WHAT DO A GLASS BOX with a massive laptop for a roof, a restaurant building encased in a mind-bending red grid, and a trio of giant foliage-filled bubbles all have in common? Not only are they all iconic steel-framed structures, but they're also winners of 2019 AISC IDEAS^2 Awards!

Why "IDEAS^2?" Because the program recognizes **I**nnovative **D**esign in **E**ngineering and **A**rchitecture with **S**tructural **S**teel. Awards for each winning project are presented to the project team members involved in the design and construction of the structural framing system—including the architect, structural engineer of record, general contractor, owner, and AISC member fabricator, erector, detailer, and bender-roller.

New buildings, as well as renovation, retrofit and expansion projects, are eligible, and entries must meet the following criteria:

- A significant portion of the framing system must be wide-flange or hollow structural sections (HSS)
- Projects must have been completed between January 1, 2016 and December 31, 2018
- Projects must be located in North America
- Previous AISC IDEAS^2 award-winning projects are not eligible

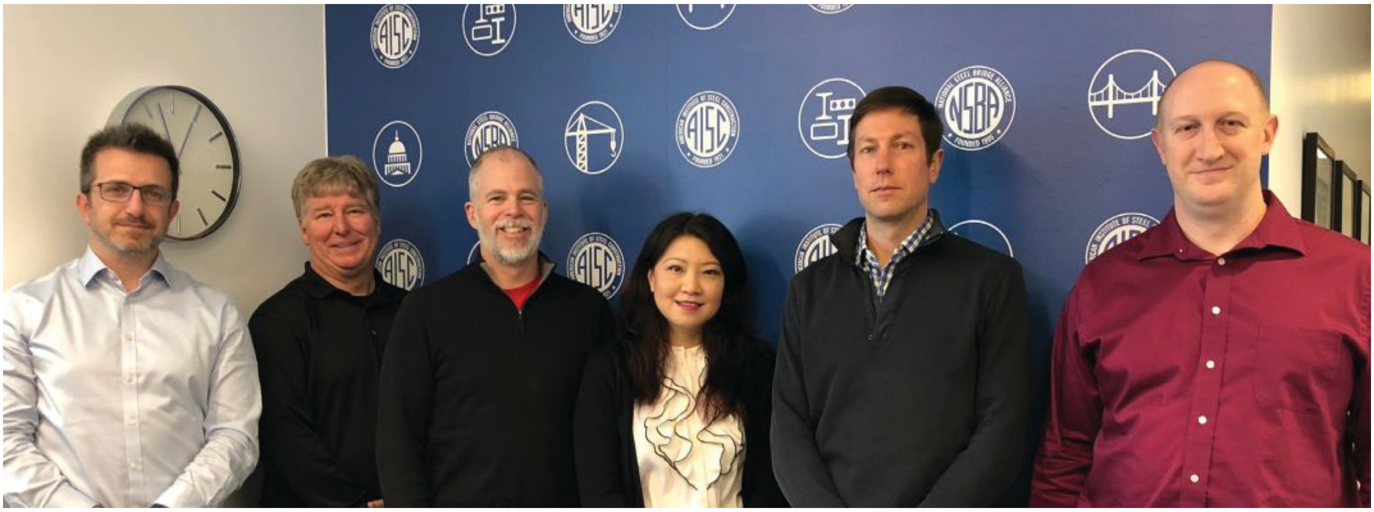
This year's six judges considered each project's use of structural steel from both an architectural and structural engineering perspective, with an emphasis on:

- Creative solutions to the project's program requirements
- Applications of innovative design approaches in areas such as connections, gravity systems, lateral load-resisting systems, fire protection, and blast protection
- The aesthetic impact of the project, particularly in the coordination of structural steel elements with other materials
- Innovative uses of architecturally exposed structural steel (AESS)
- Advancements in the use of structural steel, either technically or in the architectural expression
- The use of innovative design and construction methods such as 3D building models, interoperability, early integration of steel fabricators, alternative methods of project delivery, and sustainability considerations

A panel of design and construction industry professionals judged the entries in three categories, according to their constructed value in U.S. dollars:

- Under $15 million
- $15 million to $75 million
- Over $75 million

National and Merit honors were awarded in all three categories and two Presidential Awards of Excellence were also given: one for Erection Engineering to Facilitate Adaptive Reuse and one for Excellence in Fabrication. A Scultpure/Installation/Non-building Structure winner was also chosen.



The 2019 judging panel, from left to right: Filo Castore, Craig Wehrmann, Matt Johnson, Maggie Kwan, Eric Wills and Devin Huber.

