engine for our entire state. What Hollie and her team have built in Greenland is a New Hampshire success story—and something we are all proud of."

The visit came during a critical moment for America's fabricated structural steel industry, which has been injured by a surge of unfairly traded imports from China, Canada, and Mexico—resulting in almost $4 billion in lost sales and revenue since 2015. The industry, which supports hundreds of thousands of jobs across the country, filed trade cases earlier this year to stem the injury caused by these imports. Final determinations are due in January 2020.

"In September, Commerce issued its preliminary determinations, with troubling results," said AISC Director of Communications & Public Affairs Brian Raff. "The Canadians and some of China and Mexico's biggest offenders got a free pass to dump and subsidize fabricated steel into the United States with no penalty. If these results don't change for the final determination, fabricators in New Hampshire and across the country are at risk."

The domestic fabricated structural steel industry consists of approximately 1,700 employers throughout the country, many of which are small, family-owned businesses servicing local construction markets. The industry directly supports 115,000 jobs in fabrication and hundreds of thousands more suppliers, designers, and construction professionals and their families. Fabricated structural steel manufacturers play an essential role in the construction of America's critical infrastructure, serving as the intermediary between steel mill producers and construction projects.

Novel president Josh Noveletsky (left) and N.H. Governor Chris Sununu (right) at Novel's shop.

People and Companies

- **Margaux Burkholder, SE, PE**, has joined **Walter P Moore's** Los Angeles structures practice as a senior associate. She specializes in seismic retrofit and performance-based design projects and has worked on a variety of project types including multi-family residential, commercial, mixed use, and retail. In addition, she is actively involved in the Women in SE committee of the **Structural Engineers Association of Southern California (SEAOSC)** and the **National Association of Women in Construction (NAWIC)**.

- **Thornton Tomasetti** has launched **Beacon**, an embodied carbon measurement tool designed to provide structural engineers with the ability to measure embodied carbon, allowing for more informed decisions throughout the design process. An **Autodesk Revit** plugin, Beacon was developed through Thornton Tomasetti's **CORE studio**, a firm-wide virtual incubator focused on innovation through computational modeling and research. "We decided to make Beacon an open-source and easy-to-use tool, so it can be shared at a global scale," said **Robert Otani, PE**, principal and chief technology officer at Thornton Tomasetti. "We hope this unique and comprehensive tool will push the industry forward into developing innovative strategies that result in more sustainable and efficient structures." (Otani is the speaker for the upcoming NASCC: The Steel Conference session "Artificial Intelligence: The New Frontier in Structural Design." Find out about it in the Advance Program—and register for the conference—at **aisc.org/nascc**.) You can download Beacon at **core.thorntontomasetti.com**.

news & events

SSBC

2020 AISC Student Steel Bridge Competition Regional Events Kick Off

Nearly 200 university teams are expected to participate in the 2020 AISC Student Steel Bridge Competition (SSBC). And SSBC Regional Events—18 in all—will soon be under way, taking place throughout March and April. Approximately 40 teams, comprised of the top few finishers from the regional competitions, will move on to the 2019 National Finals, hosted by Virginia Tech in Blacksburg, Va., on May 22–23, 2020.

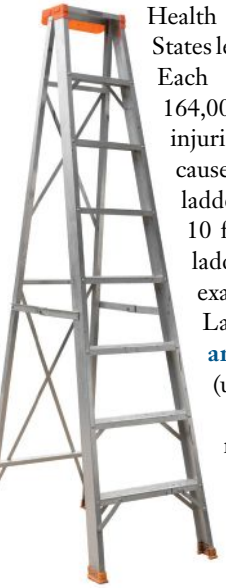
The annual competition challenges student teams to design and fabricate a scale-model steel bridge, then assemble it as quickly as possible; the bridges are also load tested and weighed. Each bridge must span approximately 20 ft, carry 2,500 lb and meet all other specifications of the competition rules. Bridges are judged not only on the structural requirements and construction speed, but also on aesthetics and economy.

Visit **aisc.org/ssbc** for more information on the competition including rules, regional event locations, volunteer and sponsorship opportunities, and more.

safety matters

Welcome to our first monthly Safety Matters section, which highlights various safety-related items. This month's edition focuses on ladders, poison, hazard communication, fall protection, and a safety session at NASCC: The Steel Conference.

Monthly AISC Safety Committee Notes



Ladders. According to the World Health Organization, the United States leads the world in ladder deaths. Each year, there are more than 164,000 emergency room-treated injuries and 300 deaths in the U.S. caused by falls from ladders. Most ladder deaths are from falls of 10 ft or less. There are plenty of ladder safety tips out there. For example, see the list of Basic Ladder Safety advice at **www.americanladderinstitute.org** (under the Safety & Training tab).

