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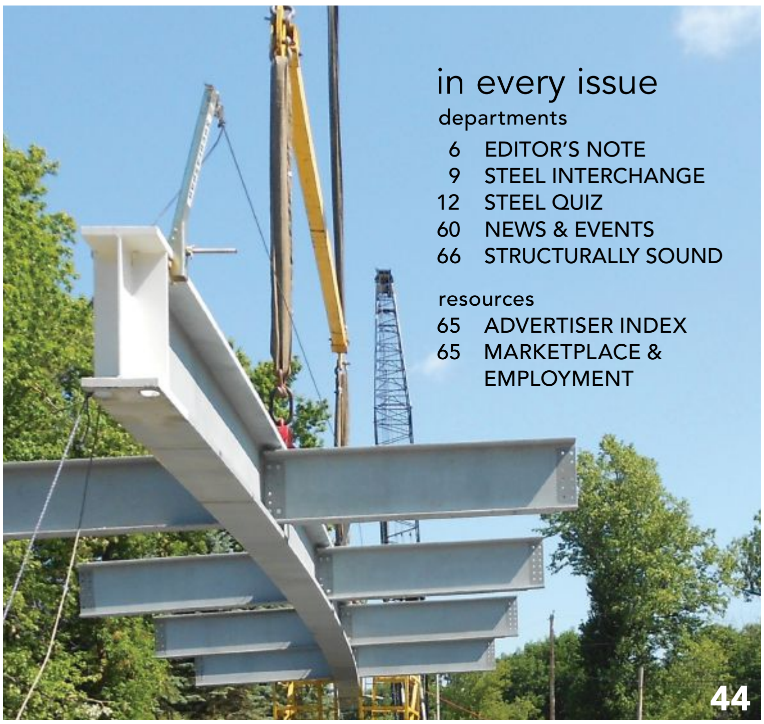

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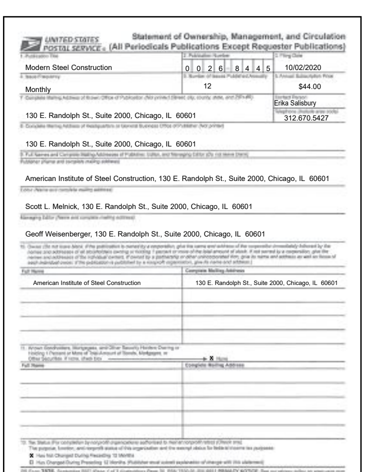

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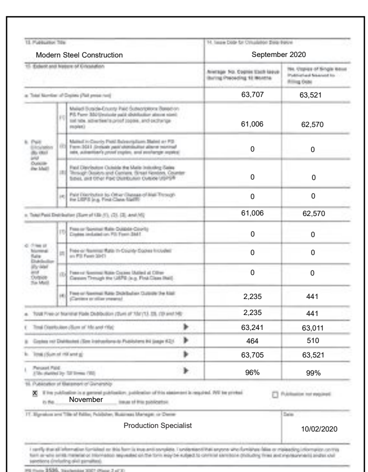

Modern Steel Construction | September 2020

a.	63,707	63,521
b. (1)	61,006	62,570
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b. (4)	0	0
c.	61,006	62,570
d. (1)	0	0
d. (2)	0	0
d. (3)	0	0
d. (4)	2,235	441
e.	2,235	441
f.	63,241	63,011
g.	464	510
h.	63,705	63,521
i.	96%	99%

X November

Production Specialist | 10/02/2020

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ON THE COVER: Hoodoo you think you are? The Hoodoo high-rise is one of this year's winning Steel Design Student Competition (SDSC) designs. To read about and see amazing renderings of all the winners, turn to page 24.

MODERN STEEL CONSTRUCTION (Volume 60, Number 11) ISSN (print) 0026-8445: ISSN (online) 1945-0737. Published monthly by the American Institute of Steel Construction (AISC), 130 E Randolph Street, Suite 2000, Chicago, IL 60601. Subscriptions: Within the U.S.—single issues $6.00; 1 year, $44. Outside the U.S. (Canada and Mexico)—single issues $9.00; 1 year $88. Periodicals postage paid at Chicago, IL and at additional mailing offices. Postmaster: Please send address changes to MODERN STEEL CONSTRUCTION, 130 E Randolph Street, Suite 2000, Chicago, IL 60601.

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editor's note

Recently, I marveled that Tesla had a valuation greater than GM and Ford combined. Thanks to having way too many friends with MBAs, I heard countless lectures on future opportunities and comparisons to Apple and Amazon in the 1990s.

And I can understand these arguments. A couple of years ago, the late, great John Bailey from Prospect Steel let me drive his Tesla Model S. It was a fantastic experience. From the elegant yet extensive controls to the amazing automation to the incredible acceleration, it was unlike any driving experience I've had before or since. But it's not just the quality of the vehicles; it's the belief that clean cars are the future of driving, and Tesla's battery technology is unsurpassed.

The key, of course, is electricity. If all of our electrical generation came from coal-fired power plants, we wouldn't be having this discussion. Fortunately, our electrical grid has shifted to natural gas and is increasingly moving to sustainable and renewable energy sources like wind and solar.

Similar conversations are important in the built environment. When you look at the three major structural materials (steel, concrete, and wood), each has its Achilles heel. For concrete, the biggest problem is CO_2 emissions from cement production (a secondary issue is the energy needs of cement trucks, which must idle at construction sites). For wood, the problem is deforestation (remember, only a small percentage of forests are sustainably managed). There's also the issue of disposal (when structural wood reaches the end of its service life, it's typically either incinerated or landfilled; both practices release all of the carbon back into the atmosphere). And for steel, it's the energy required in the steel-making process. However, in the U.S., 100% of our wide-flange production comes from electric arc furnaces. And on average, domestically produced structural steel contains around 93% recycled content (we think of structural steel as a renewable resource since old steel is simply recycled into new steel with no loss of material properties).

Because steel's carbon footprint is directly related to the electrical grid, the steel industry has greatly benefited from the move from coal-fired power to natural gas. And as we produce more and more of our electricity using renewable resources, steel's carbon footprint will continue to shrink.

At the same time, the productivity of steel manufacturing and fabrication continues to increase. If you've never seen how steel is made or never visited a steel fabrication shop, I urge you to go to **aisc.org/vr** and check out our virtual reality videos. You can walk through a steel mill, an HSS producer, and a fabrication shop. You can use your computer, but for a better experience, spend five bucks and buy a cheap VR viewer that works with your phone (there are links to sources on the AISC website). Or, if your kid is really into gaming, borrow their VR headset (my son has an Oculus Rift, and watching the videos on it is unbelievably realistic).

Given the steel industry's emphasis on electricity and technology, I guess you can even call us the Tesla of modern construction materials.

Scott Melnick
Editor

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

steel interchange

*All mentioned AISC codes and standards, unless noted otherwise, refer to the current version and are available at **aisc.org/specifications**. Design guides can be found at **aisc.org/dg**.*

Top Flange Steel Bracing

I am currently trying to determine whether bare metal deck would be sufficient to brace a wide-flange beam. Can you provide any guidance? How would I determine the required brace force to check the metal deck?

Metal decking can often provide sufficient bracing when constructed as a diaphragm. The 15th Edition AISC *Steel Construction Manual* states, on page 2-16: "In general, adequate lateral bracing is provided to the compression flange of a simple-span beam by the connections of infill beams, joists, concrete slabs, metal deck, concrete slabs on metal deck, and similar framing elements."

The required strengths and stiffnesses for beam stability bracing are specified in the 2016 AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360). In this case, Appendix 6 Section 6.3.1a is applicable. The available strength and stiffness of the diaphragm can be calculated with the Steel Deck Institute's (SDI) *Diaphragm Design Manual*. Further information is available in the March 2008 *Journal of Structural Engineering* ASCE article "Shear Diaphragm Bracing of Beams II: Design Requirements," which provides a method to estimate the fastener loads and the required strength and stiffness of the diaphragm.

Bo Dowswell, PE, PhD

Acceptable Weld Profile

A welding inspector has asked us to indicate the required convexity for a complete-joint penetration (CJP) weld on a project. I did not think that there was a specific convexity requirement, as I believe that a CJP weld could be specified to be ground smooth and still be considered a CJP weld. Are you aware of any convexity requirement for CJP welds?

This is addressed in both Chapter N of the AISC *Specification* and AWS D1.1/D1.1M:2020. Table N5.4-3 in the AISC *Specification* lists inspection tasks after welding, and one item requires welds to meet visual acceptance criteria, including the weld profile. This table uses information from Clause 5.23 of the 2015 AWS D1.1, which in turn refers to AWS Table 6.1 (the Commentary to *Specification* Table N5.4-3 provides all of the 2015 AWS D1.1 references). In addition, the 2020 Edition of AWS D1.1 addresses weld profiles in Clause 7.24, stating: "All welds shall meet the visual acceptance criteria of Tables 8.1 or 10.15, and shall be free from cracks, overlaps, and the unacceptable profile discontinuities exhibited in Figure 7.4, Table 7.8, and Table 7.9, except as otherwise allowed in 7.23.1, 7.23.2, and 7.23.3."

Tables 7.8 and 7.9 address the profiles of groove (CJP or PJP—partial-joint penetration) welds, including allowable convexity or concavity. Note that the 2020 D1.1 version revised section locations from what is shown in the *Specification* Commentary.

Carlo Lini, PE

Shear Stiffness Reduction

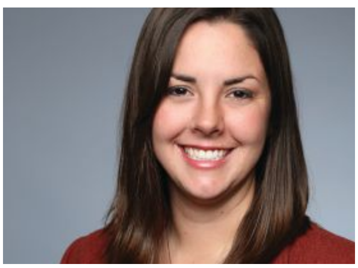
According to Chapter C of the AISC *Specification*, the direct analysis method includes requirements for applying stiffness reduction factors. Do these reductions apply to shear stiffness as well?

Section C1 states: "Stability shall be provided for the structure as a whole and for each of its elements. The effects of all of the following on the stability of the structure and its elements shall be considered:… (d) stiffness reductions due to inelasticity, including the effect of partial-yielding of the cross section, which may be accentuated by the presence of residual stresses…" Any method, including the direct analysis method, must account for this and must consider this relative to all stiffnesses, which can contribute to the stability of the member (or the structure as a whole). Note that it is possible to consider this effect while not explicitly including it in the calculations. A decision to do so must be based on engineering judgment.

Also, Section C2.3 (a) states: "A factor of 0.80 shall be applied to all stiffnesses that are considered to contribute to the stability of the structure. It is permissible to apply this reduction factor to all stiffnesses in the structure." "All stiffnesses" includes shear stiffnesses "that are considered to contribute to the stability of the structure."

AISC Design Guide 28: *Stability Design of Buildings* states: "It is suggested that all steel member properties contributing to the elastic stiffness be multiplied by 0.8 with the exception of member flexural rigidities, which should be multiplied by $0.8\tau_b$ [τ_b is the Stiffness reduction parameter]. This includes connections, panel zones, diaphragms, column bases, and member shear stiffnesses. Uniform application of this stiffness reduction to all the structural components, including leaning columns, is most consistent with the fundamental basis of the D.M. [direct analysis method] and avoids possible anomalies in the analysis results such as false differential column axial deformations."

Larry Muir, PE



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STEEL SOLUTIONS CENTER

Steel Interchange is a forum to exchange useful and practical professional ideas and information on all phases of steel building and bridge construction. Contact Steel Interchange with questions or responses via AISC's Steel Solutions Center: 866.ASK.AISC | **solutions@aisc.org**

The opinions expressed in Steel Interchange do not necessarily represent an official position of the American Institute of Steel Construction and have not been reviewed. It is recognized that the design of structures is within the scope and expertise of a competent licensed structural engineer, architect or other licensed professional for the application of principles to a particular structure.

The complete collection of Steel Interchange questions and answers is available online at **www.modernsteel.com**.

Castellated Beam Fabrication

My fabrication shop would like to bid on a project with castellated beams. Is there a licensing fee involved with fabricating these types of beams?

Castellated and cellular beams are non-proprietary systems, and fabricators are not required to pay a licensing fee to produce them. AISC's Design Guide 31: *Castellated and Cellular Beam Design* is an excellent source of information on designing castellated beams. Keep in mind that while any fabricator can make these types of beams, some may not find the process very straightforward. The production requires exact cutting, warpage control, fitting, and welding of the pieces back together.

Jennifer Traut-Todaro, SE

End-Loaded Connections with Multiple Faying Surfaces

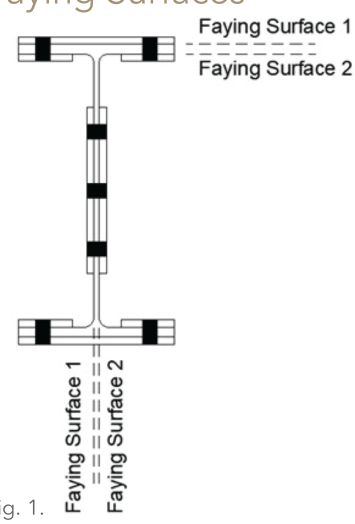

Fig. 1.

I am confused by note [b] in Table J3.2 in the AISC *Specification*, which states: "For end-loaded connections with a fastener pattern length greater than 38 in. (950 mm), F_{nv} shall be reduced to 83.3% of the tabulated values. Fastener pattern length is the maximum distance parallel to the line of force between the centerline of the bolts connecting two parts with one faying surface." In Figure 1, I am designing a connection for a member that is axially loaded with multiple faying surfaces at both flanges and the web locations. Does this mean that the requirement addressed in note [b] is not applicable, since there is more than one faying surface?

Note that note [b] in Table J3.2 is specific to end-loaded connections, which apply to members that are subject to axial loading through one or more rows of bolts. Figure C-J3.1 in the Commentary to the *Specification* provides examples of end-loaded and non-end-loaded connections, including the fastener pattern length, l_{pl} (see Figure 2). The fact that there are two faying surfaces (bolts in double shear) does not mean that these limits can be ignored. The bolts are "connecting two parts [at each] faying surface." The length will be measured at each faying surface. Therefore, the requirement stated in note [b] of Table J3.2 is still applicable.

Larry Muir, PE

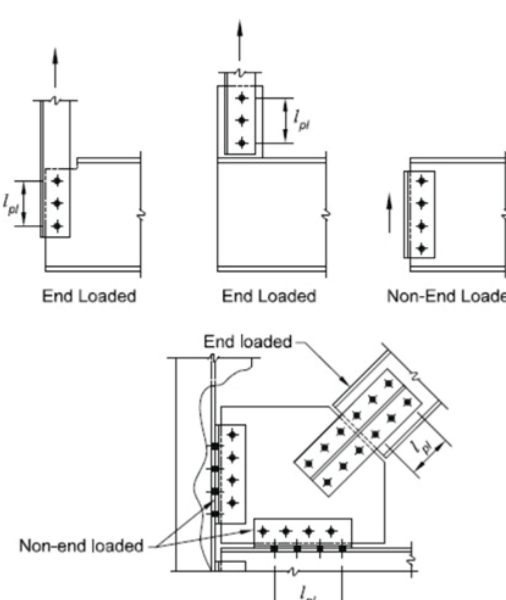

Fig. 2.


Tekla PowerFab
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steel quiz

This month's Steel Quiz is all about connections.

If you need some help connecting with the answers, we suggest you consult the 15th Edition AISC *Steel Construction Manual* and the 2016 AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360). Both are available at **aisc.org/publications**.

And many thanks to Lutfur Khandaker, PE, of KBK Structural Design, LLC, and Raunac Khandaker of Parsons Corporation, who contributed this month's questions and answers!

1 **True or False:** It is required that the minimum length of a simple shear-framed connection be half the T-dimension of the beam to be supported.

2 **True or False:** For erection safety purposes, at least one bolt must be placed in each beam end of a typical shear connection.

3 **True or False:** Fillet encroachment (riding the fillet on the beam) is not allowed.

4 **True or False:** High-strength slip-critical bolts are permitted to share the load with existing rivets in both new work and structural alterations.

5 **True or False:** Bolts shall not be considered as sharing the load in combination with welds on a common faying surface.

6 **True or False:** Slip-critical connections shall be designed for bearing-type connection limit states.

7 **True or False:** Tests shall verify the nominal strength of special fasteners and all bolts.

8 **True or False:** When bolts or other fasteners in tension are attached to an unstiffened box or hollow structural section (HSS) wall, rational analysis shall determine the strength of the wall.

9 **True or False:** Groove-welded splices in plate girders and beams shall develop the nominal strength of the smaller spliced section.

10 **True or False:** Only the limit states of flexural yielding and flexural rupture govern the flexural strength of elements of members at connections and connecting elements, such as plates, gussets, angles, and brackets.

TURN TO PAGE 14 FOR THE ANSWERS

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

1 **False.** There is no requirement in the *Specification* or *Manual* for the minimum length (depth) of a simple shear connection to be one-half the T-dimension. The *Manual* provides the following recommendation on page 10-7: "It is recommended that the minimum length of simple shear framed connections be one-half the T-dimension of the beam to be supported. This provides for beam end stability during erection. When a beam is otherwise restrained against rotation about its longitudinal axis, such as is the case for a composite beam, the torsional end restraint is not critical."

2 **False.** Page 10-7 of the *Manual* states: "A minimum of two bolts (one bolt in bracing members) must be placed for erection safety per OSHA requirements."

3 **False.** Page 10-7 of the *Manual* states: "Note that the element (clip angle) may encroach upon the fillet(s), as given in Figure 10-3." This figure indicates how much the angle can encroach on the fillet.

4 **True.** In connections designed as slip-critical, high-strength bolts are permitted in combination with rivets. This is noted in *Specification* Section J1.10.

5 **False.** Bolts are permitted to share the loads with welds on common faying surfaces under certain conditions. Section J1.8 of the *Specification* states: "…in the design of shear connections on a common faying surface joint with combined bolts and where strain compatibility is considered." It also states: "…the strength of the connection need not be taken as less than either the strength of the bolts alone or the strength of the welds alone."

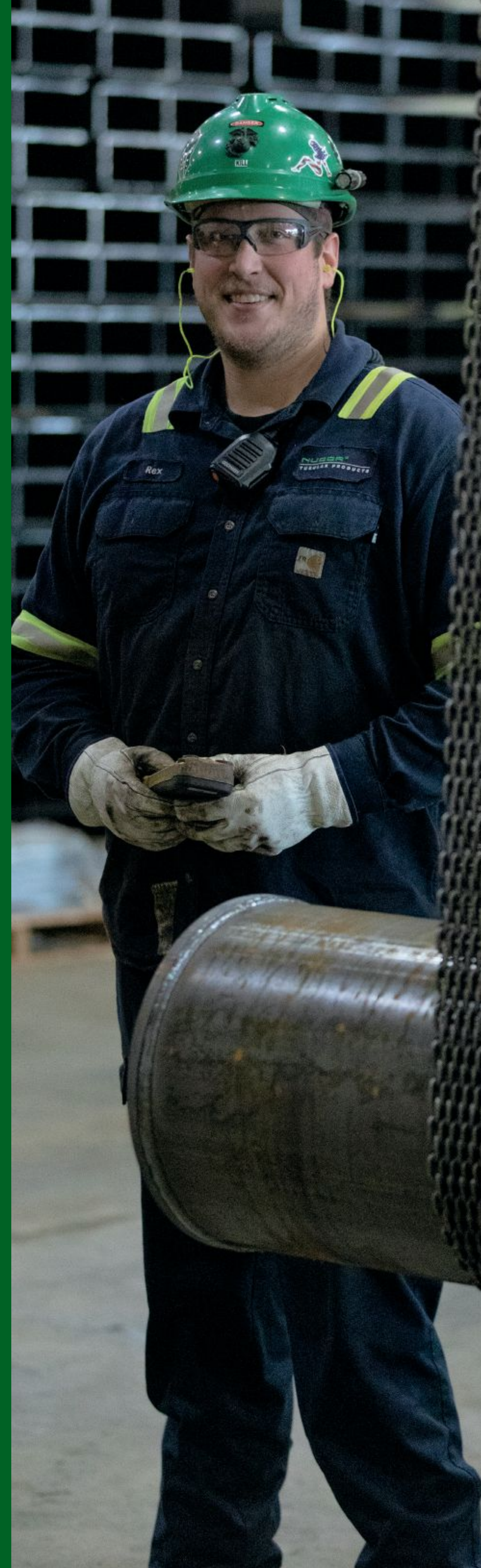
6 **True.** Section J3.8 of the *Specification* notes that slip-critical connections shall be designed to prevent slip and also for the limit states of bearing-type connections.

7 **False.** Section J3.11 of the *Specification* states that tests shall verify the nominal strength of special fasteners other than the bolts shown in Table J3.2.

8 **True.** The wall strength of fasteners at tension flanges of HSS members shall be calculated using rational analysis, as stated in Section J3.12 of the *Specification*.

9 **True.** This information is located in Section J6 of the *Specification*. Also, other types of splices in plate girder and beam cross sections shall develop the strength required by the forces at the point of the splice.

10 **False.** J4.5 of the *Specification* states: "The available flexural strength of affected elements shall be the lower value obtained according to the limit states of flexural yielding, local buckling, flexural lateral-torsional buckling, and flexural rupture."



steelwise

CAMBER CONSIDER-ATIONS

BY LAWRENCE A. KLOIBER, PE, AND SUSAN B. BURMEISTER, PE

A brief look at AISC's newest Design Guide, which focuses on factoring camber into your steel framing design.