Filo Castore, AIA

Division Vice President – Director of Client Engagement, Buildings, and Infrastructure – Americas, JACOBS

Filo has more than 20 years of experience in shaping many of Houston's buildings, businesses, and communities through stakeholder collaboration and innovative design. As a leader in the growth of national architectural practices in Houston, Filo establishes relationships with clients, developers, architects, engineers, and contractors. Filo has been involved with the American Institute of Architects (AIA) at the local, regional, and national levels for more than 15 years. His AIA involvement extends to local and national leadership positions including AIA Houston board member and AIA National Chair of the Committee on the Environment (AIA COTE). He currently serves as vice president of communications for the Texas Society of Architects (TxA) and he is on the board of directors of CoreNet Houston and Houston Tomorrow. Filo earned his BA in architecture from the University of Houston.

Devin Huber, PE, PhD

Director of Research, AISC

Devin joined AISC as the director of research this past fall. Prior to that that, he spent ten years in the private sector working for ExxonMobil (eight years) and Barton Malow (two years) where he worked in a variety of roles in the civil and structural disciplines within the oil and gas/industrial sector. Devin attended Michigan State University, where he received a BS in civil engineering, and then attended Purdue University, where he received his PhD in civil engineering.

Matt Johnson

Principal, Simpson Gumpertz & Heger

Matt is the Structural Engineering Division head for Simpson Gumpertz & Heger's Chicago office, leading a diverse team that designs, investigates and rehabilitates buildings and infrastructure, structurally complex building enclosures, and nontraditional structures. He brings a multidisciplinary approach to design and construction, combining a passion for innovation with a focus on value and client results. Matt and the Chicago office continually seek opportunities to implement industry-leading computational methods, pushing the traditional boundaries of the architecture, engineering, and construction industry. He is a graduate of Ohio University, where he received both his BS and MS.

Maggie Kwan

Senior Vice President Civil and Structural Engineering, AECOM Tishman

Maggie has 23 years of experience in the construction industry, including more than 20 years with AECOM Tishman. Her areas of responsibility include client relations, preconstruction analysis, purchasing, estimating, scheduling, budgeting, construction, design-assist programs, steel detailing programs, and special third-party construction engineering and equipment programs. Maggie is an acting second vice president on the executive board for Concrete Industry Board of New York and a member of the Structural Engineering Association of New York, Professional Women in Construction (PWC), and the American Society of Civil Engineers. Additionally, she sits on the New York City Department of Buildings Construction and Demolition Safety Code Revision Advisory Committee. She earned her BS in civil and environmental engineering, with a minor in architectural engineering, from Clarkson University.