Also, the design requirements for fixed ladders changed recently, and any fixed ladders that you add to your operation must meet new the requirements. One of the main requirements: Fall-arrest systems replace cages for new fixed ladders.

AISC presented a webinar on ladder safety, "One Rung at a Time," in March 2018 (you can access it via the Safety Webinars link at **aisc.org/safety**).

And remember, "While on a ladder, never step back to admire your work!"

Poisons. Poisons are all around us and can affect anyone, anywhere, at any time of life. Protect yourself and others from being poisoned by learning what a poison is, who is at risk, and how to prevent a poisoning from happening. In 2008, 2.5 million people called a poison center because someone had been exposed to a poison. Children under age six accounted for half of all human poison exposures reported to poison centers. However, adults are also at risk. That year, more than three-quarters of all poisoning deaths reported to poison centers occurred among people ages 20 to 59.

Hazard communication. The OSHA Standard for Hazard Communication is 1910.1200. The purpose of this section is to ensure that the hazards of all chemicals produced or imported are classified, and that information concerning the classified hazards is transmitted to employers and employees. The requirements of this section are intended to be consistent with the provisions of the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Revision 3. The transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, safety data sheets and employee training. While there is much more to the regulations two requirements that can be problematic are assuring that Safety Data Sheets are available to employees and assuring that secondary containers are properly labelled.

Fall protection. The OSHA Standard for Fall Protection is 1926 501. Some form of fall protection appears on the list of frequent citations multiple times. This may be appropriate because falls are such a significant hazard in construction.

Safety at The Steel Conference

A this year's NASCC: The Steel Conference, taking place April 22–24 in Atlanta (**aisc.org/nascc**), Vicki O'Leary and Kathy Dobson will present "Work is Making Me Sick," a discussion of health in the workplace. We've all been sick of work, but it can be a real issue when the things we expose our workers to make them sick. The costs associated with worker illness and workers compensation can make or break a company, depending on how they are managed. Fabrication shops and general office settings are full of hidden hazards that affect worker well-being and can impact the bottom dollar, from paints and solvents to an environment that is not conducive to a welcoming and safe work culture. This session will look at some of the more obvious hazards we expose our workers to, and also review other less common issues. This presentation will be helpful for people who work in offices as well as those who manage steel fabrication and erection facilities.

Dates to Note

- March is Ladder Safety Month. Find out more at **www.laddersafetymonth.com**.
- National Poison Prevention Week is March 15–21, 2020. Find out more at **poisonhelp.hrsa.gov**.

Management Challenge

Have you looked at your Safety Data Sheets recently to see that your employees have all the information they need for the various hazards they are exposed to? Email **safety@aisc.org** and tell us the most recent change to your safety program.

NASCC

Extraordinary Speakers Highlight NASCC: The Steel Conference

If you're involved with designing or constructing of steel buildings or bridges, NASCC: The Steel Conference is the premier opportunity to immerse yourself in the latest design concepts, construction techniques and cutting-edge research while engaging with thousands of industry professionals. Taking place April 22–24 in Atlanta, it will offer around 200 sessions on topics ranging from properly specifying welds to connection design to tackling the skilled trade shortage.

The conference also features an extraordinary keynote speaker on each day:

On Wednesday, Gerry O'Brion will share "What Big Brands Know." O'Brion is a strategy and branding expert who has worked on several (very) big brands—including Procter and Gamble, Coors Brewing Company, Quiznos, and Red Robin—and has distilled that experience into a framework that will challenge your thinking about why customers buy and how they make referrals. He will provide insight on how to create disruptive strategies and messaging to attract your ideal customers and how to leverage change to create unique competitive advantages that make you the clear choice.

For more than half a century, James M. Fisher, PE, PhD, has been the steel design industry's leading pragmatist. Whether designing an industrial facility or leading AISC's specification efforts, Jim has been the go-to person for practical advice on both design and constructability. His "Keys for Successful Designs: Quips and Myths" Thursday keynote presentation will highlight what he has learned about how to create successful designs. These items are not calculations and analysis methods, but rather how to use good judgment and consider the needs of the structural team members (engineers, steel detailers, steel fabricators, erectors, material suppliers) and the owner.

Friday's keynote presentation is this year's T.R. Higgins Lecture on "Gusset Plates: The Evolution of Simplified Design Models." This year's Higgins Lecturer, Bo Dowswell, PE, PhD, with ARC International, LLC, will include a brief history of gusset plate design methods and discuss their evolution over the last century. Bo will also examine current design provisions, where column and beam models are used to predict the strength of gusset plates in various configurations, including wrap-around gusset plates. The presentation will conclude with a preview of a new method to predict the compression strength of gusset plates using notional loads.