Lawrence A. Kloiber (**larry.kloiber@lejeunesteel.us**) is a structural steel design and fabrication consultant to AISC member fabricator LeJeune Steel Co. He is a member emeritus of the AISC Committee on Specifications, the AISC Committee on the Code of Standard Practice, and the ASCE/SEI Committee on the Design of Steel Building Structures. He also currently serves on the AWS D1.1 Subcommittee D1Q on Steel.

Susan B. Burmeister (**susan@s2bstructural.com**) is the owner of S2B Structural Consultants, PLLC. She is a member of the AISC Committee on Specifications and its Task Committee 5 on Composite Design, and is a frequent contributor to *Modern Steel's* Steel Interchange column. Both are the authors of AISC Design Guide 36: *Design Considerations for Camber*.

BACK IN 1989, David Ricker made camber a household word.

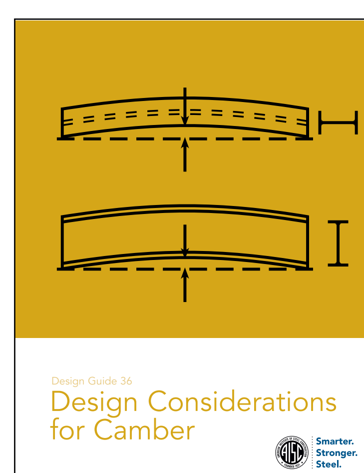
His Fourth Quarter AISC *Engineering Journal* paper from that year, "Cambering Steel Beams" (**aisc.org/ej**), is recognized as the first comprehensive document on inducing designed camber in wide-flange beams.

Now, more than three decades later, AISC's Design Guide 36: *Design Considerations for Camber* expands on Ricker's paper by including updated and more detailed information on the plastic deformations and residual stresses involved in the cambering process. Additionally, for those who don't fully understand the camber process, the guide discusses the difference between heat camber versus cold (mechanical) camber, and when each one is appropriate. Likewise, it dispels some longstanding myths, such as the one suggesting that camber can be "lost" during shipping.

The guide's primary focus, though, is on designing camber for composite floor beams to achieve acceptable levelness while also not overdesigning the steel framing. Floor levelness also depends on the method of placing and screeding the concrete, and the guide includes an appendix on this topic.

Design and Practice

The physical cambering of a member—i.e., bending it upward slightly in the middle—is relatively simple. Determining the amount of camber to specify for a level floor is the more challenging part because of all the variables involved. The new guide lists the key variables that can affect the dead load deflection of the beam and information to help designers make a judgment about their effect on the camber required for their specific project. It also discusses less apparent considerations that should be accounted for when using camber in beam design—e.g., variations between beams supported by columns versus those that are supported by beams only, the load distribution of slab weight between wet concrete in construction versus the final solid concrete, and compounded deflections. These topics, which affect all beams regardless of any level of camber, become more pronounced when the designer is attempting to use camber to provide more consistent framing elevations.



Even with plentiful information and advice, camber design is still an inexact science due to issues such as residual stresses in wide-flange beams. Unlike most structural strength design problems, too much camber can be as much a problem as too little camber. To paraphrase Goldilocks, "Not too much and not too little, but just right." Fortunately, with reasonable care in selecting the camber and with appropriate concrete placement and screeding, most floors can be constructed to acceptable levelness.

Cold cambering a wide-flange section in a gagging press.

Problems tend to occur either when there are unreasonable levelness expectations or there is a failure to communicate the anticipated deflections and monitor the actual in-place deflections.

A survey of design office practices by the guide's authors indicated that many firms use a rule-of-thumb design that specifies a design camber of approximately 80% of the simple-span deflection. (This is the deflection caused by the dead load weight of the wet concrete on the tributary area.) However, when the calculated deflections increase due to long spans and/or thicker and heavier concrete designs, the set 80% rule may require a significant increase in concrete weight and even more deflection. The inverse is true for shorter spans and a lighter concrete weight, where the camber may not all come out and the concrete thickness may not meet code.

A design that requires the concrete to be screeded to a constant thickness avoids the problems of too much or too little thickness, but it does require a design camber close to actual in-place deflection to achieve an acceptable floor levelness. In this case, a slight positive camber might be of benefit when the composite floor is loaded.

Non-composite Members

While the new guide focuses primarily on camber for composite beams, it also discusses camber for non-composite members like girders, trusses, and joists, as well as roof framing and special conditions like ponding.

The appendix on floor levelness (Appendix A) discusses levelness and flatness of concrete floors and notes that the ACI 117: *Specifications for Tolerances for Concrete Construction and Material* levelness provisions do not apply to suspended composite floors. ACI 302: *Guide for Concrete Floor and Slab Construction* is also referenced, for its guidance in recommending methods for placing and screeding concrete on suspended slabs. The appendix reviews the difference

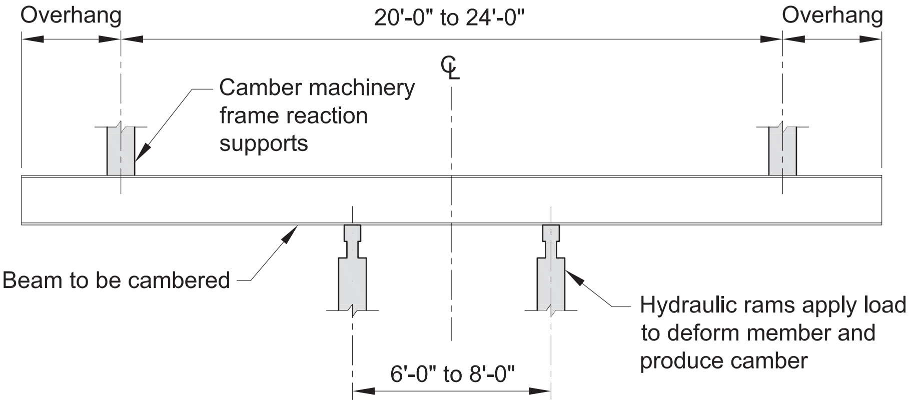


Fig. 1. A typical double-ram cambering process.

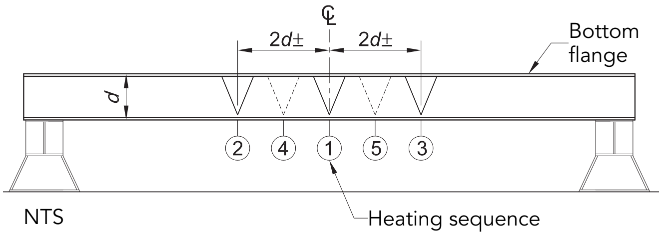


Fig. 2. A typical heat cambering setup.

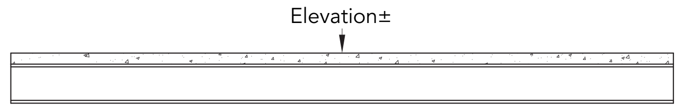


Fig. 3a. Concrete placed to constant thickness.

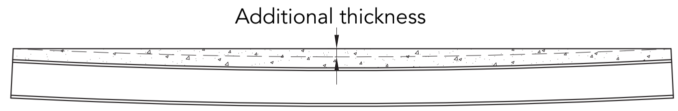


Fig. 3b. Concrete placed to constant elevation.

in screeding for the constant thickness method (Figure 3a) and the constant elevation method (Figure 3b), along with some of the design issues involved when using either of these methods.

Appendix A also stresses the importance of the exchange of information between the designer and contractor, starting with the construction documents and preconstruction meetings, along with monitoring the actual in-place performance of the structure. Remember: Design cambers must be verified in the shop as required in the AISC *Code of Standard Practice* (ANSI/AISC 303, **aisc.org/specifications**). However, field surveys should be used to verify actual dead load deflections to determine whether changes need to be made when it comes to placing and screeding the concrete.

In addition, Appendix B (Rules of Thumb) provides a list of general camber recommendations with broad application. The intent is to provide practical design information in an easily accessible manner.

While the practice of cambering beams in a fabrication shop is relatively straightforward, the theory and design of camber are more complex and can involve a multitude of considerations. This new Design Guide expands upon Ricker's pioneering paper and is intended to assist those designing camber into their steel projects with the information they need to achieve optimal results. ■

Design Guide 36, along with AISC's entire Design Guide series, is available to AISC members for free download at ***aisc.org/dg****.*

field notes

JEDI MASTER

INTERVIEW BY
GEOFF WEISENBERGER

HKS vice president Yiselle Santos Rivera takes a healing, inclusive approach to architectural design and human interaction.

Field Notes is *Modern Steel Construction*'s **podcast series**, where we interview people from all corners of the structural steel industry with interesting stories to tell. Listen in at **modernsteel.com/podcasts**.

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

YISELLE SANTOS RIVERA IS A JEDI.

No, she doesn't have a laser sword and she can't play mind tricks on people, but she is a major force (laugh at my pun, you will) in creating a sense of belonging, both in her workplace and the buildings her firm designs. In addition to being a vice president and senior medical planner with HKS' Washington, D.C., office, she is also the company's global director of justice, equity, diversity, and inclusion (JEDI).

Here, we discuss how she came into architecture by way of genetics (and geology and painting), her passion for healthcare design, and how she is working to meld the concepts of JEDI into the collective construction consciousness.

How did you get into architecture?

I'm originally from Puerto Rico. I went to undergraduate school at the University of Puerto Rico, at the Río Piedras campus, and I actually started in genetics. I really didn't like the lab I was working in. The building was designed by people that didn't understand the context and the tropical nature of our surroundings. I was working in a studio and a laboratory that were closed off to the exterior world, with no light coming into the spaces. I started painting and taking courses in geology and physics. I had some exhibits in galleries, and one of my geology professors happened to come to one of my exhibits and said, "Have you ever thought of doing architecture? It seems like you're really good at spatial arrangements."

And when I was growing up, my mother and father thought I was going to become an architect because I would configure the cushions and blankets, making spaceships and towns and cities for my little brother. But I didn't see myself studying architecture because growing up, I thought all they did was modeling. Back to the geology professor, he told me that I should take a summer architecture course, and I did. And lo and behold, I found I fell in love with building models, and I ended up in architecture school.

What some of the some of your influences in terms of buildings?

I've always been intrigued with spatial relationships and the impact that the buildings can have on how you experience your life. I loved Epcot Center growing up. I was fascinated that you could recreate culture in a spatial way, and you could traverse all of these venues and countries, and for some reason that always resonated with me. And when I was thinking about architecture as a profession, I always correlated it with culture.

I also think of Luis Barragán, the Mexican architect. I had the opportunity to do a summer program in Mexico and we visited his house, and the things that fascinated me the most were weird little things. For example, in his bathroom, he had these built-in ledges to hold soap, but he created a pattern with four of them that, with the grout and tile pattern, created a cross so that he would constantly be reminded about his connection to religion. And I remember when we walked into his kitchen, the head of the table was against one wall that was painted gold. So he would always sit at the head of the table and when people would look at him, he would be against this golden backdrop like he's holier than thou. It showed me the impact and power that architecture can have on experiences and how you want to see yourself.

Can you tell me about one of your more memorable projects?

At a previous firm, I worked on a county justice center in Richmond, Va. It was the first time that I worked on a jail, but as with anything that you don't understand really well, I initially thought of it as just a job to be done. I've always been interested in buildings that have a very unique function, where you really have to think about who uses it and how they traverse from space to space. I remember having a debate on the size of the openings for all the cells, and I remember thinking what an impact an architect can have in these kinds of conversations. These are human spaces that need to provide dignity regardless of their function, and whether people are there for only 365 days or a lot longer than that.

That's part of the reason I wanted to transition into healthcare design. I started thinking of buildings in terms of how they could help people heal and provide some kind of wellness in the time that they spend in that space. My parents are both in healthcare—my mother is a dentist and my dad is a hospital administrator—so I always had healthcare in the back of my mind. But I never envisioned the impact that I could have as an architect on the well-being of patients as well as clinicians.

When did you begin to see justice, equity, diversity, and inclusion collectively become a regular topic of a discussion in the building design and construction world?

I've always acknowledged this terminology in some form or fashion. But the moment that it became a part of how I saw architecture was probably around 2014 or 2015, when I started reading about the Equity by Design group with AIA San Francisco, and their "Missing 32%" survey, which referred to the fact that 32% of women and minorities eventually drop out of the profession. So later, when I was in the AIA D.C. chapter, I started focusing on questions like "What does the future of the profession look like? What does it mean to be a woman within the industry? What does it mean to be Latina? What does it mean to be queer in the industry?" And I've been versed in the JEDI language for five years or so, but now it's becoming more prevalent. I started seeing the role of the chief diversity officer being embedded within the C-suites in a lot of organizations within architecture and other businesses, and I started connecting all of those dots. And in 2018, HKS started formally solidifying an equity, diversity, and inclusion role in support of the UN Global Compact.

And with the "Me Too" movement and Black Lives Matter and the death of George Floyd, the terminology has started to include justice as well. And the concept of JEDI is becoming common language in all different types of companies, whether it's on the periphery or whether it's more embedded in how we do business, because even our clients are asking for it. They're asking, "How are you partnering with minority-owned businesses? Do you have a formal JEDI statement? What does that look like in your hiring process? What does that look like on your website? How are you promoting it?" It's a layered process, and the more you are aware of those terms, the more you start seeing them out there.

How much of your job does the JEDI role encompass?

At the beginning, when I was asked to take on this role, HKS gave me the opportunity to really craft it to see how it would be most beneficial for both me and the firm. We initially came to the decision that I was going to allocate 50% of my time defining this role and 50% to being a medical planner. I've been in this role for almost three years, and it initially took me about a year to come up with a strategy. I quickly realized it was not only me but would take a whole group of people to create content and do things to take ownership of some of that content. So I started breaking it down into pillars and creating a structure, and then COVID hit and then the death of George Floyd and subsequent protests happened, and now it's pretty much 200% of my time and about 1,000% of my emotional coefficient of life! I am very vested in what it means to create belonging for everybody in my firm and what it means to design for dignity.

So it's currently my calling. I hope that in the future, I can focus back more on medical planning, and I can definitely see that happening because I'm working to develop a structure that creates more accountability throughout the firm. I hope that my role doesn't formally exist in 10 years and that this just becomes embedded in how we do business. But I recognize that it is important for somebody like me to focus on this until it becomes like the concept of sustainability, a typical part of our narrative, part of who we are, part of our deliverables, part of how we partner, and how we choose our clients and products. I think this is the time for a lot of us to be advocates in this movement of seeing the world through this lens of JEDI and creating belonging for everybody. ■

This article is excerpted from my conversation with Yiselle. To hear the podcast in its entirety, visit ***modernsteel.com/podcasts****.*

business issues INTO THE WILD

BY DAN COUGHLIN

When your organization is forced to spend some time in the wilderness, don't panic and don't point figures. Work together, embrace the experience, and learn from it.

Since 1998, **Dan Coughlin** has educated for-profit and nonprofit executives to consistently deliver excellence in management, leadership, and teamwork. He serves as a business coach and teacher. Visit his free Business Performance Idea Center at **www.thecoughlincompany.com**.

In addition, Dan has presented multiple sessions at NASCC: The Steel Conference. Visit **aisc.org/education-archives** and search on "Coughlin" to access them.

VISUALIZE A ROAD TRIP.

Imagine driving your family from Los Angeles to New York City (or vice versa). You know where you want to go, you know how to get there, you have mapped out your route exactly, and you are moving at an efficient pace.

Part of your meticulously mapped-out journey is a visit to a National Park. It's as beautiful as everyone has told you. You've been making good time, so you decide to go on a hike on one of the park's less-traveled trails. Somehow, you get off the trail and become lost. No one is getting cell service and everyone's batteries have died anyway. An hour or so later, the sun goes down. What are you going to do?

Things like direction, speed, and efficiency are no longer givens. You don't know which way to go. The only things you and your family can rely on are your abilities to think, reflect, discuss, discern, and decide. Then you can move into action and get back to your car.

This is time in the wilderness.

In the business world, time in the wilderness is when an organization has reached a point where many things are unclear, and it's very hard to figure out what to do next. Changes in the marketplace, the economy, technology, competition, and so on cause your organization to reach a point where you don't know the direction you want to go in, and you don't know how to move forward effectively. In times like these, you must create a new path forward, which can involve reinventing the business you are in, your purpose, your goals, your strategy, your tactics, and/or your action plan.

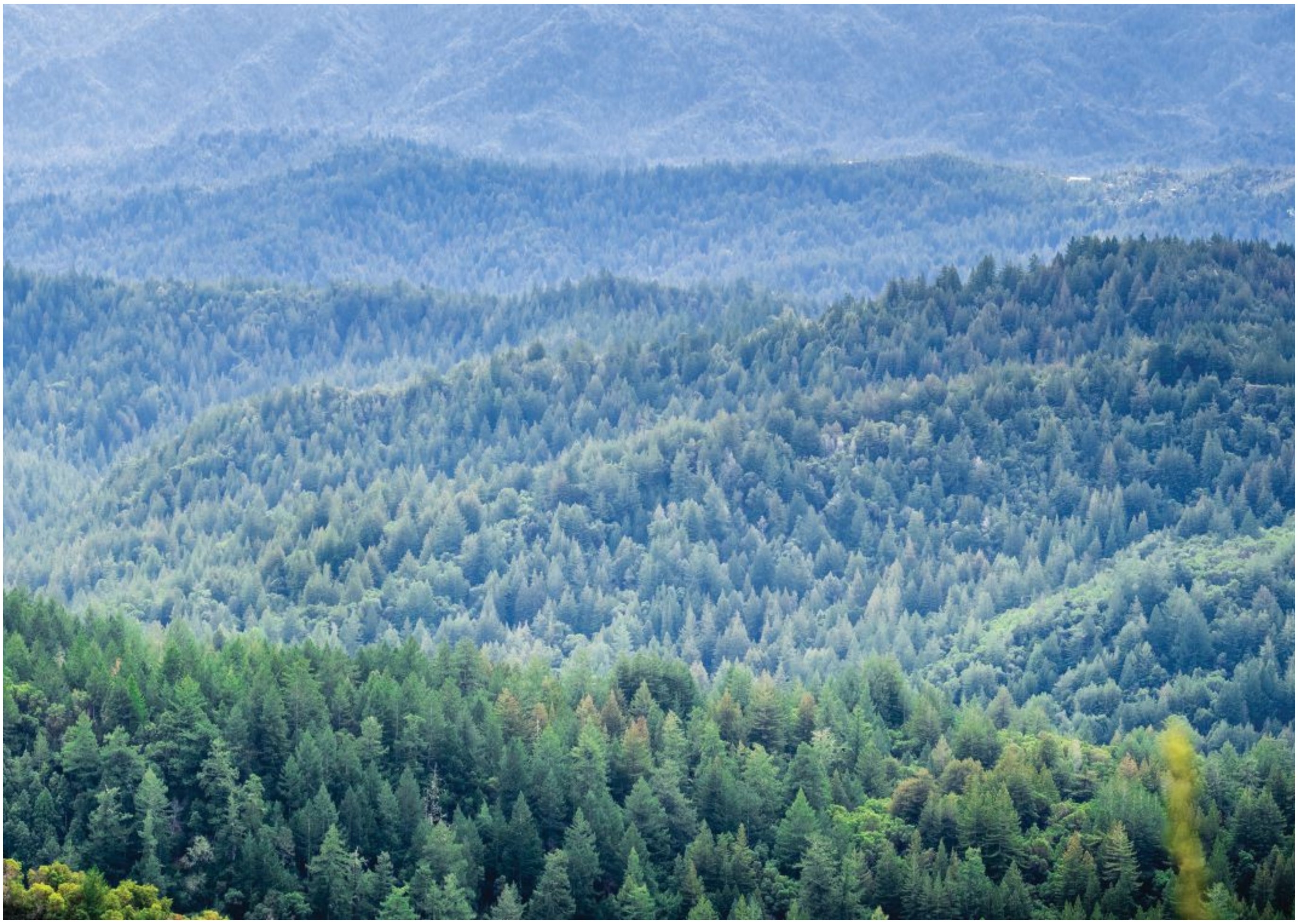
Value your Time in the Wilderness

When organizations land in the wilderness, people sometimes become extremely distressed. They want to get out right away, so they grab at any activity that can feel like progress. From 1941 to 1949, the Walt Disney Company was in the wilderness, scrambling for ways to become relevant again. The same thing happened to Apple from 1985 to 1997. In both cases, this difficult period allowed (forced) people to think, discuss, discern, and decide on a direction and an approach that led to phenomenal success for both companies over the next quarter-century.

If your organization (for-profit or nonprofit workplace, volunteer organization, trade association, etc.), team, or group is in the wilderness right now, cherish it as an opportunity to come up with new ideas or tactics, rethink your mission, and even consider things that you might have previously been afraid to try. If time in the wilderness is used wisely, it can be an amazing inflection point that produces an astonishing future.

What Not to Do in the Wilderness

The worst use of time in the wilderness is producing a scapegoat instead of focusing on productive ideas. When people are in the wilderness, they start to feel desperate and extremely anxious. They want to feel good about themselves and look good in front of other people. They want to feel in control. They often turn to pointing their finger at a subgroup and making them out to be the scapegoat for any difficulties or failures.



"*You* said we should go left at the fork, but clearly we should have gone right."

"*You* left the compass in the car."

"*You* said we'd be back by now."

By establishing a scapegoat, they attempt to feel better about themselves and downplay any of their own responsibility for the situation.

Multiple factors can cause an organization to become lost in the wilderness. And unfortunately, instead of choosing to have useful collaborative discussions, leaders sometimes pick out a scapegoat for all the problems. They spend tremendous amounts of time and energy persecuting the scapegoats until these people leave the organization or do whatever they are forced to do. The long-term impact is that the organization eventually suffers terribly both on an individual basis and as a group—potentially even going out of business.