Craig Wehrmann

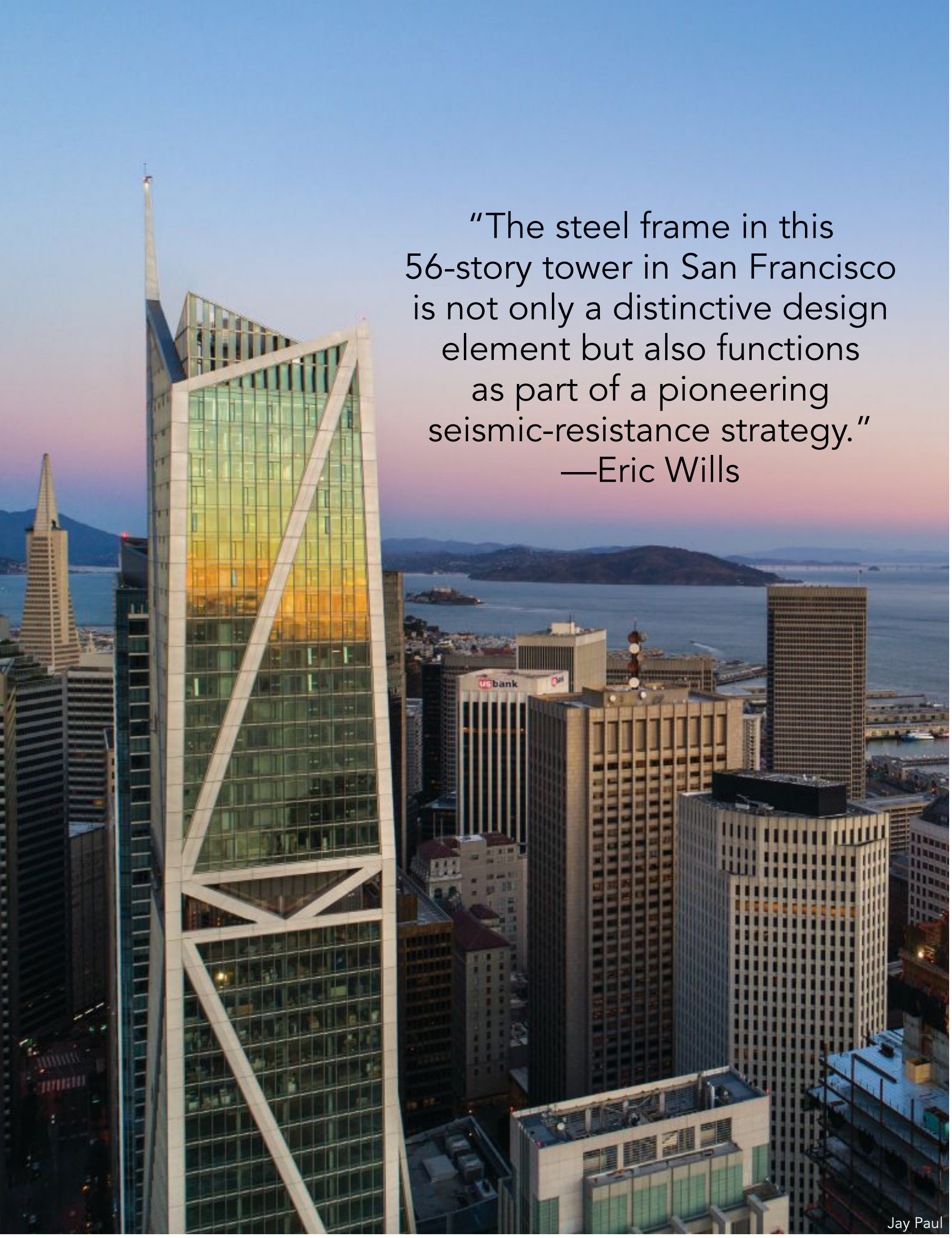
General Manager, Gateway Company of Missouri

Craig currently serves as general manager of AISC member and certified fabricator The Gateway Company of Missouri, LLC, where he specializes in the fabrication of complicated structures. Craig is a board member of the BiState Fabricator Association as well as a representative for BiState on the Fabricator Connection Committee. He is a graduate of Washington University's civil engineering program.

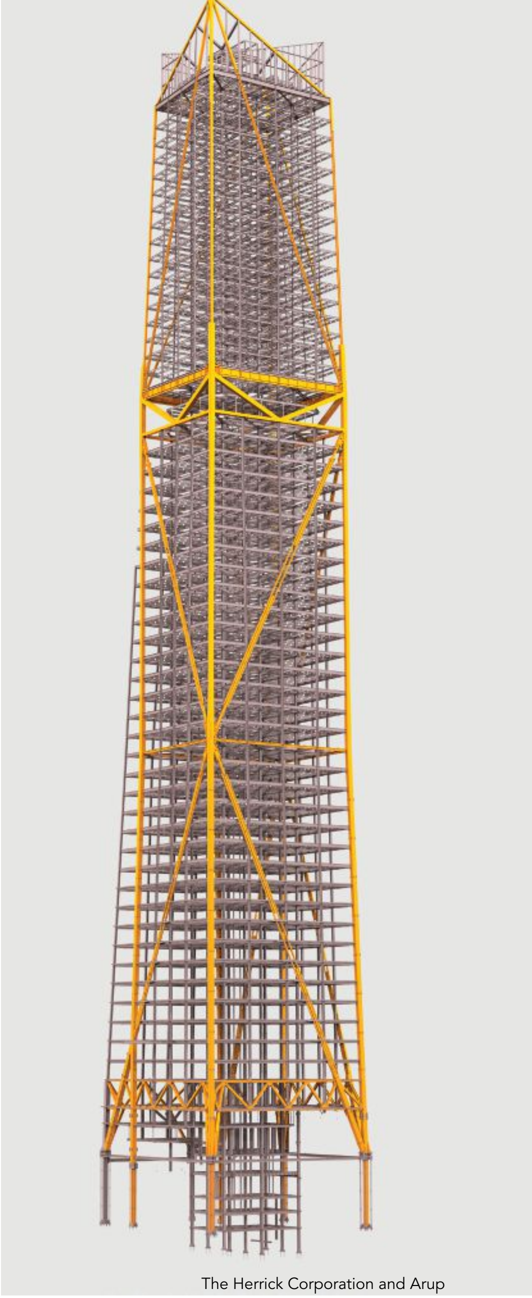
Eric Wills

Senior Editor, *Architect* Magazine

Eric Wills has 20 years of journalism experience and currently serves as senior editor at *Architect* magazine in Washington, D.C. Eric has been with *Architect* for eight years, where he edits feature stories and criticism. Eric's work has been nominated for and/or won numerous awards, including a National Magazine Award. Previously, Eric served as an editor at *Preservation* magazine, where his writing was cited in Best American Essays.