To register for the conference and peruse the Advance Program, visit **aisc.org/nascc**.


O'Brion


Fisher


Dowswell

CONSTRUCTION MARKET

Construction Employment Ends 2019 on High Note

Construction employment increased by 20,000 jobs in December and by 151,000, or 2%, in all of 2019, according to an analysis of new government data by the Associated General Contractors of America (AGC). Association officials noted that its recent survey found three out of four contractors expect to keep adding workers in 2020, but even more respondents found it difficult to fill positions in 2019, and a majority anticipate it will be as hard or harder to do so in 2020. Officials called on the federal government to increase funding for career and technical education and expand employment-based immigration for workers whose skills are in short supply.

"More than four out of five respondents to our survey said they were having a hard time filling salaried or hourly craft positions in 2019," said Ken Simonson, AGC's chief economist. "Nearly two-thirds of the firms say that hiring will be hard or harder this year. In light of those staffing challenges, costs have been higher than anticipated for 44% of respondents and projects took longer than anticipated for 40% of them. As a result, 41% of respondents have put higher prices into their bids or contracts and 23% have put in longer completion times."

Association officials said the optimistic outlook for projects depends on having an adequate supply of qualified workers. The officials urged the Trump administration and Congress to double funding for career and technical education over the next five years, pass the JOBS Act to expand opportunities for students seeking alternatives to college, and enable employers who demonstrate an unfilled need for workers to bring them in from outside the U.S.

"Construction can play a major role in sustaining economic growth, but only if the industry has an expanding supply of both qualified workers and new entrants to replace retirees," said Stephen E. Sandherr, AGC's CEO. "Construction firms are working hard to overcome labor shortages, but federal officials must do their part by adequately funding career and technical education, making it easier for students to qualify for loans for short-term technical education programs and putting in place needed immigration reforms."

marketplace & employment

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QMC **Contract Auditor**

Quality Management Company, LLC (QMC) is seeking qualified independent contract auditors to conduct site audits for the American Institute of Steel Construction (AISC) Certified Fabricators and Certified Erector Programs.

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

Contract auditors must have knowledge of quality management systems, audit principles and techniques. Knowledge of the structural steel construction industry quality management systems is preferred but not required as is certifications for CWI, CQA or NDT. Prior or current auditing experience or auditing certifications are preferred but not required. Interested contractors should submit a statement of interest and resume to **contractor@qmconline.org**.

LATE MODEL STRUCTURAL STEEL FABRICATING EQUIPMENT

Peddinghaus AFCPS 833A Revolution CNC Anglemaster Angle Line,
8"x 8"x 1", Fagor 8055 CNC, Loader, Conveyor, 2011 **#29959**

Peddinghaus Anglemaster AFPS-643E CNC Angle & Flat Bar Line,
6"x 6"x 1/2", 200 T Shear, 66 T Punch, Fagor 8025, 40' Conveyor **#30325**

Voortman V806M Robotic Structural Plasma Coping System,
6-Axis Panasonic Robot, HPR400XD Plasma, Conveyor, 2009 **#30451**

Roundo Model R-13-S Section Bending Machine,
8"x 8"x 1.25" Leg In, 31.5" Dia Rolls, 105 HP, Universal Rolls **#29237**

Ficep Excalibur 12 CNC Single Spindle Traveling Column Drill,
47" x 47" Max Beam, 50' Travel, 25 HP, PC Based CNC, 2014 **#30557**

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BIG, BLUE

WHEN IT RAINS, it pours.

And when it rains on the new vibrant blue canopy for the entrance to the Chicago Transit Authority's (CTA) Belmont Station in the Avondale neighborhood on Chicago's Northwest Side, the effect is that of a waterfall.

This is the exact intent of Ross Barney Architects and Simpson Gumpertz and Heger, whose design for the canopy was inspired by a waterfall from the bygone nearby Olson Park. The project is the most visually stunning element of CTA's ongoing initiative to re-envision and improve 14 stations along the train system's Blue Line.

EXP completed the structural work under the Walsh Group's design-build construction team, and steel was fabricated by AISC member King Fabrication. The canopy's structure is formed by five petal-shaped, architecturally exposed structural steel (AESS) frames that cantilever 68 ft over the station's plaza and 28 ft in the other direction. The primary framing members that form the outline of the petals are built-up rectangular tube sections, which support hollow structural section (HSS) purlins that connect to the blue polycarbonate panels. The petals frame into a horizontal spine at the low point of the slope with custom castings supported on three 38-in. steel-encased concrete pipe columns, which conceal the drainage downspouts. In addition, cast steel nodes provided by AISC member Cast Connex navigate the complicated moment connections where the petal loops meet the spine, as a means to adequately resist the forces, simplify construction, and meet aesthetic requirements. ■

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