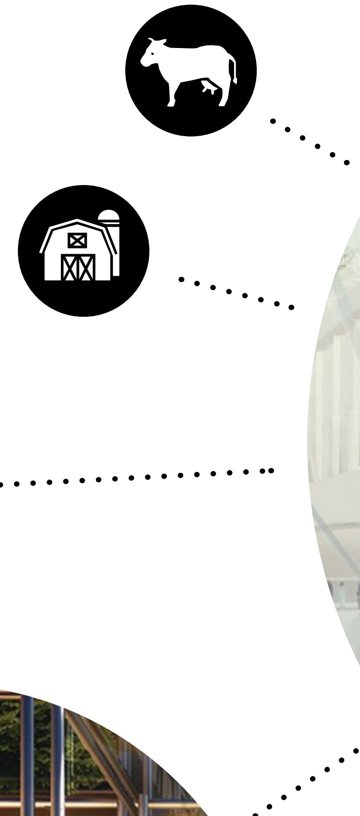
Back to Basics

When things in an organization are no longer clear, it's important to return to the fundamentals of teamwork: thinking, discussing, discerning, caring about employees at every level, communicating better, supporting one another, and making decisions that benefit everyone. When this happens, the team can pull together and create approaches, products, and services that can generate long-term success. Disney did that in 1950, entering a golden age of animation and filmmaking. Apple did that in the late 1990s, and it's been charging ahead ever since.

It doesn't happen overnight, and it doesn't happen by one dictatorial force trying to force a plan on people—and then scapegoating people when their plan doesn't work. Effective teamwork is needed to survive in the wilderness and eventually get out of it. What got both Apple and Disney out of the wilderness and on their way again? Groups of people working together and supporting one another in figuring out the purpose, vision, strategy, and plan to rally around and execute—not time wasted on creating a scapegoat and blaming them for everything. The energy spent in the wilderness was invested in thinking about the strengths of the organization and its opportunities in the market. Together, both companies developed a clarity of vision, and then they began to move forward—together. This process required tremendous patience and faith in one another, respectful communication, and a willingness to listen to other people's opinions, regardless of their level at the company.

Whether you're trying to get back to your car when you're literally lost in the woods, or your forest is more figurative and you're hoping to get your business back on track, stick together and use your lost time to find and forge a new path. ■

Hunger Games



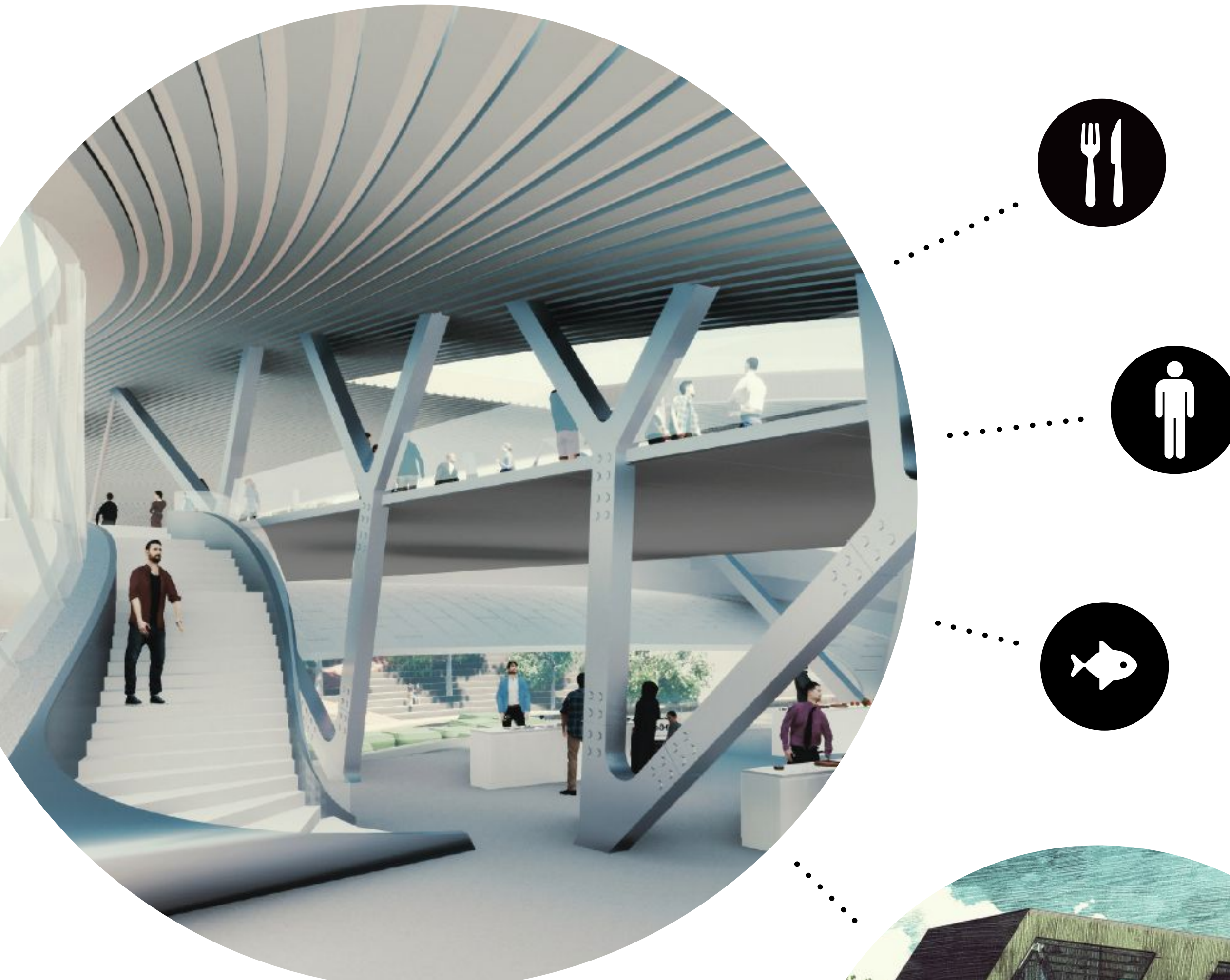
AS THE PLANET'S POPULATION GROWS, particularly in urban centers, producing and distributing enough food to feed humanity becomes increasingly challenging.

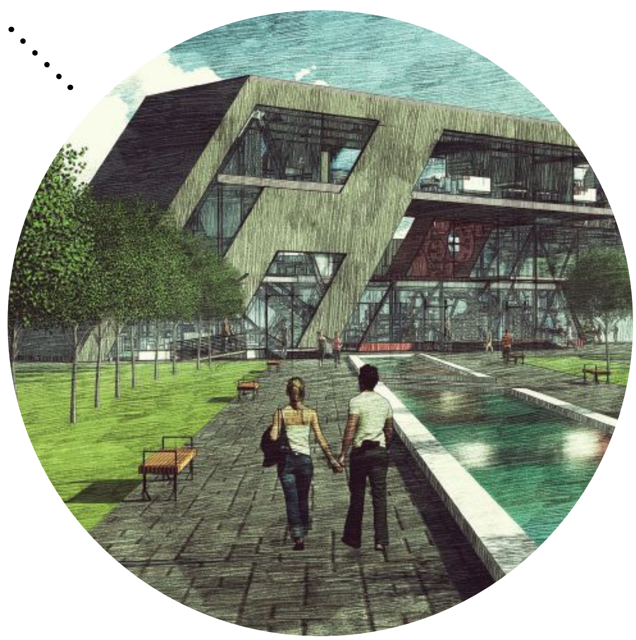
But fear not. Architectural students from across North America have developed some jaw-dropping steel-framed solutions to keep the global food network humming along.

This was the main challenge issued as part of the 2020 Steel Design Student Competition. Administered by the Association of Collegiate Schools of Architecture (ACSA) and sponsored by AISC, the program pushes undergraduate and graduate students to explore various design issues related to implementing steel in design and construction. Steel must be used as the primary structural material for a submitted design, which must contain at least one space requiring a long-span or custom-designed steel structure. In addition to the urban food hub design category, the competition included a second, open category allowing students to select any site and building program that uses steel as the primary material.

This year's program received more than 370 submissions. First, second, and third place winners, along with honorable mentions, were awarded in each category, and a total of 18 remarkable student projects garnered awards in this year's competition.

The winner designs range from a plan to reinvigorate Quebec City's marina with a "food machine" built of movable parts to a unique ossuary for New York's Hart Island potter's field to a reimagined concept for the Centers for Disease Control and Prevention.





The winners of this year's Steel Design Student Competition cook up some mouthwatering designs for urban food distribution centers and other facility types.

ACSA and AISC are grateful to the distinguished jurors for their time and dedication:

Category I: Urban Food Hub Jury

- Ming Hu, University of Maryland, School of Architecture, Planning and Preservation
- Ayad Rahmani, Washington State University, School of Design and Construction
- Chuck Wyder, Harley Ellis Devereaux

Category II: Open Jury

- Jared Ganstine, Structural Design Group
- Michelle Pannone, Marywood University, School of Architecture
- Kristina H. Yu, University of New Mexico, School of Architecture and Planning

Students and faculty sponsors who worked on the winning projects received cash prizes ranging from $500 to $2,500. For more information about the competition, please visit **acsa-arch.org/competitions/2020-steel-competition**.

Read on to learn about and see images of the winning designs. And to view even more renderings, visit the Project Extras section at **www.modernsteel.com**.

CATEGORY I:
URBAN FOOD HUB
Winners

Food Machine

1st

Students: Hatem Bouassida and Antoine Hurez
Faculty: Jacques Plante and Richard Pleau, Université Laval

Quebec City is a major North American tourist destination, thanks largely to its exceptional architectural heritage and breathtaking vistas.

However, the wharves lining the city's historic port area do not garner the same positive attention as the city's more popular areas. In recent years, the relocation of the area's public market and the closure of a neighboring exhibition pavilion have negated all commercial and tourist activity on this portion of Rue Saint-André.

With so much potential and visibility, the vast deserted area lining the marina calls out for new public uses. The establishment of a Food Hub here brings new life to surrounding streets in all seasons, providing a lively and stimulating addition to the urban promenade between the port, the lower town, and the upper town. Its location is easily accessible to cruise passengers, tourists, and residents, making it an ideal starting point for exploring the historic city.

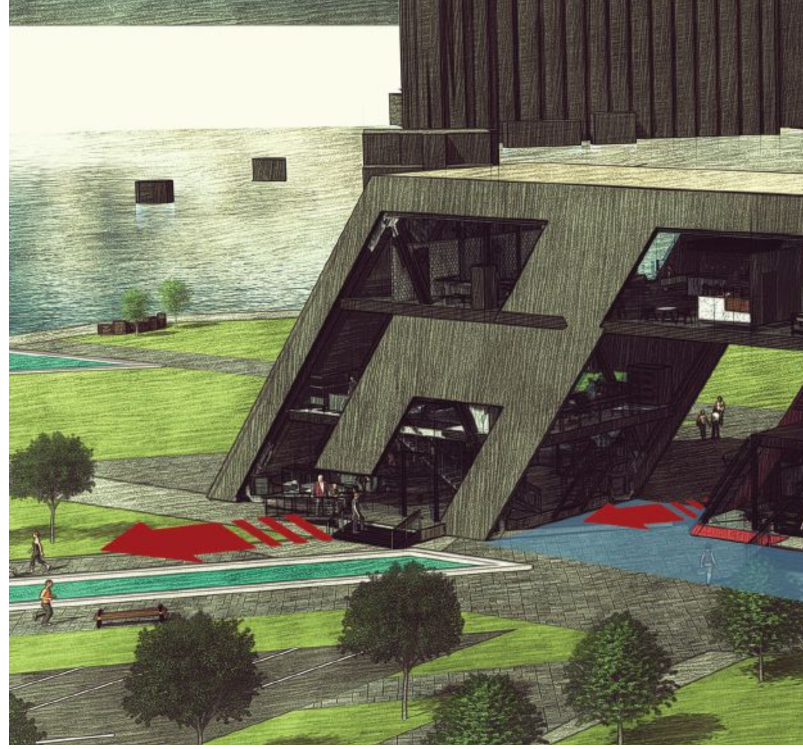
Food Hub is broken down into three blocks:

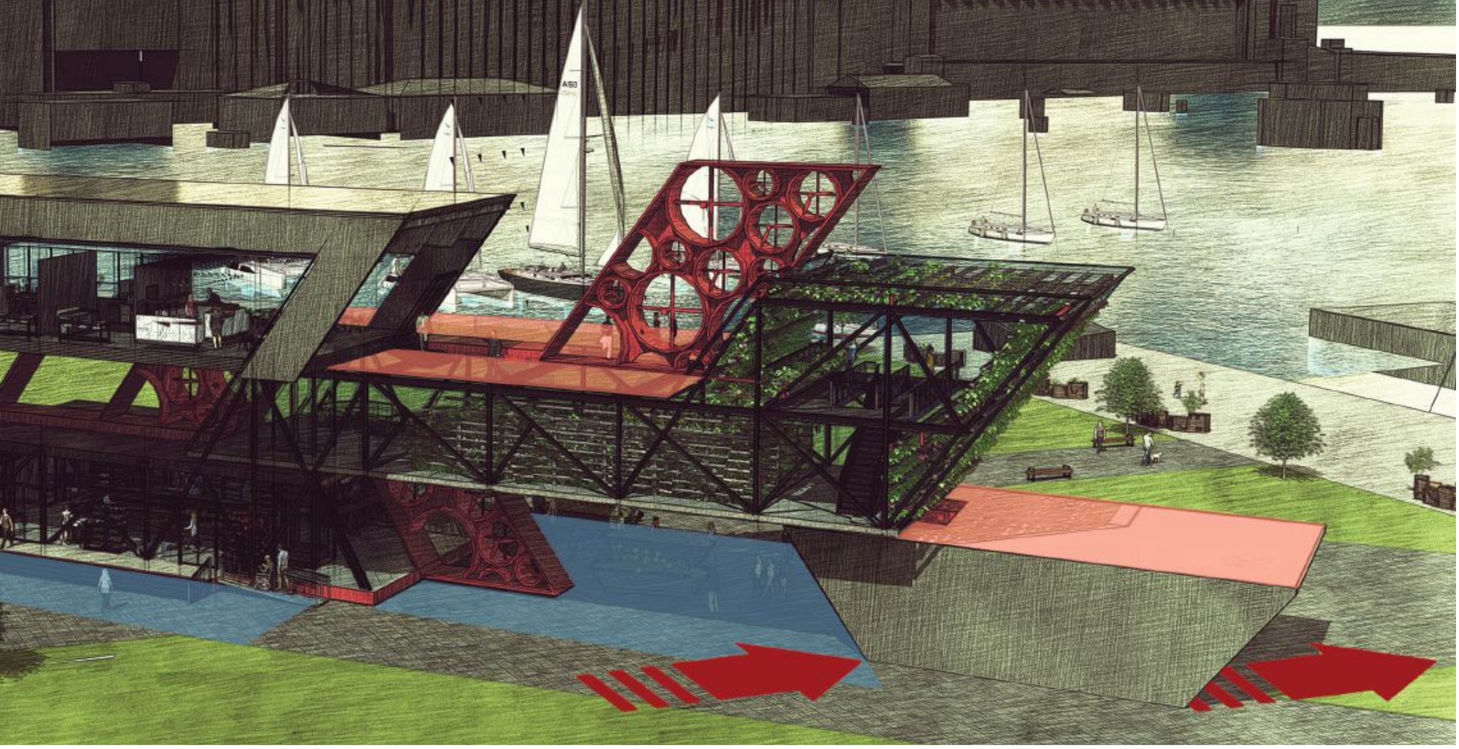
- A large mobile cantilever, comprising retail space on the ground floor, two commercial kitchens on the second floor, and multiple restaurants, a play area, and public restrooms on the third floor
- A fixed glass block (also cantilevered) with a large indoor market on the ground floor, a vertical farming area on the second floor, and harvest space and a rolling culture wall on the third floor
- A mobile portion that serves as a storage space for crops; it can also be used for deliveries to local shops

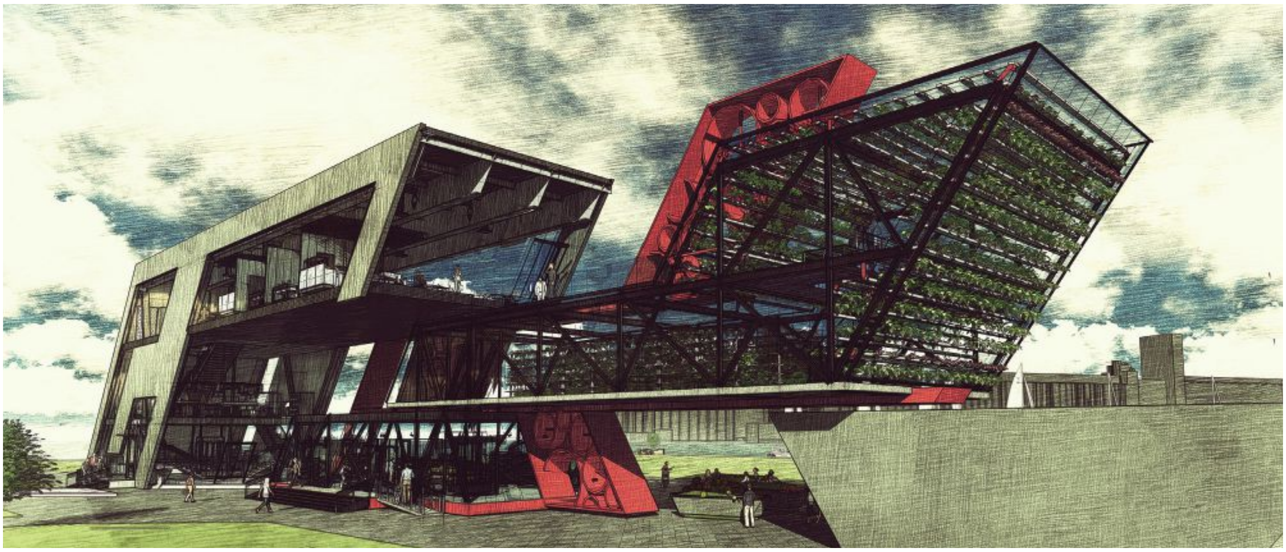
Much like a machine, the building's parts can move and pull apart, following the trajectory of the tracks in the area's former marshaling yard and evoking the memory of its industrial past. Boldly sheathed in steel, the building's dynamic form uses the prevailing winds to generate energy, thanks to turbines integrated into the envelope. With these whirring turbines and stacks of hydroponic trays rotating behind the greenhouse's glass façade, the structure appears to be in perpetual motion.

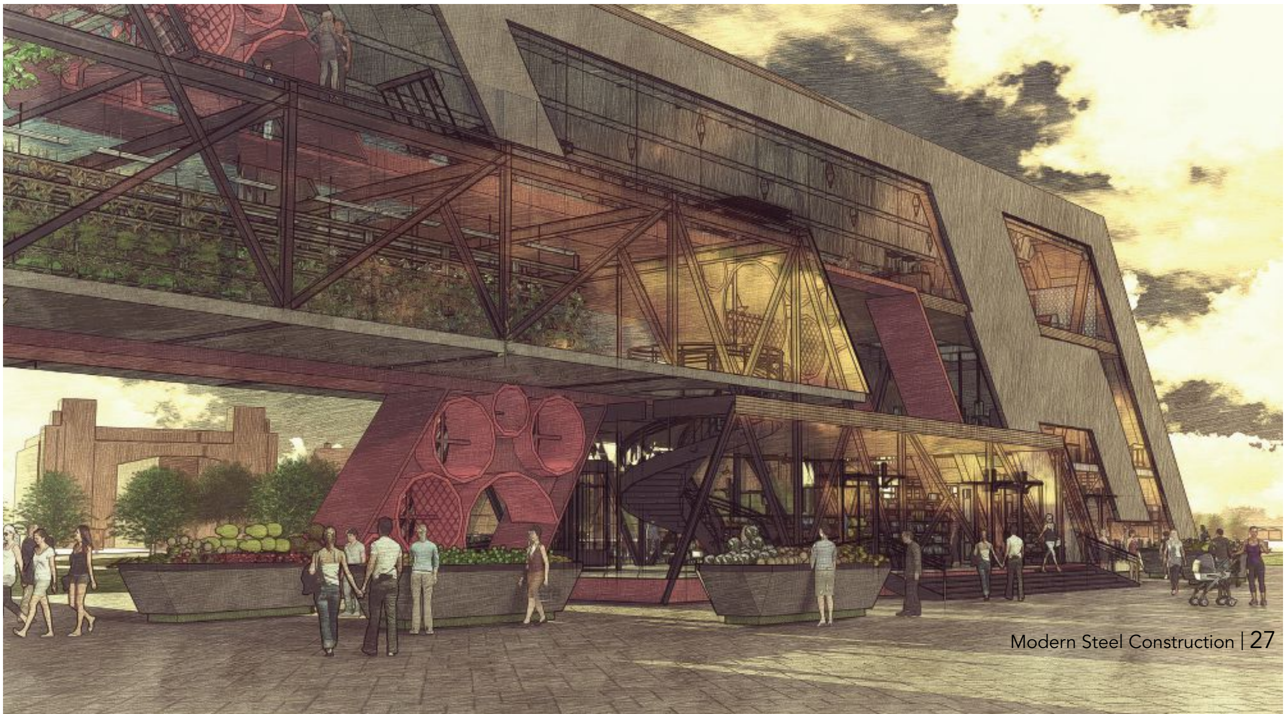
When fully opened, the building reveals unexpected vistas of the surrounding city and its port. The cantilevers beckon to visitors, providing shelter from rain as well as spaces for public events, farmers' markets, and other festivities.