Jay Paul



The Herrick Corporation and Arup

NATIONAL AWARD Greater than $75 Million

181 Fremont, San Francisco

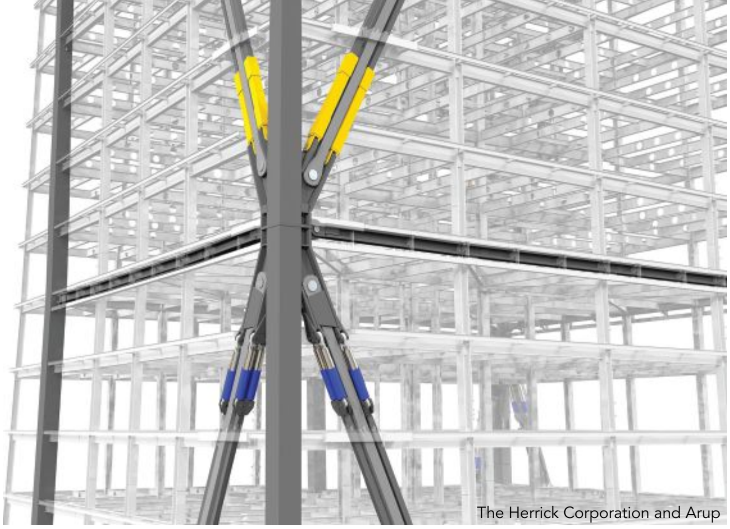
181 FREMONT TOWER adds a striking new focal point to the San Francisco skyline.

The tallest mixed-use building in the city, the 802-ft-tall tower is also arguably the most resilient tall building on the West Coast and is designed to remain essentially elastic and achieve immediate reoccupancy following a 475-year earthquake. After recognizing that the seismic performance objectives in current building codes did not align with its goals, the building's owner chose to pursue an innovative design to deliver "beyond code" seismic resilience.

The architectural design of the building, which has achieved LEED Platinum, features a faceted, tapering façade that highlights an integrated mega-frame structural system. A visual recess between the commercial and residential levels provides a residential amenity floor with a double-height open terrace made possible by 8-ft-deep perimeter transfer girders. Similarly, transfer trusses between levels 2 and 3 carry load to corner mega-columns to create a column-free ground-floor lobby.

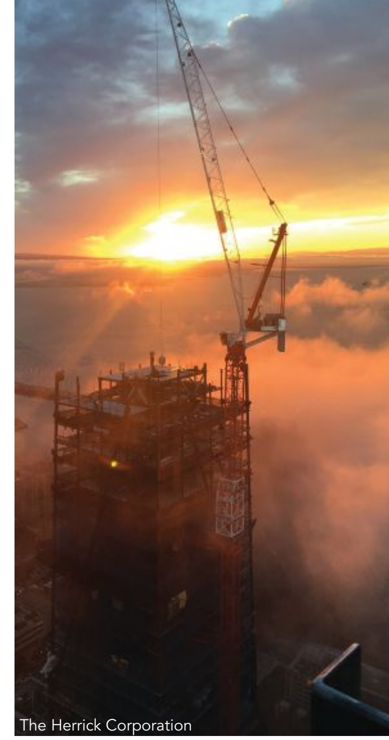
The design team selected a steel-only lateral force-resisting system (LFRS) instead of a more traditional concrete core to preserve floor space inside the slender tower. At the commercial levels, damped mega-braces span 200 ft to 250 ft between mega-nodes, with perimeter moment frames to carry lateral load from each floor up or down to nodal levels. The damped mega-brace design facilitated a reduction in building stiffness to decrease seismic demands while also improving occupant comfort for wind-induced vibration. This eliminated the need for a tuned mass damper at the roof, which freed the penthouse level for a luxury condominium. The design saved approximately 3,000 tons of steel from the framing package, a roughly 25% reduction in weight compared to a more conventional steel system.