The students have created an exuberant presentation and an in-depth understanding of the steel structure and compositional form. The project is ambitious and believable, from the small steel details to the larger structural members.









2nd

From "AgriHood" to AgriHub

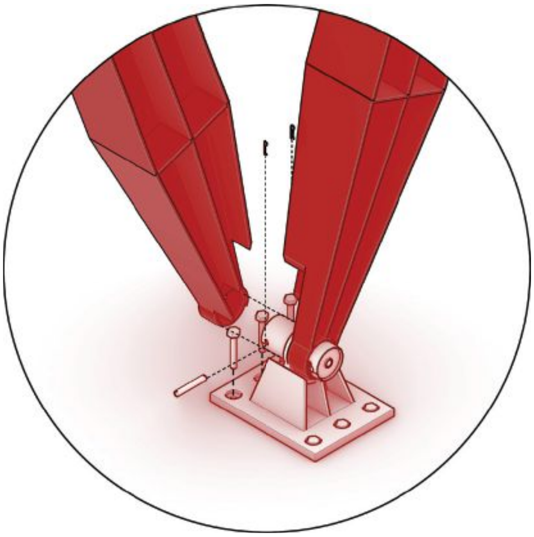
Students: Callum Nolan, Ethan Paddock, Colin Williams, and Patrick Stephen
Faculty: Terri Boake, University of Waterloo

In 1950, Detroit was one of the most important industrial hubs in North America and the fourth largest city in the United States. Since this peak, the city's population has fallen by over 60%, resulting in urban decay and more than 100,000 abandoned properties, leaving neighborhoods underfunded and underfed.

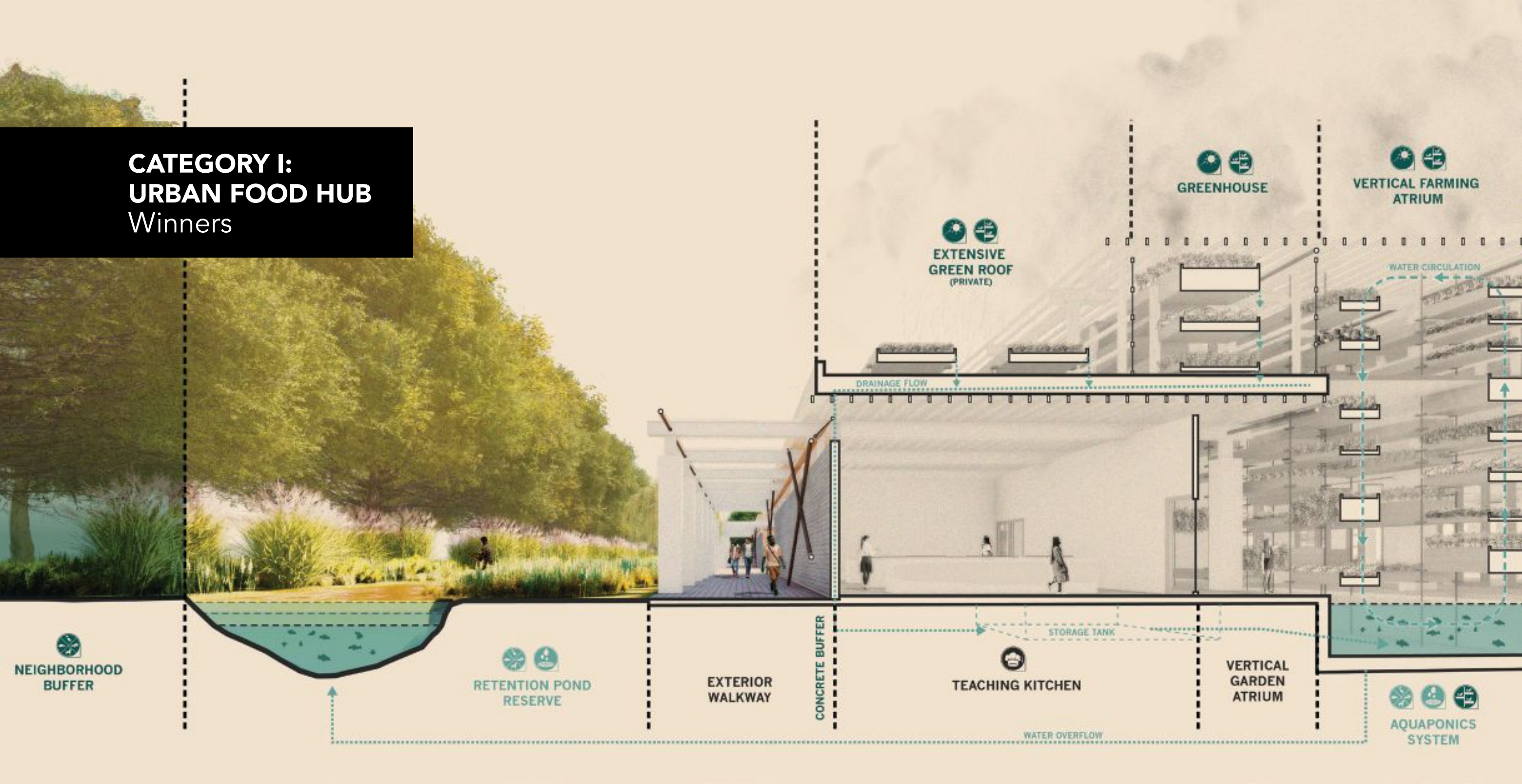
The Michigan Urban Farming Initiative (MUFI) is working to transform Detroit with urban agriculture and currently boasts 1,400 farms and community gardens across the city. As a response to this initiative and the city's ongoing urban issues, the steel-framed AgriHub design introduces a holistic agricultural hub at the core of one of the city's poorest neighborhoods, expanding MUFI's operations and breathing new life into the surrounding abandoned buildings and lots. By introducing a dedicated market, plant library, and industrial area, the site becomes a space for food production, coordination, commerce, and education. The project provides resources and supplies for other urban farming initiatives, cementing the area as the urban farming hub for the city.

AgriHub consists of four main programmatic elements, beginning with an extension of MUFI's community gardens. The gardens then lead to the exterior space of the Market Hub, which houses both indoor and outdoor public market spaces as well as teaching and small-scale commercial kitchens for local restauranteurs to create value-added products. The Plant Library offers the community a quiet space to learn, cultivate, and connect. Scaffolding occupies a decommissioned church building, allowing the area to adapt and change with the needs of the community. The Distribution and Industrial Growing Hub occupies a gutted and structurally reinforced existing warehouse, allowing it to accommodate the spatial requirements of vertical and aquaponics farming and also a packaging and distribution facility. Lastly, the axis is the AgriHub's connective tissue, a boldly colored, elevated walkway that provides visitors with a unique vantage point to view the facility's exciting programmatic diversity.

From "AgriHood" to AgriHUB is a clever celebration of an existing structure. The students' approach of taking a minimum gesture in material and making it a grand, elegant presentation takes the design to a whole new level.



CATEGORY I:
URBAN FOOD HUB
Winners



3rd

Pesce Plaza

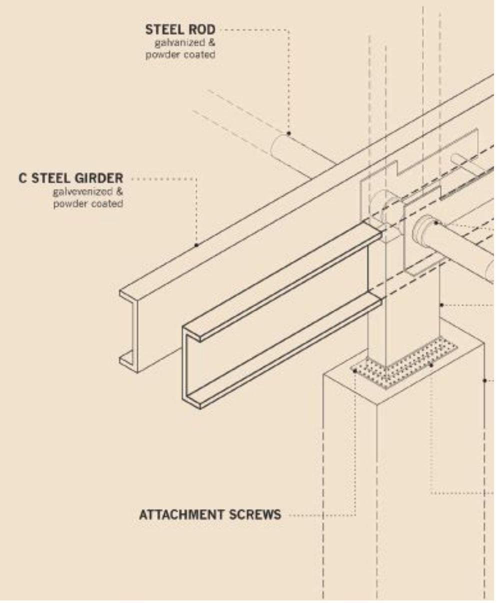
Student: Jacob Lyons
Faculty: Kristopher Palagi, Soo J. Jo, and Tara Street, Louisiana State University

The Plank Road corridor in Baton Rouge, La., was once a major bustling highway connecting the city's regional airport to the Louisiana state capitol building. Alas, it has become underappreciated ever since the introduction of Interstate 110 through the area.

Pesce Plaza hopes to flip this script. The design incorporates an educational urban food plaza, community garden center, public park, farmers market, and micro-culinary school that emphasizes healthy cooking with locally propagated fish and vegetation. Its location between Plank Road, Mohican Drive, and N. Acadian Thruway takes advantage of the Plank Road Master Plan's proposed rapid bus transit line that runs along the corridor, providing a major bus terminal for the thousands of area residents that currently depend on public transportation.

The entire building is designed around a vertical aquaponics system that allows the building to have a street frontage presence while simultaneously creating a public park, solving the evident lack of green space along the corridor. The project's structural steel system creates unity between contrasting intimate and public spaces thanks to its ability to span great lengths. The long-span girders within the open park space allow families to receive the full benefits of an open-concept green space while also having a sense of security and enclosure. Visitors will notice the beautifully detailed and simplistic connection between the steel C-girders and columns, which are connected by a rod attachment that runs the entire length of the building.

The food hall and commercial kitchen are divided by a vertical aquaponics farming atrium, which allows produce to be efficiently transported from the rooftop farms to the food hall and commercial kitchen through a revolving cable system. The stacked design of the building allows the heat from



The students' successful solution tackles the design problem head-on with a step-by-step process, and the project shows a clear understanding of steel structure with beautiful execution.

cooking appliances in the food hall and commercial kitchen to become trapped and used in the upper greenhouses, and large revolving windows coupled with the aquaponics system facilitate natural cooling in the food hall.

Runoff water from the green roofs is filtered and dispensed into the aquaponics system. During heavy rainstorms, the aquaponics system can overflow into a retention pond, which couples as a green vegetated buffer system for the adjacent neighborhood. Last but not least, the fish at the center of the aquaponics concept are grown in this retention pond as minnows and are then moved into the system after they reach full size.

CATEGORY I: URBAN FOOD HUB
Honorable Mentions

HOOPLA

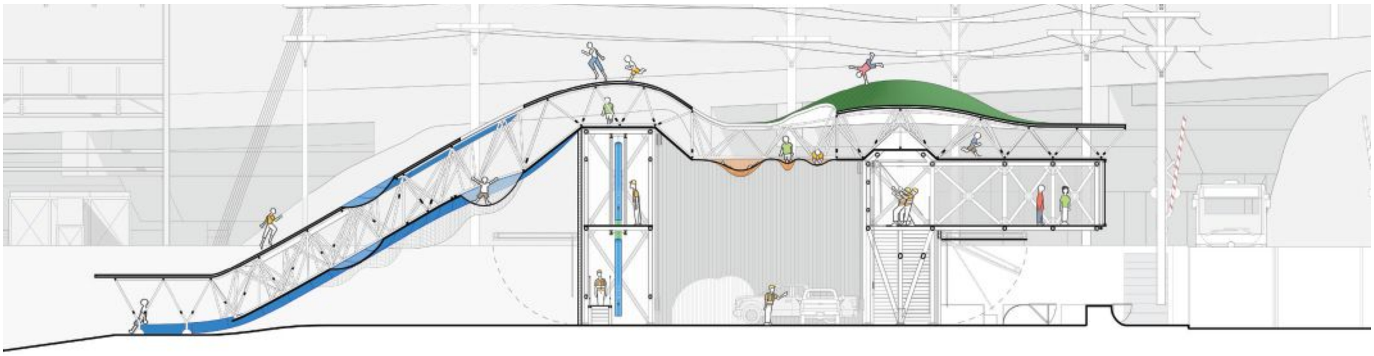
Students: Briley Houston and Phillip Minton
Faculty: Kevin Stevens, University of Tennessee–Knoxville

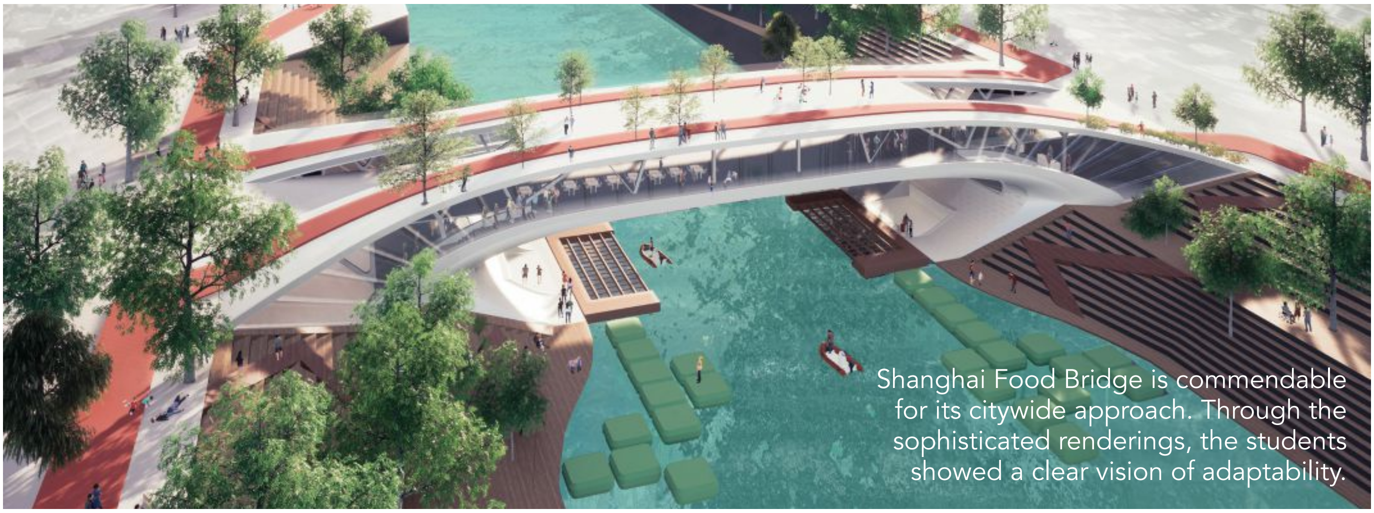
HOOPLA is noteworthy for its innovative inclusion of children as a focus for the design. The project uses the steel structure to animate the building and makes food an experiential part of it.

HOOPLA's primary goal is to give the family the power to become the farmer.

The food hub acts as a center to deploy modular units, kits-of-parts designed to be easily assembled by anyone, regardless of prior training, that can be constructed in a residential yard. The idea is to provide families with food production, water collection, and electricity generation capabilities on a per-unit basis.

The units' design is whimsical and thought-provoking, drawing inspiration from toy joints, thereby taking steel construction and reimagining it at a scale that even a child can understand. The hub itself revolves around two central cores, one of which stores and recycles the compact kits for use by the consumer, and a second for processing and storing food. The community is strongly encouraged to participate in the goings-on of the hub, whose bustling environment is emphasized by the space frame that drapes over it and serves as both structure and "playscape," with slides, nets, and openings that beg to be explored.





Shanghai Food Bridge is commendable for its citywide approach. Through the sophisticated renderings, the students showed a clear vision of adaptability.

Shanghai Food Bridge

Students: Yifan Zhou, Connie Kwan, and Sydney Foster
Faculty: Clark Llewellyn, University of Hawai'i at Manoa

Shanghai Food Bridge solves modern agricultural dilemmas with urban design techniques.

As a community food hub, its main goal is to support the local food economy. This goal is predicated on the task of mitigating the high cost of land use in Shanghai, which the design addresses by bridging two dense urban areas of the city while minimizing land use. As a result, the project becomes more than a food hub; it becomes a point of connection for the community.

Underwater aeroponic farm pods promote on-site food production, giving residents access to fresh, local produce. Placing vertical farms underwater regulates temperature and facilitates year-round food production. Compared to the traditional agricultural process, Shanghai Food Bridge achieves higher productivity on a smaller land area while also reducing the fossil fuels needed for farming equipment and distribution.

The design also uses the Suzhou River as a distribution network for future Food Bridges. This system helps small farms gain access to a larger volume of marketplaces by coordinating local supply chains, and the bridge becomes a permanent symbol for interlacing communities.

Bandes de culture

Students: Alice Corrivault-Gascon and Dominique Arseneault
Faculty: Jacques Plante and Richard Pleau, Université Laval

Bandes de culture is inspired by the history of food production and distribution in Quebec City.

Located in the city's Old Port, near the Louise Basin marina, the program brings production (greenhouses and fruit and vegetable gardens), processing (kitchens), and food distribution (retail spaces) together in one place, with the site being divided into programmatic strips hosting these various functions.

A section of each strip is raised from the ground to create a roof. The free space under the roof, inspired by the transparency of old market halls, allows for views and movement between the marina and the city. The long-span steel structure facilitates large open spaces and a sense of continuity for each strip. It is designed with standard removable, reusable, and recyclable elements, with particular attention paid to sustainable development and adaptability.

Bandes de culture turns structure into a beautiful design. The project shows a fantastic relationship between steel assembly and joinery.

CATEGORY I: URBAN FOOD HUB
Honorable Mentions

Hongkou Hub—Sustainable Community Farming in Urban Shanghai

Students: Wenzhu Li, Feifan Chen, Richard Robinson, and Bruce White
Faculty: Clark Llewellyn, University of Hawai'i at Manoa

Hongkou Hub is a model for sustainable, community-based urban farming in Shanghai's Hongkou neighborhood. This urban food hub aims to increase the local community's access to clean, healthy, and fresh food while also providing agriculture-based work for Shanghai's many rural-to-urban migrant workers.

The food hub is constructed from a system of modular steel frames inspired by the temporal bamboo framing traditionally found in China. The modularity of the system allows the structure to expand vertically and horizontally in response to programmatic, hierarchical, and food production needs. The chuck-and-clasp-based connection system allows for structural members of various circumferences. This design facilitates the potential for a hybrid approach of using tubular steel members for the more permanent structure, with bamboo additions for temporal adaptations of spaces such as seasonal pop-up markets or community events in the outdoor flex space.

In an effort to further strengthen the project's connection to the surrounding community, the iconic window pattern of the city's historic 1933 Old Millfun complex adjacent to the site has been used to develop a perforated steel panel system that provides diffused light, airflow, and aesthetic interest to the building. Additional façade options include corrugated steel panels that offer privacy and protection from the elements in certain areas of the hub, and panels that provide locations for the harvesting and delivery drones to dock and charge.

Hongkou Hub—Sustainable Community Farming in Urban Shanghai speaks to the local culture of bamboo, but adapts it in steel. The sophisticated design uses steel structure to give the building flexibility.

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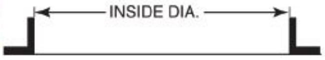
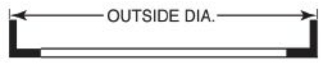
1 Angle Leg Out



10" x 10" x 1" Angle

2 Angle Leg In

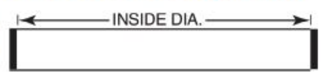


10" x 10" x 1" Angle

3 Flat Bar The Hard Way

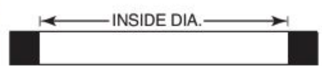
24" x 12" Flat

4 Flat Bar The Easy Way



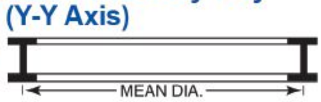
36" x 12" Flat

5 Square Bar



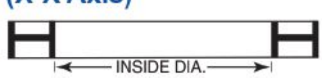
18" Square

6 Beam The Easy Way (Y-Y Axis)



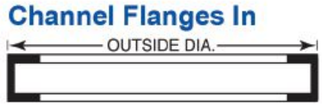
44" x 335#, 36" x 925#

7 Beam The Hard Way (X-X Axis)



44" x 285#

8 Channel Flanges In

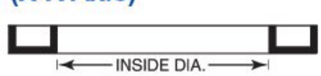


All Sizes

9 Channel Flanges Out

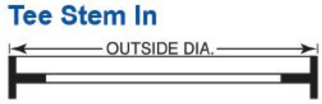
All Sizes

10 Channel The Hard Way (X-X Axis)



All Sizes

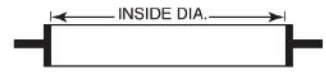
11 Tee Stem In



22" x 142 1/2# Tee

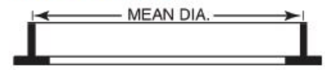
We bend ALL sizes up to:

12 Tee Stem Out



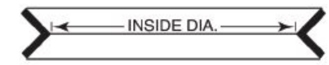
22" x 142 1/2# Tee

13 Tee Stem Up



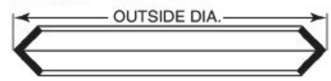
22" x 142 1/2# Tee

14 Angle Heel In



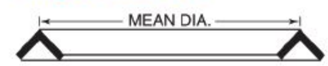
8" x 8" x 1" Angle

15 Angle Heel Out



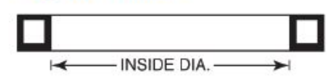
8" x 8" x 1" Angle

16 Angle Heel Up



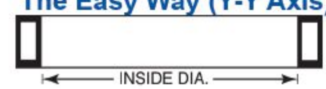
8" x 8"x1" Angle

17 Square Tube



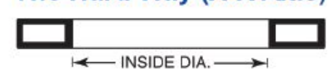
24" x 1/2" Tube

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



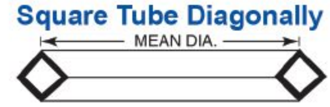
20" x 12" x 5/8" Tube

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



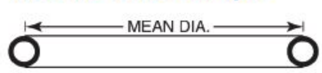
20" x 12" x 5/8" Tube

20 Square Tube Diagonally



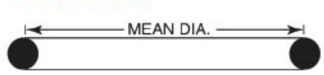
12" x 5/8" Square Tube

21 Round Tube & Pipe



24" Sched. 80 Pipe

22 Round Bar



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Shanghai Food Basket is an adventurous design facilitated by steel through its concept and strategy.

Shanghai Food Basket

Students: Bingjie Li, An Guo, Angus Lin, and Janica Domingo
Faculty: Clark Llewellyn, University of Hawai'i at Manoa

The Shanghai Food Basket is an educational food hub designed to bridge the gap between farmers and consumers. The vision for the project is to create not only a space for food marketing food production, but also a destination to educate visitors about food production, food distribution, food processing, and the importance of food waste recovery.

A public food market and retail space are located on the ground floor, and the upper four levels contain restaurants, a shared kitchen, a tasting kitchen, an educational area, food galleries, vertical farming, and offices. In the central atrium, a waterfall creates a focal point and collects rainwater to be reused onsite. Inspired by the form of a Banyan tree, the building's steel frame creates a light yet durable structure, inviting ample natural light to pass through the atrium and modules. Each step of the food chain process is distributed among these modules, which are strategically placed and interconnected inside the steel structure. Various fruit-bearing plants and vegetation are located on the ground floor and around the structure, creating a lush, green environment.

Transcend

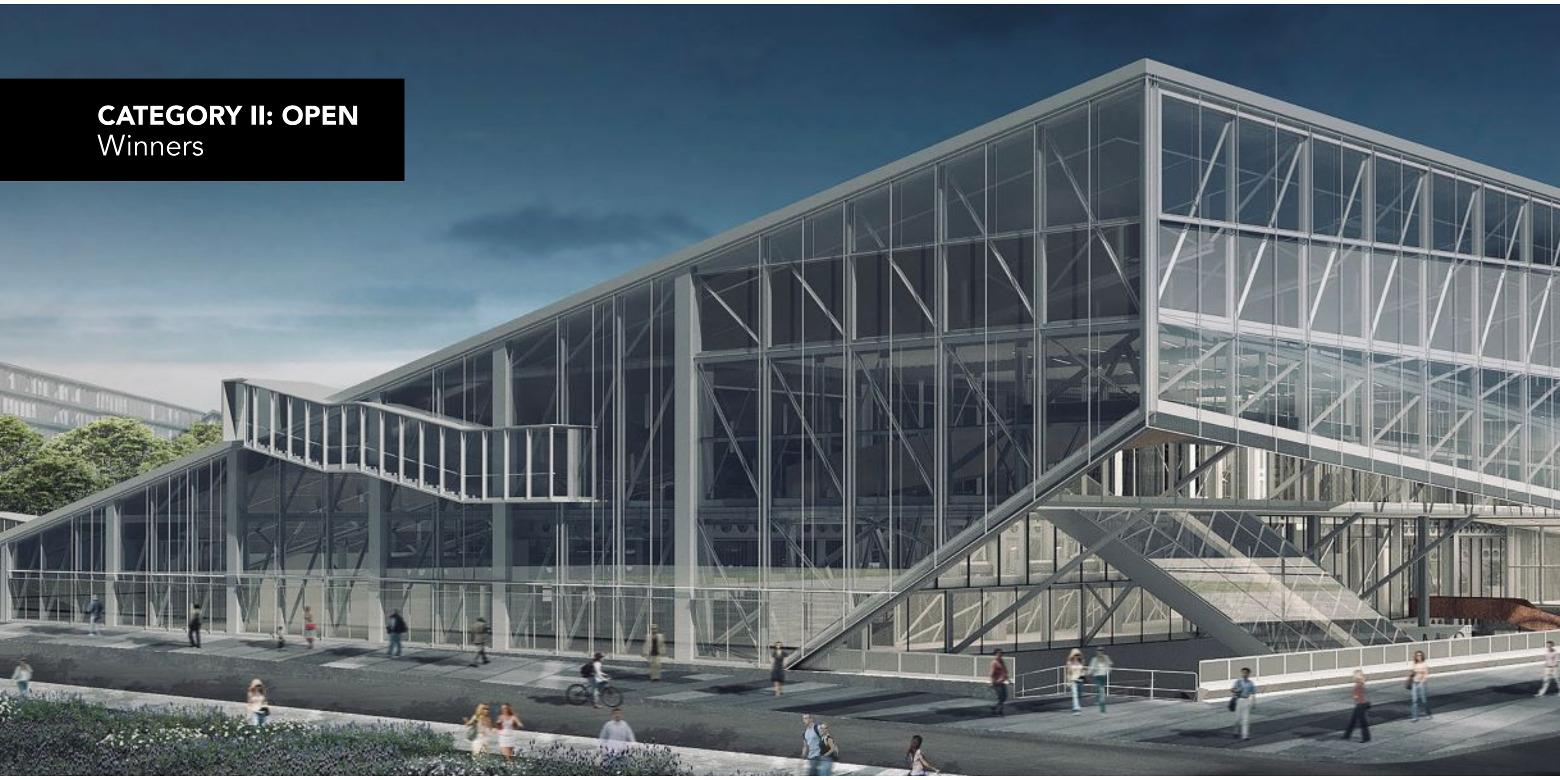
Student: Allison Loth
Faculty: Timothy Gray, Ball State University

As an opposition to the current eating habits in the United States, the Transcend food hub empowers the slow food movement. It provides an opportunity for the community to obtain fresh and healthy produce from local sources. The design, intended for downtown Fort Wayne, Ind., brings the community together and highlights the life cycle of food, rendering the journey from farm to table transparent.

The steel and glass building remains true to its materials, allowing the greenery and activity of the space to bring the site to life. The building itself demonstrates healthy living through the incorporation of sustainable strategies, such as controlling light penetration with sun shading aluminum and glass panels, as well as managing rainwater with permeable surfaces, rain gardens, and underground cisterns. The design features outdoor corridors and gathering areas and movable doors and shifting panels that create a dynamic relationship between the indoor and outdoor spaces. The roof system has a sculptural, inviting quality that plays with light and shadow via glass panels of varying transparencies and colors.

Transcend displays an innovative cantilevered canopy design. The steel space frame truss feels organic and would have a lasting impact on the inhabitants.

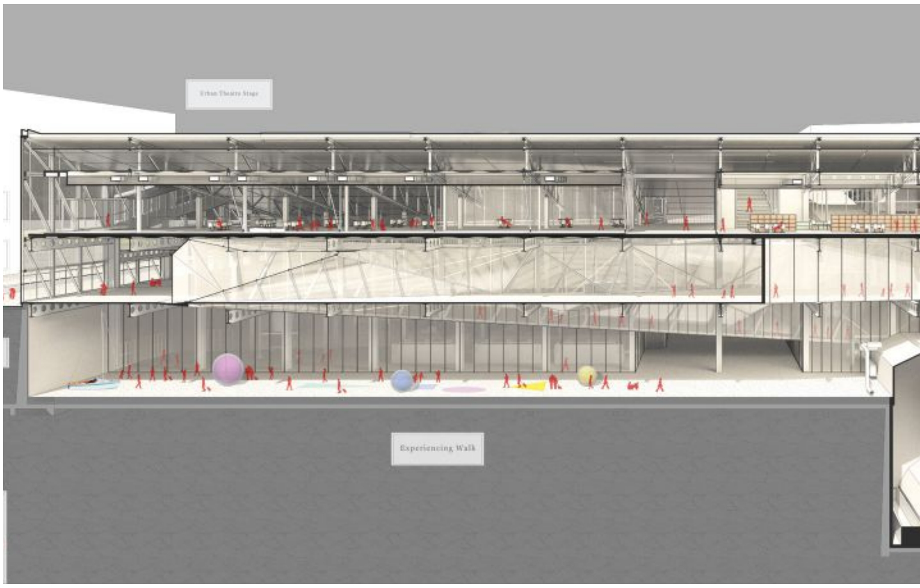
CATEGORY II: OPEN
Winners



"W" for Will

1st

Students: Rui Li and Fei Hu
Faculty: Fei Wang,
Syracuse University



"W" for Will evaluates the waste-to-energy industry by inserting a new program to enhance and respond to the industrial process.

The design mediates the industrial process from hazardous to experimental. The stacking form takes advantage of gravity and horizontal stretch to greatly reduce the byproducts generated by the burning process, turning the building into layers of different industrial happenings. The industrial waste (noise, heat, etc.) is used for artistic effect and interior conditioning. Multiple interior programs are connected to the walkable, scenic rooftop. The facility's translucent façade showcases the interior in colorized programs.

"W" for Will is an intriguing design with a beautifully detailed steel structure that creates a faceted exterior. The project's proportions and use of a long-span steel structure show a clear understanding of engineering.

2nd — Hart Island Ossuary

Student: Tatiana Estrina
Faculty: Vincent Hui, Ryerson University

Hart Island serves as New York City's potter's field, a burial place for unknown, unclaimed, and indigent persons. Due to the unmarked graves and the few accessible roads on the island, locating and visiting a loved one's resting place has proven difficult for visitors.

While not alleviating these issues entirely, the Hart Island Ossuary design does give visitors a more fulfilling experience via an open-air visitors center, memorial, and observation tower that provides panoramic views of the massive gravesite while also bringing the more than one million dead buried on the island out of anonymity.

Taking advantage of the ruins of the former Phoenix House building, the ramping structure weaves below, through, and above the crumbling brick façade, commemorating not only the dead but also the history of the island. The capability of structural steel is instrumental in the success of this proposal. The tower's main structural framework consists of an undulating truss system, and the scaffolding and underpinning of the existing condition could only be accomplished by exploiting steel's strength and modularity.

Hart Island Ossuary is a perfect balance of a poetic and technical landmark project, and the interplay of steel structure and lighting is compelling.

Urban Roots

3rd

Students: Ashkan Radnia, Gavin Reeb, and Spencer Sparagna
Faculty: Kyoung-Hee Kim and Liz McCormick, University of North Carolina at Charlotte

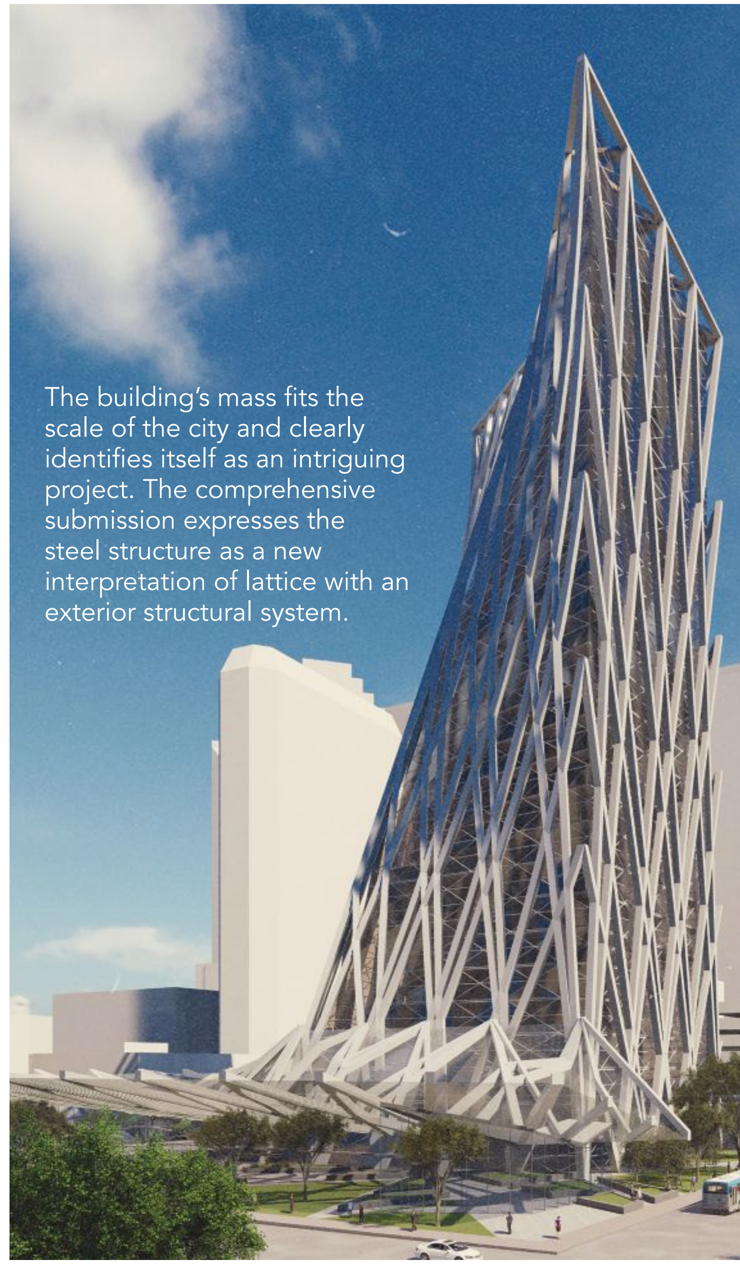
In the next three decades, the global population is estimated to grow by three billion, and nearly 70% of humanity will reside in urban centers. This dramatic growth of cities increases the need for food and the energy required to transport it from rural areas to these cities.

One of these urban centers is Charlotte, N.C., one of the fastest-growing cities in the U.S. And this is where the Urban Roots project would reside.

Urban Roots is designed to significantly reduce the emissions caused by food transportation by growing the produce at the destination; 1,500 miles from farm to store becomes 420 ft. In addition to reducing emissions, growing food at the source solves several other challenges in the agriculture industry. The plants do not have to deal with common afflictions such as bugs, adverse weather conditions, and inadvertent destruction by harvesting equipment—plus the need for pesticides is eliminated. In addition to these benefits, water use will be reduced to a fraction of its original level, and nutritional value will increase as the food will no longer need to be picked before it ripens to accommodate for transportation time.

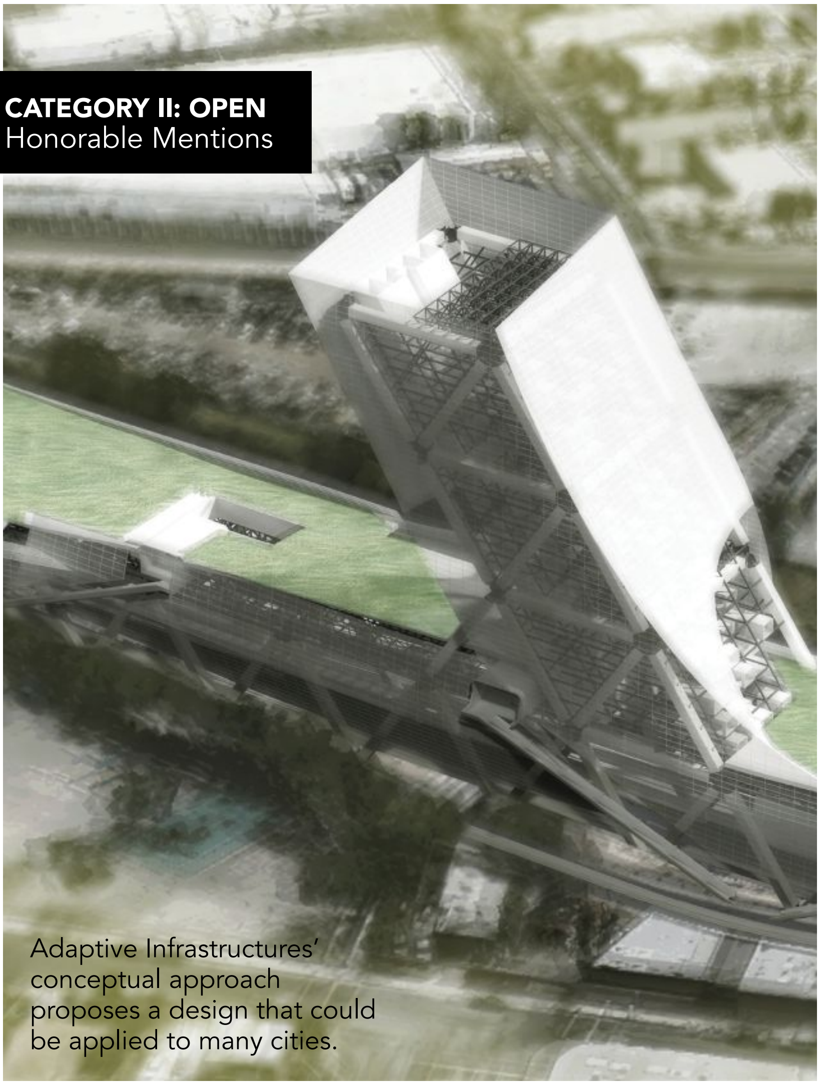
The design also works to bridge the gap between agricultural and urban workspaces. The resulting offices would be occupied by companies that specialize in food research, innovation, and production. And given its planned, central location in Charlotte's Uptown area, with open access to sunlight from the south, Urban Roots is ideal for bringing food production to the center of the metropolitan area.

The resulting steel architecture is an office environment that is always connected to green space. The architectural decisions are influenced by the challenge of incorporating and intertwining these greenhouse and office spaces to benefit each other while not compromising their integrity, either spatially, systematically, or functionally.



The building's mass fits the scale of the city and clearly identifies itself as an intriguing project. The comprehensive submission expresses the steel structure as a new interpretation of lattice with an exterior structural system.

CATEGORY II: OPEN
Honorable Mentions



Adaptive Infrastructures' conceptual approach proposes a design that could be applied to many cities.

Adaptive Infrastructures

Student: Jacob Bodinger
Faculty: Margarida Yin, California Polytechnic State University

Transit infrastructure in the United States focuses on the highway as a primary connective tissue and design driver.

The car-centric city was built in an age where environmentalism and efficiency were not priorities, and recent efforts to remedy this have been incremental and largely inconsequential. Our attachment to car travel is driven by the apparent permanence of our highway and road systems and increasingly disparate residential areas. America desperately needs quickly available, widely flexible, and environmentally efficient modes of transit infrastructure.

Adaptive Infrastructures proposes occupancy of the existing freeway system with a new rail-based transit system. This effort will occur gradually, beginning with commuter and local rail systems and culminating in a national system of high-speed rail to replace car-driven transit.

The design looks at Los Angeles as an example site, largely based on its sprawling nature. The system is punctuated by the use of transportation hubs as centers of travel, commerce, industry, and community. Each hub is constructed as a framework for the programs occurring within, confronting new fast-paced and nomadic cultural norms by envisioning the programs as temporary installations amid a permanent structure. This new steel-enabled network is a forceful reworking and radical adaptation of the current, outdated system of travel—a new approach that is both compatible with the old and everchanging in form and scale to meet future demands.

the HOODOO

Students: Alena Nagornaia, Solanda Magnuson, Elitsa Vutova, and Amy Tang
Faculty: Thomas Fowler, California Polytechnic State University
Partners: Leo Chow, FAIA, and Mark Sarkisian, SE, PE, LEED, SOM

Hoodoo, a design for a high-rise residential tower located at 1 Oak Street in San Francisco, interprets the wind erosion of a rock formation, mimicking the geologic formation for which it is named.

A hoodoo's shape responds to existing wind patterns and minimizes the influence of lateral forces thanks to its layered structure, with the strongest and densest layers remaining above eroded weaker layers. The steel tower version in downtown San Francisco adopts a similar concept via outrigger trusses, with the central void stressing the concept of wind and creating a vertical community space.

The structure of the building is comprised of canted steel cylindrical columns that twist around the perimeter. Two three-story steel outrigger trusses split the tower into thirds. The cores are tied together using these outrigger trusses, which are also surrounded by a system of steel belt trusses.

The envelope consists of a double-skin façade system for the tower and a screen system for the podium. Horizontal frit creates a pattern that corresponds with the erosion concept, decreases sun exposure, and creates living shadows in the apartment units. The podium system repeats the same frit pattern using a terracotta screen instead.

The podium includes an atrium connecting Market and Oak Streets and an outside cafe, a rock formation museum, a roof garden, and other civic spaces. The tower provides more than 450 housing units and varies from six to ten units per floor. Each unit is a segment of a floor plate, allowing every room to have different views, and the balconies create an eroded pattern on the exterior.

Pack Instinct

Student: Imani Jackson
Faculty: Erik Hemingway, University of Illinois, Urbana-Champaign

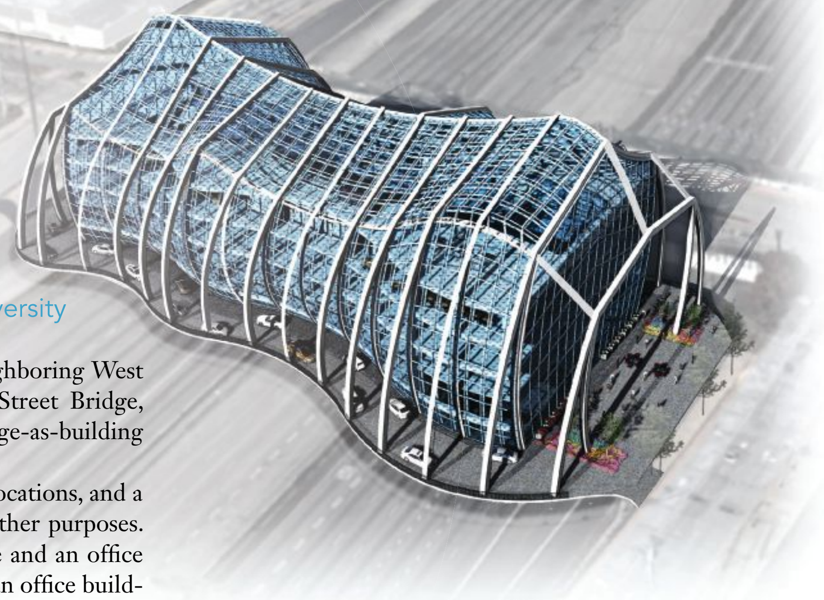
The Pack Instinct design creates a public experience in Chicago that allows the community to help raise, socialize, rehabilitate, and care for local dogs while learning the vital leadership skills required to effectively communicate with them.