The mega-brace design uses an innovative combination of established technologies. Built-up box primary braces connect to mega-nodes at both ends, with parallel secondary braces on opposite sides, and the stiff secondary braces drive deformation into vis-



The Herrick Corporation and Arup

Jay Paul



The Herrick Corporation

The Herrick Corporation

The Herrick Corporation

cous dampers at one end of each secondary brace. The combined system performs like a giant shock absorber to limit building drift and reduce floor accelerations. Buckling-restrained braces (BRBs) in both the primary and secondary brace frames act as fuses in the event of maximum considered earthquake (MCE) shaking, preventing damage to the dampers and mega-columns. The largest of these BRBs is composed of four units with a total 5,000-kip capacity. The mega-braces are restrained laterally at each floor to prevent buckling but slide freely along their length against polytetrafluoroethylene (PTFE) bearing pads attached to a steel mount cast in each floor slab.

Corner mega-columns carry load into the foundation through steel cruciform sections embedded in pilasters within the basement walls. The mega-columns are designed to remain elastic in a MCE, employing built-up box columns as large as 36 in. by 36 in. using 5-in.-thick plate. To limit tension demands in the tower and foundation, the mega-columns are designed to uplift slightly at their base and are anchored at ground level by 3-in.-diameter 150-ksi pretensioned rods extending to the bottom of the five-story basement foundation. The anchor force is tuned to prevent uplift in wind or smaller earthquake events but also to allow approximately 1 in. of uplift in a MCE.

For more on this project, see "Braced for the Future" in the April 2016 issue, available at ***www.modernsteel.com****.*

Owner
Jay Paul Company, San Francisco

General Contractor
Level 10 Construction, San Francisco

Architect
Heller Manus Architects, San Francisco

Structural Engineer
Arup, San Francisco

Steel Fabricator and Erector
The Herrick Corporation, Stockton, Calif.

NATIONAL AWARD Greater than $75 Million

Superior Court of California, San Diego

SAN DIEGO'S NEW Central Courthouse brings boldness and beauty to the realm of civic buildings.

The 700,000-sq.-ft, 25-story structure, which consolidates three previous courthouses into one facility, addresses the security needs of a modern court building while also presenting an uplifting and welcoming image. The new building connects with the adjacent Hall of Justice at the third level via a steel pedestrian bridge, which required complicated planning, engineering, and logistics as it passes over the catenary lines for the San Diego Metro line below and is designed so as not to load the Hall of Justice. The 85-ft cantilever span with an 80-ft back-span is supported in the center by a single tapered column that fits within the sidewalk.

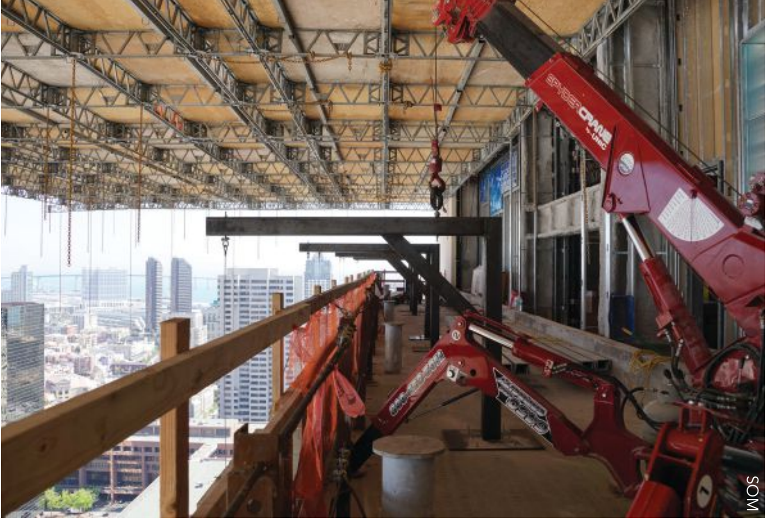
All high-volume activities are located on the first four levels of the building, including security, arraignment courts, business offices, the jury assembly hall, the cafeteria, and the bridge. These program elements are linked in section by a naturally lit, three-story great hall, which incorporates a cascading escalator linking the first four levels of the building. To allow for future flexibility, the design of the family, probate, and civil courts is identical to the criminal trial courts except for the jury box. The business offices in the podium have large, open floor plans to allow for future programmatic evolution. The unique geometry of the trusses at level 4 enabled a flexible layout at the podium levels. These trusses support not only the level 5 frame above but also a hanging cafeteria below.

Above the four-story podium, the remainder of the building is organized in plan, using two pairs of courtrooms with a holding core in between. The courthouse features a distinctive soffit at its crown, clad with shaped aluminum panel sections, that shades the building during morning hours and also captures and dynamically reflects southern and western light back onto the underside of the structure's surface.