Located beside the revitalizing social atmosphere of the Chicago River, the project places dogs at the intersection of human community, urban life, and the natural environment. As highly social pack-oriented animals, canines and humans benefit from a shared space that accommodates mental stimulation, physical exercise, and intellectual challenges. The design integrates animal and human social spaces, including a dog shelter, veterinary clinic, dog cafe, training spaces, and recreation areas.

Refuting the conventional prison-like layout of typical animal shelters—which facilitates behavioral problems such as aggression, depression, and psychotic behavior resulting from "kennel syndrome"—the steel-framed facility accommodates the psychological, behavioral, and sensory needs of canines. Rather than typical 5-ft by 9-ft kennels, the shelter provides large, dynamic spaces for multiple dogs, creating a harmonious social atmosphere that results from an instinctual pack mentality. The shelter area consists of a wide public space with sliding walls that can lengthen or shorten the kennel rooms depending on the needs and level of socialization of the dogs. The garden atrium acts as a communal space that channels dogs' fundamental sense of smell. Indoor and outdoor walkways allow constant social exposure to the public, facilitating the dogs' socialization. The kennel area and dog cafe overlook the river, allowing visitors from the community to easily walk and interact with the dogs around the reclaimed natural environment.

The form of the facility follows the natural topography around the Chicago River. The program areas are contained in two leaf-like masses that emerge sinuously from the landscape. These organic masses are bridged by a central atrium space that provides direct circulation to the natural riverside. A conventional steel frame acts as the underlying structure while a pipe steel structure provides a framework for the green roofs that envelop the facility and create south-facing overhangs for shading. The green roofs merge down into the riverside park landscape, and the western roof is accessible and used for recreation. Lightweight ethylene tetrafluoroethylene (ETFE) skylights in the atrium provide natural light while reducing solar gain.

CATEGORY II: OPEN
Honorable Mentions



Fusion

Student: Pablo Garcia
Faculty: Christopher Welty, Kennesaw State University

Midtown Atlanta is the definition of city life, while neighboring West Midtown has a less urban feel. Located at the 14th Street Bridge, Fusion is designed to unite the two areas through a bridge-as-building approach while also creating a community beacon.

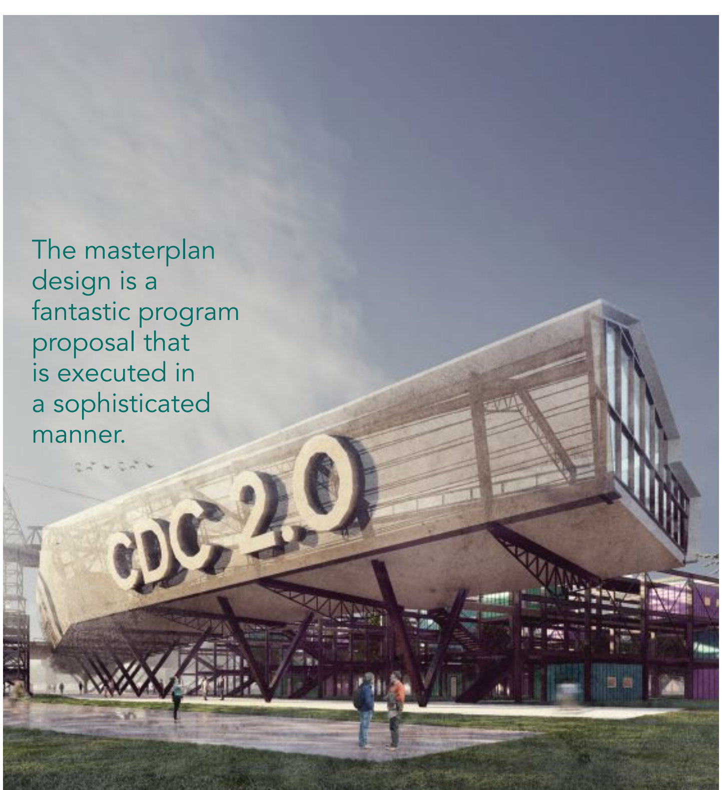
A bridge typically acts as a connection between two locations, and a building allows people to gather for work, social, and other purposes. Fusion works to synthesize the practical use of a bridge and an office building, pushing the boundaries of steel by supporting an office building over a highway while still acting as a means for both vehicular and pedestrian movement.

The steel bridge supports the structure that forms the building, with the main structural ribs connecting to the bridge structure and transferring the load onto the bridge and into the ground. The floors of the building are created by steel beams that tie into the ribs, and the structure allows for large spans and open interior spaces that can be adjusted to accommodate the inhabitants' preferences.

Fusion breaks out of the usual notion of private buildings by establishing a public street within the structure where the community and the office can interact with the building and bridge via programmatic elements. The building can be accessed by vehicles through the highway exit and by people through sidewalks. As visitors walk into the building, they can observe the atrium that expands outward towards the top, and the curved floors create a connection between exterior and interior. The plaza level is dedicated to community and social programs, and the second floor incorporates office programs while remaining available to the public.

The third through fifth floors include three office spaces apiece, each with its own lobby and conference areas, and a collaborative team room where employees from any company/tenant can work on projects together. The sixth floor is designed as a leasable event space and houses the majority of the mechanical equipment.

Fusion is impressive thanks to its deep engagement with the geometry of the steel exoskeleton.



The masterplan design is a fantastic program proposal that is executed in a sophisticated manner.

CDC 2.0

Student: Kade Brandon
Faculty: Pasquale De Paola and Kevin Singh, Louisiana Tech University

COVID-19 is affecting the entire planet, and with a new virus come new adaptations in the form of equipment, medicine, and technology.

A new steel-framed research facility for the disease could be part of the answer—but just as a virus grows and spreads, a research facility should be able to do the same.

What if a research facility could be transformed into a relief center? This is the plan for CDC 2.0, which doubles as a research facility and a relief center for pandemics/epidemics. As a pandemic spreads from an initial point, pods will be able to attach to the existing structure of the research facility and also expand, allowing researchers to both treat and monitor people with the disease.

The facility consists of both research pods and patient pods. The patient pods have two different iterations, one with multiple beds for patients with less critical needs and the other for people who require more care and isolation. The research pods contain refrigerators and storage space for new medicines being developed to battle the disease. There are also back-of-house ICU spaces as well as offices, restrooms, and additional storage spaces.

Incremental Architecture

Students: Megan Gotsch and Philip Riazzi
Faculty: David Franco, Daniel Harding, and Dustin Albright, Clemson University

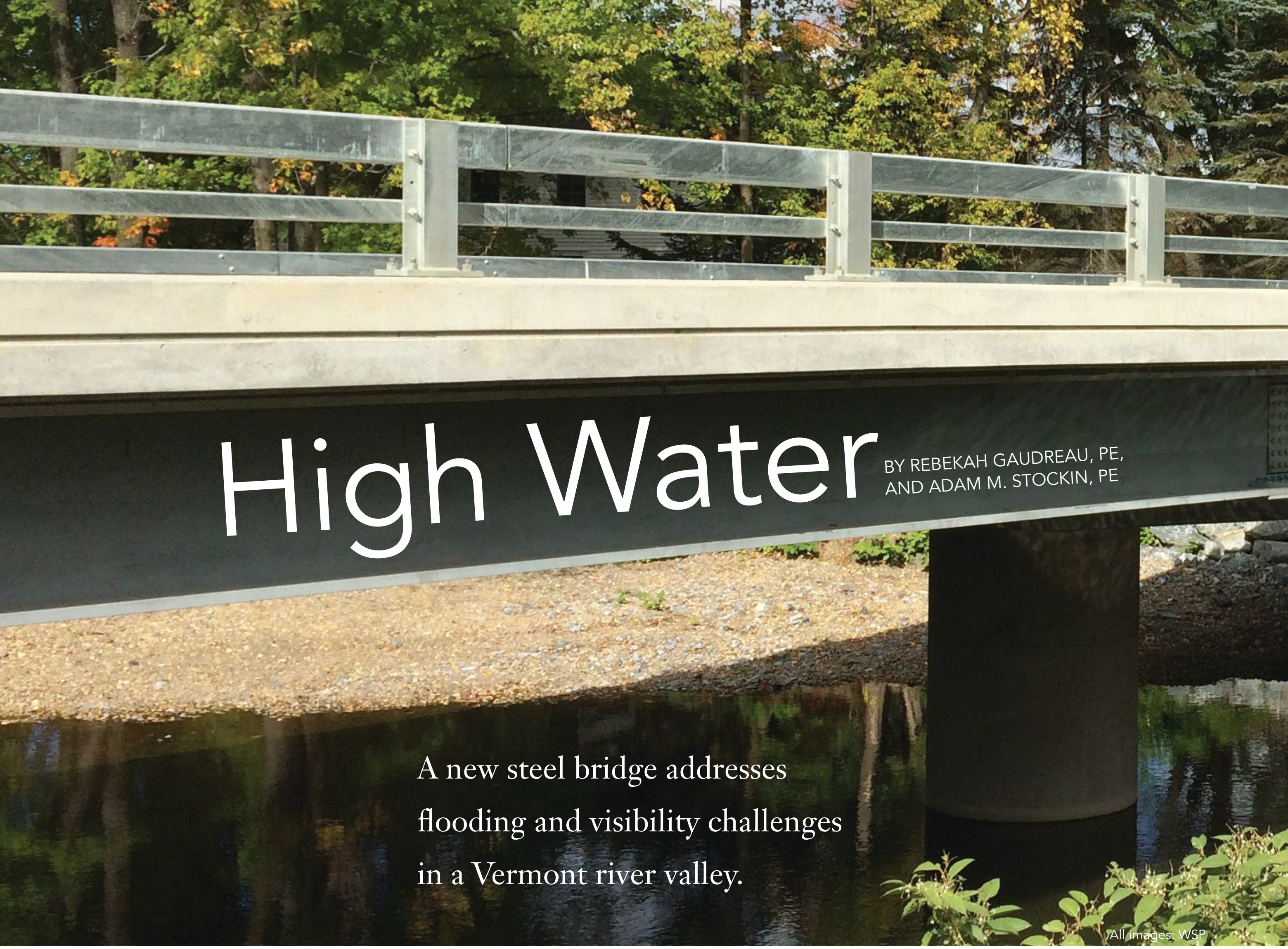
Incremental Architecture is about creating highly adaptable and accessible spaces that address changing user needs over time.

The design is explicitly explored in Anderson, S.C., home of the now-empty Anderson Textile Mill. The idea is to allow buildings—perhaps long-closed ones, such as this mill—to outlive their original use as vital community hubs.

The Anderson building was chosen due to the community's need for education and job training. Using the Incremental Architecture design, the revitalized facility will host skilled manufacturing jobs in a factory space modified to produced deployable building components for affordable housing. Tied in with the factory are community training, business incubation, and a food hub.

This highly adaptable and adjustable architecture is made possible via a steel space frame, which serves as the backbone for the building's major systems. The interior spaces are wrapped in a series of successive skins—a thermal barrier, a weather barrier, and a solar barrier—to create a resilient and adaptable building, which is not only beneficial to the environment but also the local economy and community. ■

Incremental Architecture presents a wonderfully simplified building type. The design challenges systematic structures and comes up with an expandable and transformative project.



High Water

BY REBEKAH GAUDREAU, PE, AND ADAM M. STOCKIN, PE

A new steel bridge addresses flooding and visibility challenges in a Vermont river valley.

All images: WSP

Rebekah Gaudreau (rebekah.gaudreau@wsp.com) is lead structural engineer and technical principal, and **Adam M. Stockin** (adam.stockin@wsp.com) is assistant vice president and supervising structural engineer, both with WSP.

THE RIVER ROAD BRIDGE over the New Haven River in New Haven, Vt., had a good run.

Built in 1935, the 170-ft-long three-span crossing was designed with straight steel girders on a curved alignment. Its design service life was eventually surpassed, and the deck and substructure components required replacement.

In 2017, its 164-ft-long two-span curved plate girder replacement structure took over the duty of carrying River Road over the waterway. The new structure has no joints or bearings, helping to decrease maintenance costs while increasing service life, with the hopes that it will outlast its predecessor's impressive life.

This accelerated bridge construction (ABC) project was completed within a 72-day closure window at a total construction cost of $3.5 million. And though the finished structure appears simple, the design and construction had its share of complexities.

The crossing is in a valley prone to flooding, and debris frequently became trapped under the former bridge. It was critical that the final design solution limited obstructions and maximized the vertical clearance over the river. However, raising the bridge's profile was not a practical solution, as it is located on a high point within the flood plain, and any increase would require earth and roadway work for a significant distance along the approaches. An intersection approximately 50 ft from the bridge added to the sight distance challenges of the curved alignment and further complicated a designed increase in the vertical profile. The site also has very poor subsurface conditions, with a 40-ft-thick layer of very soft clay with blow counts at weight of rod. This clay layer was located over additional stiffer clay layers and glacial till, and refusal was not achieved within the 120-ft depth of the subsurface investigation.

Bridge Design

The chosen bridge design consists of four curved steel plate girders, topped with an 8½-in. high-performance concrete composite deck, for a total width of 32 ft, 6 in. The

alignment was shifted to allow for a 6-ft, 6-in. shoulder on the inside of the curve to improve site distances and allow room for snowmobile passage across the bridge. The width of the pier cap matches that of the superstructure for clean lines and a pleasing aesthetic appearance.

A two-span configuration was chosen to eliminate a pier location, and the integral abutments were placed radially and supported on HP14×102 ASTM A572-50 piles orientated on the weak axis. The central pier consists of a single 6-ft-diameter circular column supported by an 8-ft-diameter, 115-ft-long mono-shaft, which significantly reduced hydraulic impacts when compared to a wall pier or multicolumn pier configuration. The substantial length of the mono-shaft was required due to the soft clay layer at the site. The traditional hammerhead pier cap was moved upward into the superstructure to further reduce hydraulic impacts and lower the potential for debris collection, an innovative technique that required the plate girders to be cast through the cap.

The girders were fabricated with 2-in.-diameter holes in the webs located 3 in. below the top flange. This design decision accommodated the introduction of ten #11 bars for reinforcement continuity to meet the large moment demands at the top of the cap. A second row of ten #11 bars was cast into the deck, and additional holes for #6 bars were included vertically for the side reinforcement in the cap. A matrix of 56 ⅞-in.-diameter by 6-in.-long

above: The new 64-ft-long two-span curved plate girder River Road Bridge in New Haven, Vt., replaced a Great Depression-era crossing.

below: The existing bridge frequently experienced debris jams from high flows.

above: The full 103-ton steel superstructure.

left: The precast cap with girder stubs being prepared for transport.

studs was affixed to each side of the webs to ensure the system acted integrally in this high negative moment region of the plate girders. The shear studs were encircled by two #6 hoops on each side, 3 in. from the web face.

The steel plate girders—33¼ in. deep with a 16-in. by 2-in. bottom flange and a 16-in. by 1¾-in. top flange—were horizontally curved with radii ranging from 714 ft to 742 ft and cambered for dead load deflections and vertical profile. Horizontal curvature was achieved by flame-cutting the flanges simultaneously on both edges in accordance with Vermont's *Standard Specifications for Construction*. Diaphragms consisted of W24×84 rolled sections, and the steel framing was vertically offset to allow for a 4% super-elevation. A total of 103 tons of structural steel was required to complete the superstructure framing.

Given the frequent high water levels at this crossing, weathering steel was not an option, and traditional paint systems were also ruled out due to continual maintenance needs. The design team chose to metalize the AASHTO M270 Grade 50 structural steel members with an 85%-15% zinc-aluminum blend, which was shop applied using electric arc thermal spray equipment to a thickness of 8-12 mils, followed by a

Placing the precast cap unit on the mono-shaft.

sealer coat. All surfaces in contact with concrete were treated with a zinc primer, as aluminum reacts negatively with concrete. Faying surfaces were metalized but not sealed, and steel fabricator Casco Bay Steel provided documentation that a slip-critical coefficient required for a category B connection would be achieved.

ABC Challenges

Due to the tight closure window for bridge removal and construction, there was not adequate time to cast the cap around the structural steel in the field, thus requiring the cap to be precast together with the steel girder segments off-site. In order to meet shipping requirements, the girder segment length was set to 12 ft, which resulted in the need for bolted field splices to be designed at 6 ft from both sides of the centerline of the pier.

Because of the significant geometry control required for placing the superstructure on a central pier, plus the need to land the superstructure on precast abutment seat locations, prescriptive contract requirements were included to ensure that there would be no alignment challenges in the field. A special provision was developed to introduce a third-party engineer, hired by the contractor, to perform quality control and coordination between the general contractor, precast contractor, and Casco Bay. The structural steel framing was fabricated at Casco Bay's Portland, Maine, shop and shipped to the concrete contractor in Clarendon, Vt., where the structural steel system was erected with full geometry control and all field splices and diaphragms were

above: Erecting the steel superstructure.

below: In order to meet shipping requirements, the girder segment length was set to 12 ft, which resulted in the need for bolted field splices to be designed at 6 ft from both sides of the centerline of the pier.

fully connected. Reinforcement was then tied, and the cap was cast around the girders. Once the cap had cured, the structural framing was disassembled and shipped to the project site.

Simple yet Elegant

The construction team completed the bridge in the 72-day closure window, meeting the Town of New Haven's desire for the local school bus schedule to remain unhindered by the project. At final inspection, it was clear that the complex design of this bridge yielded a simple and elegant structure, with the only visible joint being the ½-in. grout pad between the pier cap and the column. In addition, the single circular column is the only obstruction in the river, significantly reducing the likelihood of debris being trapped.

When it made the decision to replace the original River Road Bridge, the Vermont Agency of Transportation (VTrans) sought a successor that would increase hydraulic capacity and safety at the nearby intersection, eliminate maintenance issues associated with joints and bearings, provide extended service life, and inflict minimal delay to residents. The new bridge accomplished all of these goals, serving as an excellent example of how engineering, innovation, and prescriptive contract requirements can be blended to meet the client's and the traveling public's needs under very challenging site conditions. ■

above and below: The completed integral structure, with an open stream crossing and metalized continuous plate girders, from below and above.

Owner
Vermont Agency of Transportation (VTrans)

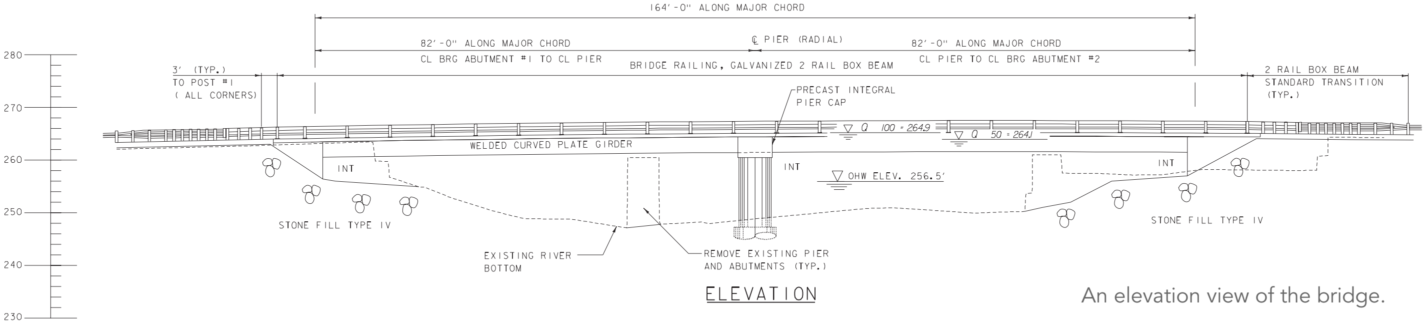
General Contractor
CCS Constructors, Inc.

Structural Engineer
WSP USA, Inc.

Steel Team

Fabricator
Casco Bay Steel, Portland, Maine AISC CERTIFIED FABRICATOR

Detailer
Tensor Engineering, Indian Harbour Beach, Fla. AISC DETAILER

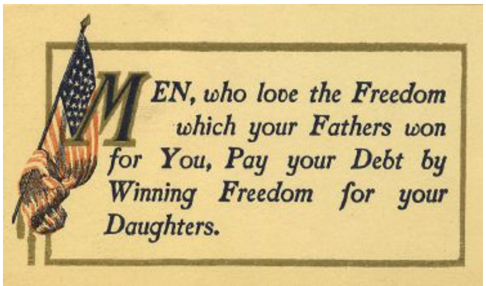


An elevation view of the bridge.

1830 · 1840 · 1850 · 1860 · 1870 · 1880 · 1890 · 1900 · 1910 · 1920 · 1930 · 1940

1847

Seneca Falls Convention launches women's suffrage movement.



NINE STEEL BRIDGES that are still in service today were open to traffic when it happened.

5,189 SUCH BRIDGES were already open when the Nineteenth Amendment finally granted women the right to vote in 1920.