The building consists of a steel-framed superstructure with two-way lateral special moment frames (SMFs) using ductile

Bruce Damonte

SOM

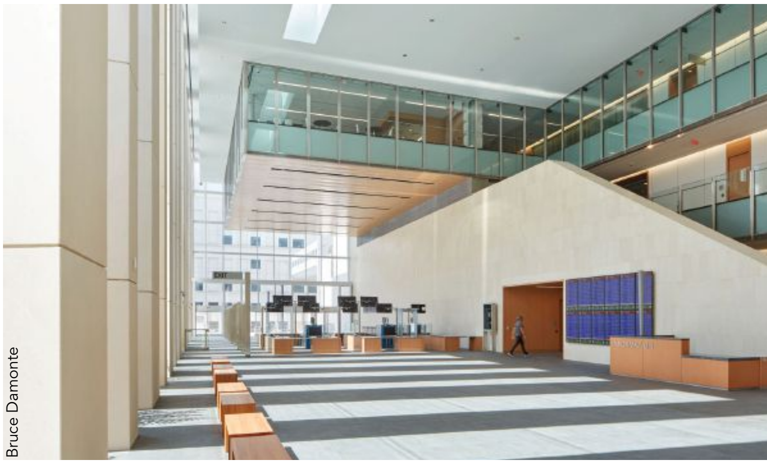


SOM

Bruce Damonte

“Raising the bar on courthouse design by adopting an innovative and contextual resolution to complex and demanding program requirements!”
—Filo Castore

Bruce Damonte



Bruce Damonte

reduced beam section (RBS) connections with wide-flange cruciform and built-up box column sections. The steel moment resisting frames incorporate 106 nonlinear viscous damping devices (VDDs) in the slender transverse direction to provide a distributed supplemental energy-dissipating damping system over the height of the structure. This system reduces seismically induced building story shears, story drifts, floor accelerations, and inelastic rotational demands on moment frame beam-column joints. The VDDs were also effective in providing damping for wind loads.

During early design development phases, seismic risk and life-cycle assessments were completed to assist with selecting alternative structural systems, leading to cost-effective “enhanced” seismic performance objectives. Simplified nonlinear capacity (pushover) curves in each principle direction were used to estimate economic losses, resulting in expected mean annual loss, cost-benefit ratios, and return on capital investment based on a 25-year life-cycle over the baseline SMF “normal” or code-minimum performance objective.

Owner

Judicial Council of California Administrative Office of the Courts, San Francisco

General Contractor

Rudolph and Sletten, Inc., San Carlos, Calif.

Architect and Structural Engineer

Skidmore, Owings & Merrill, LLP, Chicago

Steel Team

Fabricator and Erector

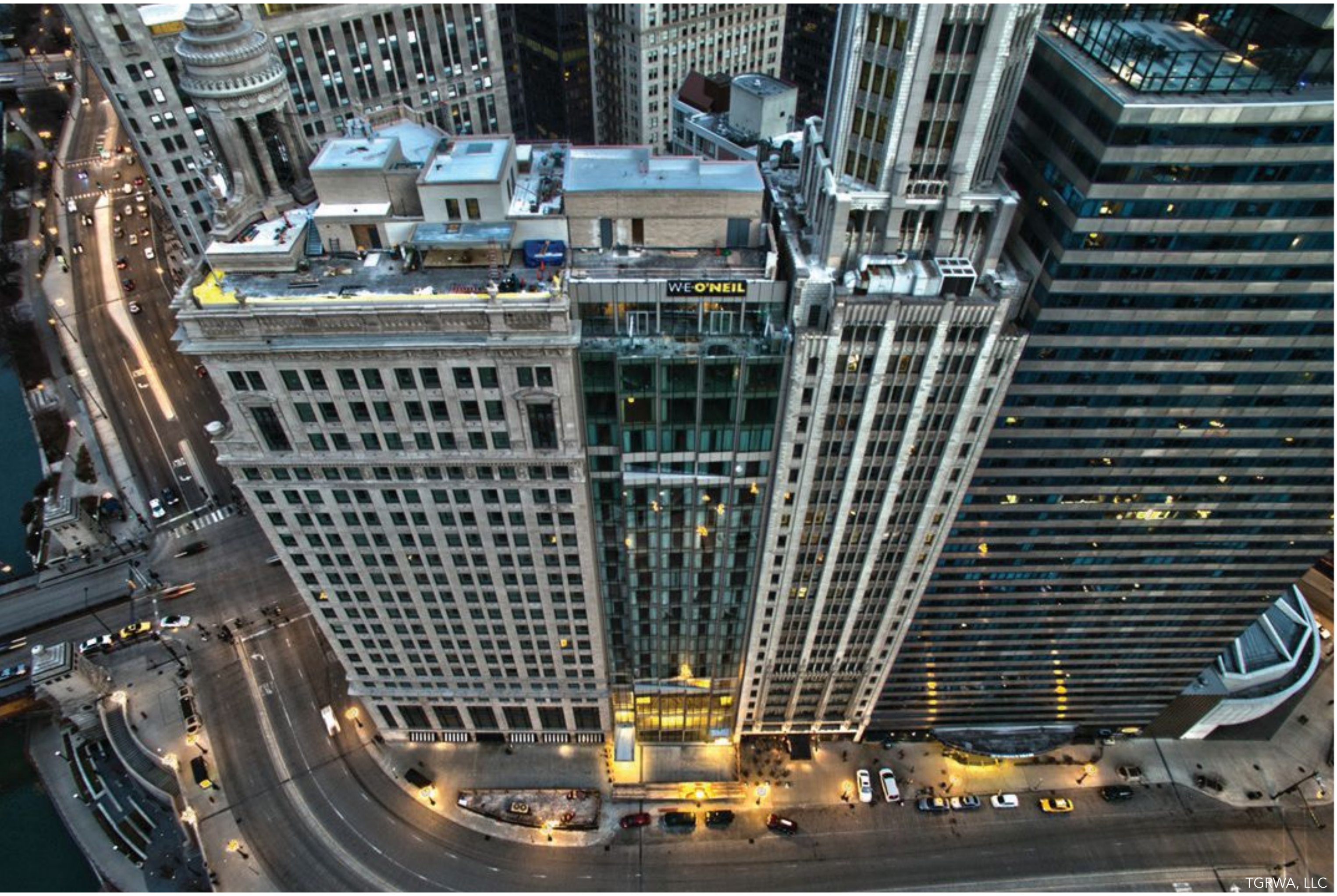
The Herrick Corporation, Stockton, Calif. AISC CERTIFIED FABRICATOR & ERECTOR

Detailer

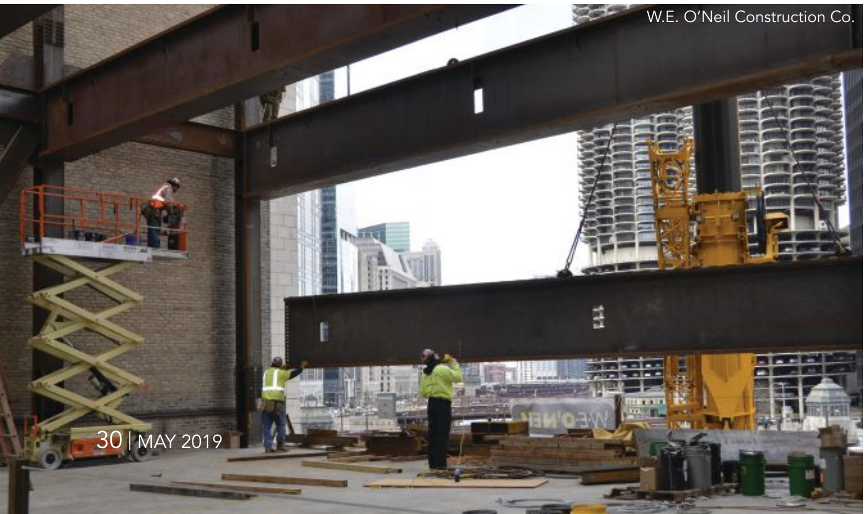
SNC Engineering, Inc., Norwalk, Calif. AISC DETAILER

Goettsch Partners, Inc.

TGRWA, LLC



TGRWA, LLC



W.E. O'Neil Construction Co.

"A seamless and respectful urban infill execution was achieved by astutely leveraging engineering, design, and construction processes."
—Filo Castore

MERIT AWARD Greater than $75 Million

LondonHouse Hotel, Chicago

THE LONDONHOUSE HOTEL sits at a prominent intersection on the edge of Chicago's Loop central business district, overlooking the "Magnificent Mile" of Michigan Avenue and the Chicago River.

The project involved the renovation of the landmarked 280,000-sq.-ft London Accident and Guarantee Building, originally constructed in 1923, into a modern hotel, as well as the addition of a new, attached 22-story, 70,000-sq.-ft steel framed tower, which filled in the only open parcel on the block (its footprint previously served as a street-level parking lot).