1933

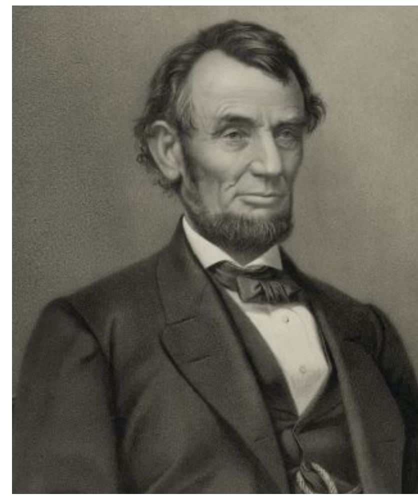
Police drag the Charles River after a "cod-napping" in the Massachusetts State House.

At least **13,525 STEEL BRIDGES** that are still in service today were already open to traffic.

Scott D Flickr

1863

President Abraham Lincoln delivers the Gettysburg address.



63 STEEL BRIDGES that are still in use today were already open to traffic.

EVERY DAY IN THE U.S., AN AVERAGE OF 77 MILLION VEHICLES CROSS MORE THAN 25,000 STEEL BRIDGES BUILT BETWEEN 1838 AND 1938.

These are just a few of the stories these bridges could tell: dazzling innovation, events that changed the world, and quirky people being...well, quirky.

Visit **aisc.org/nsba/timeline** for more.

New resources from the American Galvanizers Association can help you determine the maximum steel element size for maximum efficiency in your next progressive-dip galvanized job.

Maxing Out

BY ALANA FOSSA

Alana Fossa (**afossa@galvanizeit.org**) is the Sr. Corrosion Engineer for the American Galvanizers Association (AGA) and the Vice Chairman of the ASTM Subcommittee A05.13 that authors and edits specifications on hot-dip galvanizing of steel articles.

ONE OF THE MOST COMMON QUESTIONS about after-fabrication batch hot-dip galvanizing is, "What is the largest piece that can be hot-dip galvanized?"

The quick answer is, "There's not a one-size-fits-all answer." Hot-dip galvanizing is an immersion process, so size limitations are often governed by the galvanizing kettle dimensions.

Although the average kettle length in North America is around 40 ft, there are many kettles between 50 ft to 60 ft long. Whatever the kettle size, the practice of progressive-dip galvanizing—colloquially though erroneously referred to as "double-dipping"—allows large steel elements to be dipped, even when they exceed the dimensions of the chosen kettle. And new free tools from the American Galvanizers Association (AGA) can help specifiers determine the maximum article size appropriate for successful progressive dip galvanizing depending on kettle and facility constraints.

So why is determining maximum article size even important? Isn't it possible to simply break down assemblies to their smallest elements and dip them in several batches? Absolutely. But keep in mind that galvanizing is a very involved process, and galvanizers don't charge by the assembly but rather by the number of dips. So from a time and financial standpoint, maximizing sizes and minimizing the number of dips is your best option.

Maximum Article Size

Steel assemblies intended to be galvanized are typically designed in sections or individual members to fit within the kettle and are then bolted or welded together following the dipping process. If an item or is too long or deep for a single immersion in a kettle, this is where progressive dipping can come into play. In this process, articles are partially galvanized at an angle, flipped, rehung, and then galvanized on the remaining surface to fully coat the assembly with a small overlap area.

The maximum progressive dip length is most easily approximated by modeling the steel article as a solid, 3D box partially immersed in the galvanizing bath, where the width of the article is less than the kettle width. (You can find kettle dimensions for all of AGA's member hot-dip galvanizers at **galvanizeit.org/galvanizers**.) In addition to the kettle and article dimensions, the dross line height and freeboard height are important variables in the calculation (dross forms by reactions between molten zinc and loose particles of iron in the galvanizing kettle, and typically drops to the bottom of the kettle because it is heavier than the molten zinc). The kettle is not filled to the top with molten zinc, but rather to a few inches below the top. If this distance from the top of the zinc to the top of the kettle, called the freeboard height, is unknown, it can generally be estimated at 4 in. The galvanizing dross line height varies over time depending on the plant's kettle maintenance schedule, but steel assemblies are often lowered to a point just above this line to minimize the potential for dross inclusions (aka "dross pimples") on the surface of the article. For steel elements where inclusions are not acceptable—such as handrails, architecturally exposed structural steel (AESS), and steel to be painted or powder coated after galvanizing—a dross height of 8 in. can be estimated, a measurement that errs on the side of caution. To maximize the size of an article to be galvanized, for which dross inclusions are acceptable, you can drop the dross line value to zero.

opposite page: Steel elements that are too large to be galvanized in a single dip can be progressive-dipped.

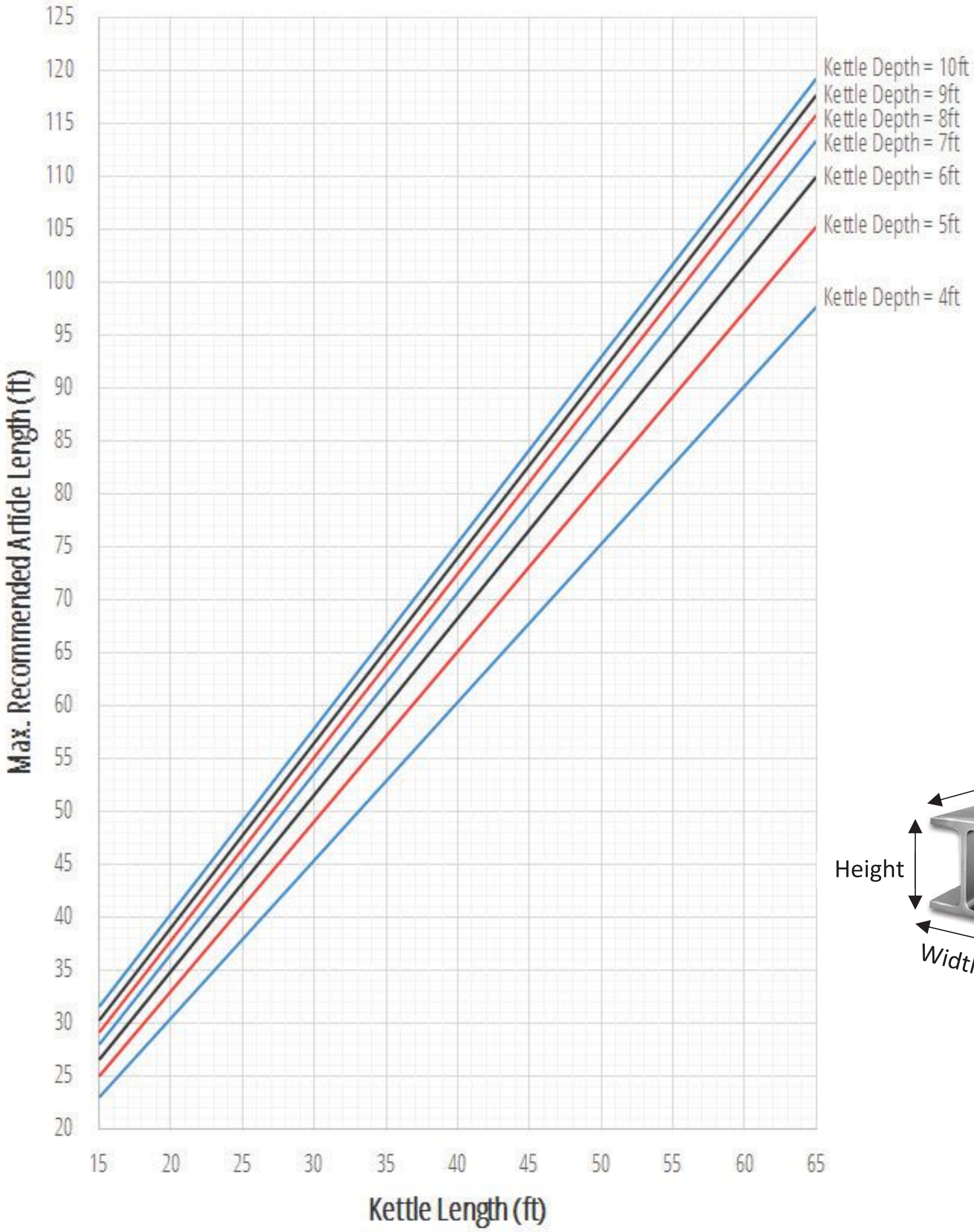
below: A lengthy steel member taking its first dip in the zinc bath.

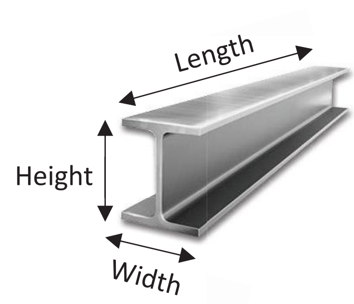
A large steel element going in for its second zinc dip.

Progressive Dip Charts and Calculator

Once you determine the necessary tank measurements, there are two new resources to assist you with calculating the maximum article size: the AGA Progressive Dip Charts and AGA Progressive Dip Calculator.

The AGA Progressive Dip Charts (**galvanizeit.org/pdcharts**) estimate the maximum article length if the article height and galvanizing kettle dimensions are known to the nearest foot. The four charts provide the maximum length for articles of 1 ft, 2 ft, 3 ft, or 4 ft in height when considering a range of typical galvanizing kettle lengths and depths.





A sample AGA Progressive Dip Chart. All of the charts are available at **galvanizeit.org/pdcharts**.

For a step-by-step look at the hot-dip galvanizing process, see "Galvanizing Illustrated" in the August 2014 issue, available at **www.modernsteel.com**.

The AGA Progressive Dip Calculator (**galvanizeit.org/pdcalculator**) offers a customizable format to determine whether an article of specific dimensions can be hot-dip galvanized within a known galvanizing kettle size. This calculator informs you whether the steel item can be progressive-dipped successfully in one particular galvanizing kettle. It also provides vital information that can be discussed between the designer and galvanizer to make educated decisions about lifting arrangements that may influence the final decision to galvanize. The outputs from the calculator include a visual 2D model, allowable angles for successful galvanizing, available options for article orientation during galvanizing, and guidance on whether rotating the article width and height affects galvanizing success.

Other Considerations

While maximum article size is indeed a crucial consideration for progressive dipping, it's not the only one. Progressive dipping jobs are also influenced by dimensional constraints, aesthetic requirements, and zinc temperature.

Lifting orientation and handling. The galvanizing plant must be capable of handling the articles to be dipped, which depends on the facility's crane load capacity, crane height, and overall plant layout. Discuss lifting orientation and lift points directly with the galvanizer to avoid the article clashing with nearby walls or equipment at the plant for both passes, and confirm the article weight is within the safe working load limit of the available lifting equipment.

Aesthetics. Progressively dipped pieces have an overlap area that often appears darker, develops a thicker coating, and may not weather consistently with the rest of the product. Although the overlap line does not affect the overall corrosion protection, it can be buffed or ground down even with the surrounding coating to improve the look. Grinding is also beneficial and necessary in situations where the increased coating thickness of the overlap area impacts a connection point with other pieces.

Process temperature concerns. Uneven heating and cooling are inevitable during progressive dipping, as one end of the article will be in the molten zinc bath (~850 °F) while the other end is exposed to cooler air—and exposure to such wide temperature variations may lead to distortion of fabricated assemblies. The risk of distortion can be reduced by designing for the increased stresses from thermal expansion at the zinc bath temperature. Analyzing the conditions of the first dip is critical, as the temperature gradient will be greatest for this step and less severe for the second dip due to heat retained in the steel from the first immersion. Additionally, ensuring that vent and drain holes are adequately sized and placed will facilitate rapid immersion and withdrawal of the object from the bath. Bracing (permanent or temporary) may also be incorporated to provide stability during the thermal expansion and contraction. Additional details for minimizing the potential for distortion are available in ASTM A384: *Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies* (available at **astm.org/atandards/a384.htm**).

Enter Kettle Dimensions:		
K (Kettle Depth)	72	inches
L (Kettle Length)	600	inches
W (Kettle Width)	60	inches

Enter Article Dimensions:		
(S) Height	16	inches
Length	780	inches
Width	34	inches

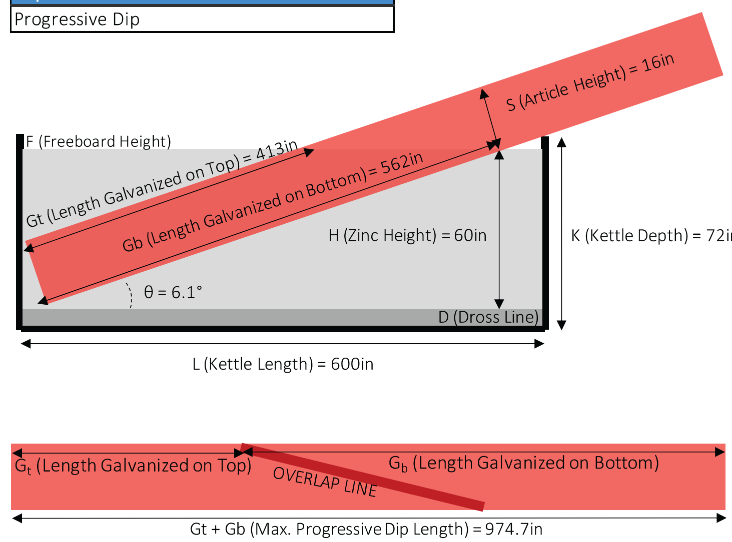
Enter Properties of Zinc Height:		
Dross Line Height	8	inches
Freeboard Height	4	inches

If **unknown:** use dross height = 8 in. and freeboard = 4 in.

Allowable Angles in the Bath:	
θ minimum	6.1 °
θ maximum	7.6 °

Article Orientation:	—
Can This Article be Fully Galvanized?	YES ✓

Dip Method:
Progressive Dip



above: A sample steel item and kettle scenario as run through the AGA Progressive Dip Calculator. Visit **galvanizeit.org/pdcalculator** to give the calculator a try.

below: Progressive dipping typically produces an overlap surface condition that is thicker and darker in appearance than the surrounding area but can be smoothed out via grinding if required.

Minimize Dips, Maximize Efficiency

Steel elements and assemblies that are too long or deep for a single dip present some additional challenges in the galvanizing process. But with the right tools and communication with your galvanizer, you can ensure that the process will run smoothly and result in a quick turnaround and long-lasting corrosion protection for your hot-dip galvanized steel projects. ■

Seismic Design Manual Virtual Seminar
presented by Thomas M. Sabol | Earn up to 9.0 PDHs
Discounted Seismic Design Manual available with registration!
Sessions 1–4: Monday, Nov. 30 – Thursday, Dec. 3 | 2:00 – 4:00 p.m. EST
Q&A session: Friday, Dec. 4 | 2:00 – 3:00 p.m. EST
aisc.org/SDMwebinar
Rake in the PDHs
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Upcoming Daytime Webinars
Designing Built-Up Flexural Members
presented by Louis F. Geschwindner | 1.5 PDHs
Thursday, Nov. 5 | 1:30 – 3:00 p.m. EST
Line Girder Analysis for Skewed Straight Steel I-Girder Bridges
presented by Dennis Golabek and Donald W. White | 1.5 PDHs
Tuesday, Nov. 10 | 1:30 – 3:00 p.m. EST
Design of Strengthening for Existing Steel Members
presented by Joseph Schuster | 1.5 PDHs
Thursday, Dec. 10 | 1:30 – 3:00 p.m. EST
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A Seismic Shift in Steel Education

BY CHRISTINA HARBER, SE, PE

The latest AISC *Seismic Design Manual* seminar starts its virtual "tour" on November 30.

IT'S SOMEWHAT OF A TRADITION AT AISC: Publish a new manual, write a seminar on the manual, and travel around the country to present the seminar to engineers.

This was AISC's plan for the latest (third) edition of the *Seismic Design Manual* (**aisc.org/seismic**), for which the presentations rotate between three speakers: Tom Sabol, Rafael Sabelli, and Michael Englehardt. But after stops in St. Louis and Honolulu in late 2019, the tour was grounded as of March 2020 due to the pandemic.

However, we have good news: The seminar is back on tour! Sort of. Now in a convenient, virtual format, the "tour" is kicking off on November 30. This new, live webinar—which will take place in four two-hour sessions from November 30 through December 3—will highlight the latest edition of the *Seismic Manual* as well as AISC's 2016 *Seismic Provisions for Structural Steel Buildings* (ANSI/AISC 341, **aisc.org/specifications**), which is included in the *Seismic Manual*.

Why Seismic, Specifically?

AISC's seismic-related continuing education programs have always been popular, and the webinar's sole presenter, Sabol, a principal at Englekirk Structural Engineers in Los Angeles and an adjunct professor at UCLA, points to two main reasons. First, building codes have shifted, factoring seismic considerations into regions where they were previously not required. "There are many people who have never taken seismic design in school who are asked to address seismic design issues, which is a challenge for them," he says.

The second reason is that codes and standards have become more complicated over the years, and structural engineers are increasingly keen to stay on top of all the changes, regardless of their primary region. Sabol attributes this progression of codes and standards to the additional knowledge gained from research, as well as the current desire to build more complex structures. With a more sophisticated design standard, more efficient designs can be achieved with less unnecessary conservatism, pushing engineers to become familiar with newer standards to maximize safety and efficiency in their buildings.

Christina Harber (**harber@aisc.org**) is AISC's director of education.

Tom Sabol, presenting the *Seismic Manual* seminar in Honolulu last November.

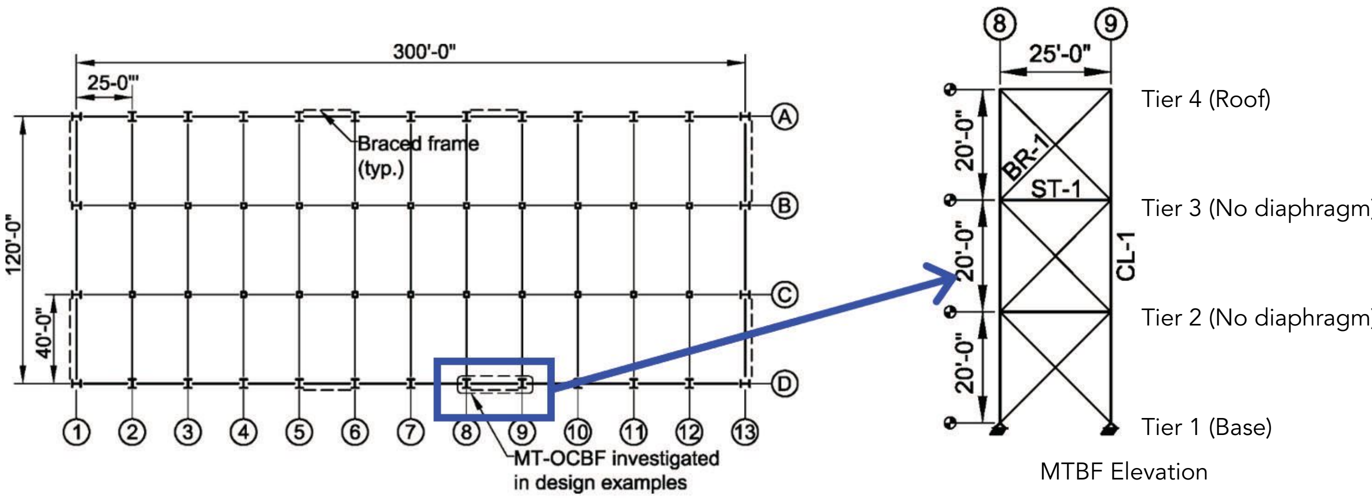
Meet the Speaker

Tom Sabol is a principal at Englekirk Structural Engineers in Los Angeles and has authored and presented the *Seismic Design Manual* seminar since the first edition was published in 2006. He serves on several research and standards-development groups, such as the AISC Seismic Provisions and Specification committees, and is the chair of Task Committee 9: Seismic Design. He was actively involved in the FEMA-sponsored SAC projects and the NSF-sponsored Seismic Repair and Rehabilitation Project. Sabol is also an adjunct professor in the Civil and Environmental Engineering Department at UCLA, where he teaches graduate and undergraduate courses focusing on earthquake engineering and structural steel.

And of course, seismic design teaching and practice have both evolved over the years. Sabol recalled an example from the early days of the seismic design seminar when, after the eight-hour session, an attendee asked him to explain the concept of a plastic hinge, a basic term Sabol had used repeatedly during the seminar. Sabol and the two other presenters decided that such a question was proof that large portions of the country needed more education, and that the seminar needed to introduce fundamental concepts before moving on to more complex issues.

Engelhardt, a frequent AISC seminar speaker, professor, and assistant vice chancellor of research for the University of Texas, has tried to address some of this knowledge gap in his presentation "Seismic Design for Non-West Coast Engineers." This was a popular session at the 2015 NASCC: The Steel Conference and later as a live webinar (you can find a recording of the full presentation at **aisc.org/education-archives**). In that presentation, Engelhardt explained the impact of major historical earthquakes, how force is transferred to a building during an earthquake, and the philosophy behind earthquake-resistant design. His aim was to lay the groundwork for a basic understanding seismic design of structural steel systems.

After many presentations of the *Seismic Manual* seminar and other related AISC seminars, Sabelli, a principal at Walter P Moore in San Francisco, observed that the average engineer's level of understanding has elevated over the years. "I noticed an increase in the detail and level of sophistication in the questions I was asked," he says. "Attendees aren't just coming to satisfy continuing education requirements, but rather they're looking to improve their designs and have a better understanding of seismic concepts." (One of Sabelli's favorite things about presenting the seminar is his joke involving a gusset plate detail. He would point out the two lines of weld from the brace to the plate, then walk behind the screen to announce that there were two more weld lines on the back. If you're not laughing, chalk it up to "You had to be there.")



The seminar will include a discussion of multi-tiered braced-frame systems.

Something for Everyone

The *Seismic Manual*, which contains AISC's *Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications* (ANSI/AISC 358) in addition to the *Seismic Provisions*, runs about 700 pages. Of course, this can't all be covered in eight hours. So, what does the seminar include?

Topics covered include:

- Specifications, codes, and references
- Seismic design overview
- Design tables
- Role of structural analysis in design
- Systems not specifically designed for seismic resistance (R=3)
- Moment frames (OMF, IMF, SMF, column splice, and base details)
- Braced frames (OCBF, SCBF, BRBF, connection design)

Not covered:

- Analysis procedures and modeling
- Special truss moment frames
- Eccentrically braced frames
- Composite moment frames
- Composite braced frames and shear walls
- Diaphragms, collectors, and chords

Regardless of an engineer's seismic design acumen, there is always more to learn from the experts. For those less practiced, the seminar will start with a general discussion of seismic design philosophy and ASCE 7-related requirements, something that even experienced seismic designers appreciate when applied directly to steel. It will cover the design of all commonly used systems from ordinary moment frames (OMF) to buckling restrained braced frames (BRBFs). Attendees will also learn how to apply the *Seismic Provisions* through numerous examples worked in both LRFD and ASD, gain helpful tips on using design tables, and receive insightful explanations from the people who wrote the standard.

For the more advanced engineer, the seminar will also cover topics that are new to the *Seismic Manual*. For example, the multi-tiered braced frame (MTBF) system, an ordinary concentrically braced frame in which the columns are not laterally braced out-of-plane at intermediate levels, has been added to the 2016 *Seismic Provisions*. Sabol will walk through design considerations for this system and illustrate how to apply the provisions through an example.

Webinar Details

AISC *Seismic Design Manual*, 3rd Edition and Applications of the 2016 *Seismic Provisions*

- Presenter: Thomas Sabol, SE, PE, PhD
- Up to 9.0 PDHs (8.0 AIA LU/HSW)
- $325 for AISC members
- $525 for nonmembers
- Includes PDF course notes

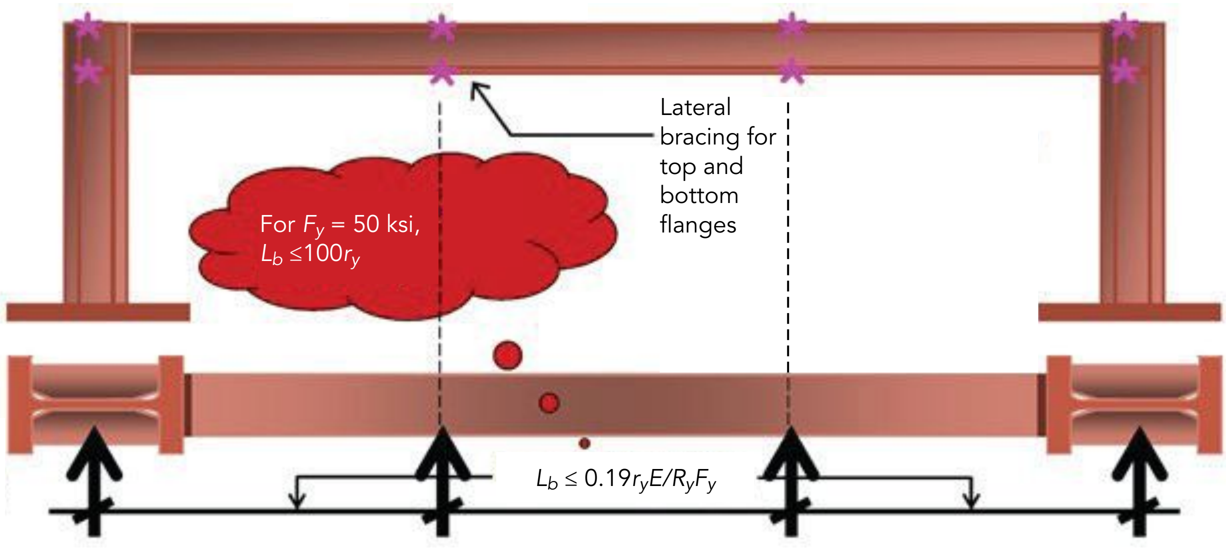
Available to registrants:

- For a limited time, the AISC *Seismic Design Manual*, 3rd Edition, will be available for $75 (a $200 value) plus shipping and handling
- Printed course notes (free, plus shipping and handling)

Registration: **aisc.org/sdmwebinar**

Sessions 1–4:
Monday, November 30 – Thursday, December 3,
1:00 p.m. – 3:00 p.m. CST

Q&A session:
Friday, December 4
1:00 p.m. – 2:00 p.m. CST



Minimum unbraced length between lateral braces for moderately ductile members.

The webinar will also include a detailed explanation of the beam stability bracing requirements for moment frame beams, incorporating an example that is new to the 3rd Edition *Seismic Manual*. Sabol will explain how to determine the required spacing, location (stay out of the protected zone!), and stiffness of bracing for special moment frame beams. Plentiful photos, diagrams, and calculations will help attendees understand every detail of the design process.

Seismic Opportunity

Whether it is overcoming canceled flights with a 20-hour drive to give a seminar or contending with a boisterous presentation about pest control in an adjacent hotel meeting room, Sabol will not miss the unpredictability of in-person seminars. However, he will miss interacting with the audience. "I get a lot of energy from the group," he says. "It makes giving an in-person seminar more fun."

While obviously not being held in-person, the online version of the seminar will be interactive. Attendees can send in questions at any time, and Sabol will be happy to take a break during the lecture to provide real-time answers. There will also be quiz questions sprinkled throughout the presentation to make sure everyone is following along. Finally, if any questions remain unanswered after the four sessions, attendees can tune in to a one-hour question-and-answer session on the last day. Take this as an opportunity to invite Sabol into your home, office, or wherever you are working these days and learn more about seismic design. ■

A Brief History of Seismic

The first national standard for seismic design and steel structures was published as the *Seismic Provisions for Structural Steel Buildings* by AISC in 1990. The subcommittee that led this effort was chaired by legendary University of California, Berkeley, professor Egor Popov, who asked Michael Engelhardt, then his PhD student, to assist with this work. Several other young researchers were also asked to serve on committees, as AISC sought to recruit new, bright minds.

Greg Deierlein, currently a professor at Stanford University, was brought onto the committee for his background in composite steel-concrete structures. Engelhardt and Deierlein, both early in their research careers, recalled this as an exciting period for advancement in the field. "We were fortunate to be on the ground floor on this," said Engelhardt.

Before that time, many of the standards for seismic design originated from California and the Structural Engineers Association of California (SEAOC). The development of the First Edition of the *Seismic Provisions* in 1990 reflected a growing interest and concern for seismic-resistant design at the national level.

Engelhardt and Deierlein (both now professors) and others like them, who remain active in research and serve on AISC committees, have played a key role in spreading seismic design knowledge outside of California through their teaching. Starting in the 1980s, considerable funding from sources such as the NSF created research for PhD students who were able to develop an expertise in seismic design. After these students graduated, they moved to academic positions across the country and world. Not only did they continue to research in this area, but they also developed new courses at their universities, making seismic design of steel structures mainstream at the graduate level.

A timeline of the *Seismic Provisions* and its seminar:

- 1990: AISC published its first *Seismic Provisions for Structural Steel Buildings*
- 1997: *Seismic Provisions* include a substantial increase in content due to research and discoveries from the 1994 Northridge Earthquake
- 2005: This year's version of the *Seismic Provisions* is ANSI accredited for the first time
- 2006: AISC publishes the first *Seismic Design Manual* and launches an accompanying seminar
- 2020: AISC debuts the webinar version of the *Seismic Design Manual* seminar

SSBC

AISC Releases 2021 Student Steel Bridge Competition Rules

For more than 30 years, AISC's Student Steel Bridge Competition (SSBC) has challenged student teams with developing a scale-model steel bridge that must meet the requirements and specifications for a mock design scenario. The rules are written by the SSBC Rules Committee, and they are updated every year to renew the challenge and keep things exciting.

Given the abrupt end to the 2020 Competition due to the COVID-19 virus, this year's rule changes allow bridges designed for the 2020 Competition to be used in the 2021 Competition, and they do not prohibit teams from modifying their 2020 bridges or developing a completely new design as they see fit.

The mock scenario remains the same: The bridge will cross a new waterway created by flooding along a recreational trail in Katy Trail State Park in Missouri. The bridge must be skewed with the waterway running parallel to the skew. However, teams must consider a different construction site layout this year when determining how to assemble the bridge.

To accommodate the variety of circumstances on (and off) college campuses as a result of the pandemic, AISC is excited to offer three ways for students to compete in 2021:

1. Teams can participate in the traditional competition at one of 17 in-person Regional Events—where it is safe to do so and with social distancing and other safety protocols in place.
2. Teams can also participate in the traditional competition from their campus via video submission.
3. They can participate in a new, design-only program known as the Supplemental Competition. Student teams will be asked to submit a written report and a video summarizing their design and construction sequence for the bridge.

AISC and the SSBC Rules Committee hope that the variety of options will provide students with the best opportunity to compete as they are able.

"We hope that students will still be able to enjoy the things that make SSBC so special: camaraderie, creative problem-solving, and actual engineering experience," said Christina Harber, AISC's director of education.

For the complete problem statement, rules, and sponsorship opportunities, visit **aisc.org/ssbc**.

People & Companies

DeSimone Consulting Engineers, a full-service engineering firm with offices worldwide, has announced the asset purchase of **RRC Engineering**, a Massachusetts-based structural engineering firm specializing in designing data centers. The move further strengthens DeSimone's offerings in the tech-driven space while providing greater resources to RRC, which will continue to be led by founding principal **Robert Chartrand**.

Short Span Steel Bridge Alliance (SSSBA) has redesigned its website, **www.shortspansteelbridges.org**, to include enhanced features, easy-to-use navigation, and improved accessibility on mobile devices. The site implements a "card-style" interface to improve mobile responsiveness, organization, and the ability to scan content. New features include the following:

- The Project Assistance section provides expert guidance to questions on new and existing steel bridge projects.
- The Find-A-Supplier section gives users access to a detailed online listing of the products/services offered by suppliers who specialize in short-span steel bridge projects.
- The Education section offers information on steel bridge basics, learning opportunities for students, available scholarships and internships, and educational events and resources for bridge professionals.
- The website also includes an update to the eSPAN140 bridge design tool, research reports on innovative bridge technology, and an events calendar to keep users informed about new educational opportunities.

Letter to the Editor

Accelerated Deterioration

I enjoyed the September 2020 editorial on infrastructure. I am an avid cyclist and occasionally lead rides around Philadelphia. I call one of them "Cliff's Decaying Infrastructure Ride." We ride around the city and look at buildings and bridges falling apart. I tell non-engineers that a good rule-of-thumb is: "You shouldn't be able to see daylight through the web of a plate girder." (See the photo at right.)

The editorial noted that the steel industry requested $37 billion for state DOTs to address the problem. While that's a good start, it's going to take a staggering $2 trillion to rebuild our nation's infrastructure. On the plus side, spending this money will create lots of new jobs and will make our nation more competitive in the global market—and will also save lives (due to bridges not falling down). This is a problem that cannot continue to be ignored. Deterioration is not linear. It accelerates with neglect.

Thanks for the suggestion. I'm going to contact my legislators.

Cliff Schwinger, PE
Vice President, The Harman Group
King of Prussia, Pa.

PUBLIC REVIEWS

Structural Stainless Steel Spec and *Code* Available for Public Review

The new AISC *Specification for Structural Stainless Steel Buildings* (AISC 370) will be available for public review until November 11, 2020. Also, the new AISC *Code of Standard Practice for Structural Stainless Steel Buildings* (AISC 313) will be available for public review from November 13 to December 11, 2020.

You can download the draft standards and review forms from **aisc.org/publicreview**. Hard copies are also available (for a $35 charge) by calling 312.670.5411. Please submit comments, using the online forms, to Cynthia J. Duncan, AISC's director of engineering (**duncan@aisc.org**), by the respective deadlines for consideration. These new standards are expected to be completed and available in late 2021.

SCHOLARSHIPS

Annual AISC Scholarship Winners Announced

AISC has announced the winners of its 2020-2021 scholarships.

A total of $277,250 in scholarships has been awarded to 83 deserving undergraduate and masters-level students for the 2020-2021 academic year.

The AISC Scholarship jury consisted of the following individuals:

- Benjamin Baer, Baer Associates Engineers, Ltd.
- David Bibbs, Cannon Design
- Christopher Brown, formerly of Skidmore, Owings & Merrill, LLP
- Luke Johnson, ECS Limited
- Rose McClure, Simpson Gumpertz & Heger
- Steven Offringa, EXP
- Kristi Sattler, AISC
- Matthew Streid, Magnusson Klemencic Associates

The AISC David B. Ratterman Fast Start Scholarships program awarded a total of $76,000 in scholarships to 27 students this year. The program awards children of AISC full member company employees who will be freshmen and sophomores during the upcoming academic year. The students may attend two- or four-year programs and may choose any area of study.

For the third straight year, Puma Steel in Cheyenne, Wyo., held a student welding competition where local high school students competed to win scholarships to attend the welding program at Laramie County Community College (LCCC). AISC administered funding to six students (Keedin Denny, Hayden Hancock, Ethan Harris, Ruben Munoz, Tanner Pace, and Conner Walker) who entered LCCC's program this fall. Rex Lewis, President of Puma Steel, was honored with an AISC Special Achievement Award in 2020 for creating this welding competition and scholarship program.

Unfortunately, the Student Steel Bridge Competition (SSBC) was canceled in 2020 due to the Coronavirus pandemic, and $13,000 in related scholarships went unawarded. These scholarships will carry over to 2021 for the top three team finishers as well as three team awards for spirit, ingenuity, and engagement.

Finally, the AISC Education Foundation, in partnership with several other structural steel industry associations, awarded $196,000 to 50 students. AISC is deeply thankful for the growing support of our industry partners and offers our sincerest thanks for their generous, continued contributions.

If you are interested in donating to the AISC Education Foundation scholarship program, please visit **aisc.org/giving** for more information.

Without further ado, here are the winners of the 2020–2021 academic year AISC scholarships (beginning on page 62).

AISC Scholarships
for Juniors, Seniors, and Master's Students

- Tayoshe Aluko, Johns Hopkins University
- Madison Baechle, University of Dayton
- Cecile Baeza *(not pictured)*, University of Michigan
- Kaley Collins, University of Arkansas
- Stephanie Cote, University of Nevada, Las Vegas
- Rebecca Dempewolf, Oklahoma State University
- Evelyn Ehgotz, Rhode Island School of Design
- Charlotte Guyer, Oklahoma State University
- Mary Juno, University of Kansas
- Amanda Kalab, Washington State University
- Steven Klepac *(dual winner)*, University of South Alabama
- Elizabeth Laughlin, Clarkson University
- Awoenam Mauna-Woanya, Stanford University
- Jenika McClay, San Francisco State University
- Amanda McMurray, Montana State University
- Laurie Metzler, Virginia Tech
- Cooper Morris, The University of Memphis
- Seng Tong Ngann, Purdue University
- Nicholas Riesterer, University of Michigan
- Laura Rojas *(not pictured)*, Southern Illinois University, Carbondale
- Trinity Schaefer, The University of Texas at San Antonio
- Niyam Shah, The University of Texas at Austin
- Bayley St. Jacques, Northeastern University
- Drake Taxon, Milwaukee School of Engineering
- Natasha Vipond, Virginia Tech
- Zoe Zhang *(dual winner)*, Georgia Institute of Technology

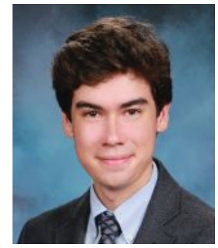
AISC/Southern Association of Steel Fabricators

- Steven Klepac, University of South Alabama
- Zoe Zhang, Georgia Institute of Technology

AISC/Associated Steel Erectors of Chicago

- Jay Avita, University of Illinois at Chicago
- Jacob Behnke, Illinois Institute of Technology
- Andrew Conwell, University of Illinois at Urbana-Champaign
- Zachary Haney, Illinois Institute of Technology
- Derek Miller, Trine University
- Quinten Prieur *(not pictured)*, Trine University
- Nathan Self, Valparaiso University
- Cosette Thompson, Illinois Institute of Technology







AISC/Rocky Mountain Steel Construction Association

- Danielle Barrett, Metropolitan State University of Denver
- Chris Okamoto, Colorado School of Mines


AISC/Ohio Steel Association

- Elizabeth Mosier, University of Cincinnati

AISC/Indiana Fabricators Association

- Cassidy Schichnes, Rose-Hulman Institute of Technology
- Leesa Greenwood *(not pictured)*, University of Notre Dame
- Veronika Meyer, Purdue University Fort Wayne
- Zeman "Hector" Liu *(not pictured)*, Valparaiso University


AISC/UIUC Architecture Scholarship

- Henry Holm, University of Illinois at Urbana-Champaign

AISC/W&W Steel/Oklahoma State University

seniors

- Jacqueline Fuller, Civil Engineering
- Nathaniel Northcutt, Construction Management

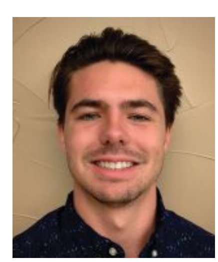
juniors

- Jeffrey Collier, Civil Engineering
- Kelsey Hooper, Construction Management
- Kirby Lough, Architectural Engineering

sophomores

- Mason Egermeier *(not pictured)*, Civil Engineering
- Sutton Hess, Construction Management
- Molly Hoback, Architectural Engineering



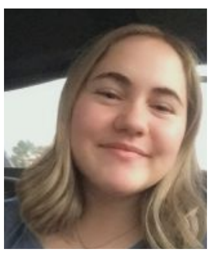
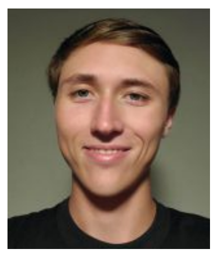




David B. Ratterman Fast Start Scholarships





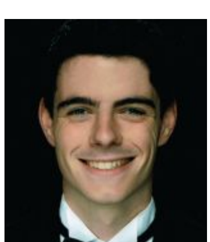
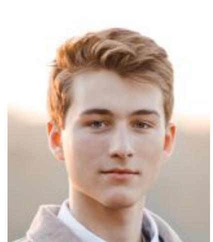





$2,000 Award Recipients






$4,000 Award Recipients


The David B. Ratterman Scholarship Jury consisted of the following individuals:

- David B. Ratterman, Scholarship Committee Chair
- Charles J. Carter, AISC President
- Lawrence Cox, AISC Board Member
- Hugh McCaffrey, AISC Board Member
- Patrick Schueck, AISC Board Member
- Matt Smith, AISC Board Member
- Glenn Tabolt, AISC Board Member

$2,000 Award Recipients

- Cody Bell, Chaffey College
- McKenna Bruin, Muskegon Community College
- Sarah Bryant, Montgomery County Community College
- Jacob Dodd *(not pictured)*, Mississippi Delta Community College
- MaKenzie Enderlin, Northeast Community College
- Ethan Fusini *(not pictured)*, University of Massachusetts
- Breanna Gerhardt, Pennsylvania Highlands Community College
- Sabrina Hackett, Moberly Area Community College
- Daniel Hartman, Universal Technical Institute
- Brooklynn Magsamen *(not pictured)*, Central Community College
- Jaden Majewski *(not pictured)*, Elgin Community College
- Morgan Meridith *(not pictured)*, Central Community College-Platte Campus
- Nolan Schultz, Ivy Tech Community College
- Mackenzie Shull, Dabney S. Lancaster Community College
- Vincent Stolz, Iowa Western Community College
- Briana Wright, Emporia State University

$4,000 Award Recipients

- Jaxon Allsage, University of Wisconsin–Eau Claire
- Shea Baechle *(not pictured)*, University of Missouri–Columbia
- Aaliyah Biamby, Thomas College
- Michael Clancy *(not pictured)*, University of Nebraska-Lincoln
- Kasten Grape, Morningside College
- Alicia Lichacz, University of Kentucky
- Nicholas Maloney *(not pictured)*, Penn State University
- Cooper Morrison, California State University Long Beach
- Isabel Morrison *(not pictured)*, University of the Pacific
- Jared Ritchie, Northeastern University
- Hannah Tucker, Truman State University

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Courtesy of Gensler + HDR in association with luis vidal + architects

(RE)PICTURE THIS

THIS SUMMER, AISC teamed up with RePicture—a virtual community where students learn about STEM careers and real-world projects—on a structural steel-related competition. The participants, in this case college-level students, were tasked with researching and writing a report on a chosen structure in one of six categories.

One of the categories was architecturally exposed structural steel (AESS), and winner Taiseer Al-Salihi, a student at the University of North Carolina at Charlotte, highlighted Pittsburgh International Airport's Terminal Modernization Program (TMP). Designed by luis vidal + architects and Thornton Tomasetti, the reimagined terminal is topped by a wavy roof inspired by the rolling hills and river valleys that define Pittsburgh's geography. The roof is held aloft by HSS (hollow structural section) "tree" columns that divide into four branches apiece, and openings between the various "ribbons" of the roof allow natural light to penetrate the building.

You can read more about the TMP project, as well as the rest of the winners, in the related Steel in the News items at **www.modernsteel.com**. The winners will also be featured in our December issue.