One structural challenge was to create a column-free open space to accommodate a large ballroom in the new addition. Structural engineer TGRWA's solution was to design double-webbed plate girders framing to a single wide-flange column, which provided the maximum amount of usable space possible without the need to eliminate prime hotel rooms. Site constraints limited the lifting capacity of the contractor's crane, requiring the plate girders to be divided into two lighter sections in parallel, which were connected together in the field.

When it came to the lateral system for the new addition, TGRWA developed a hybrid system to address wind loading, which is the controlling lateral criteria per the local building code. For north-south wind loading, concentric steel braced frames were implemented, which provided drift performance to accommodate concerns of differential lateral movement of the joint between the new and existing buildings. For the east-west wind loading, the building's program did not allow for a conventional lateral system of shear walls or steel braced frames due to the new addition not having an elevator core or consistent stair tower. A such, the solution was to use the steel moment frame lateral system of the existing building to withstand east-west wind loading.

Because the new steel structure was laterally tied to the existing building's lateral system in one direction only, while allowing slip in the perpendicular direction, a specially designed expansion joint was required between the new and existing structures. The load was transferred from the diaphragm of the new structure to the existing structure using a specialized drag strut system. At several locations on each floor, new steel members extended from the new structure to the existing structure and distributed the load through the existing clay tile diaphragm. This innovative hybrid approach greatly reduced the required material and labor costs of an independent lateral system and worked with the unique building program. This hybrid lateral system provided a tremendous cost savings to the owner since the construction time, labor, and steel required were greatly reduced compared to a conventional moment frame solution. It also provided the architect with much more usable space in the structure compared to a braced frame solution.

*For more on this project, see "Tight Quarters" in the October 2017 issue, available at **www.modernsteel.com**.*

Owner
Oxford Capital Group, LLC, Chicago

General Contractor
W.E. O'Neil Construction Co., Chicago

Architect
Goettsch Partners, Inc., Chicago

Structural Engineer
TGRWA, LLC, Chicago

NATIONAL AWARD $15 Million to $75 Million

Spectrum IV, San Diego

SPECTRUM IV, the new base of operations in San Diego for Vertex Pharmaceutical, Inc., is inspired by the company's own work.

The V-shaped building form, with people, light, and air passing through a common lobby, is reminiscent of the trachea and the lobes of the lungs, targets for the cystic fibrosis medications Vertex develops. The facility, which is anticipating LEED Gold certification, consists of 170,000 sq. ft of state-of-the-art laboratory, office and collaboration spaces above two levels of underground parking in the heart of San Diego's Torrey Pines life-science cluster.

For the structural frame, the integrated design team selected a stepped-grade steel framing concept comprised of two rectangular wings interconnected by a high-volume through lobby. The wings are at right angles to each other, resulting in the V-shaped design. The building's seismic force-resisting system consists of steel special moment-resisting frames in each of the wings, arranged orthogonally to reduce building torsion and allow for predicable ductile behavior during future earthquakes.

Structural steel was the ideal material for both the superstructure and the subterranean parking structure. It was able to efficiently span uninterrupted interior lab spaces and provide the adaptability and flexibility required to meet Vertex's current and future needs with relatively shallow shapes, thus allowing the project team to fit three stories of program within the local height limit. Further, at strategic locations the steel floor framing was carefully tuned to minimize the dynamic-loading-induced floor vibrations that are incompatible with the high-powered optical lab equipment used to develop the company's pharmaceuticals.

The integrated architecture and structural engineering team collaborated closely on several prominent building features designed to showcase the versatility and beauty of exposed structural steel. One of these is a steel halo that rings the perimeter of the building, cantilevering up to 25 ft from the façade. At the rear of the building, the halo is supported by sloping bundles of tilted weathering tube steel columns that pass through an expansive outdoor deck.

Taking advantage of the area's moderate climate, the design blurs the boundaries between indoors and outdoors, while maintaining the controlled laboratory environment within. Thanks to the inherent openness of steel-framed buildings, 100% of the occupied interior space is able to take advantage of natural light, and the solar heat gain into the building is minimized by perforated steel sunshades, building overhangs, and vertical and horizontal louvers.

For more on this project, see "A Living, Breathing Building" in the February 2019 issue, available at ***www.modernsteel.com****.*

Owner
Alexandria Real Estate Equities, San Diego

General Contractor
BNBuilders, San Diego

Architect and Structural Engineer
LPA, Inc., Irvine, Calif.

Steel Team

Fabricator and Erector
Rossin Steel, Inc., San Diego

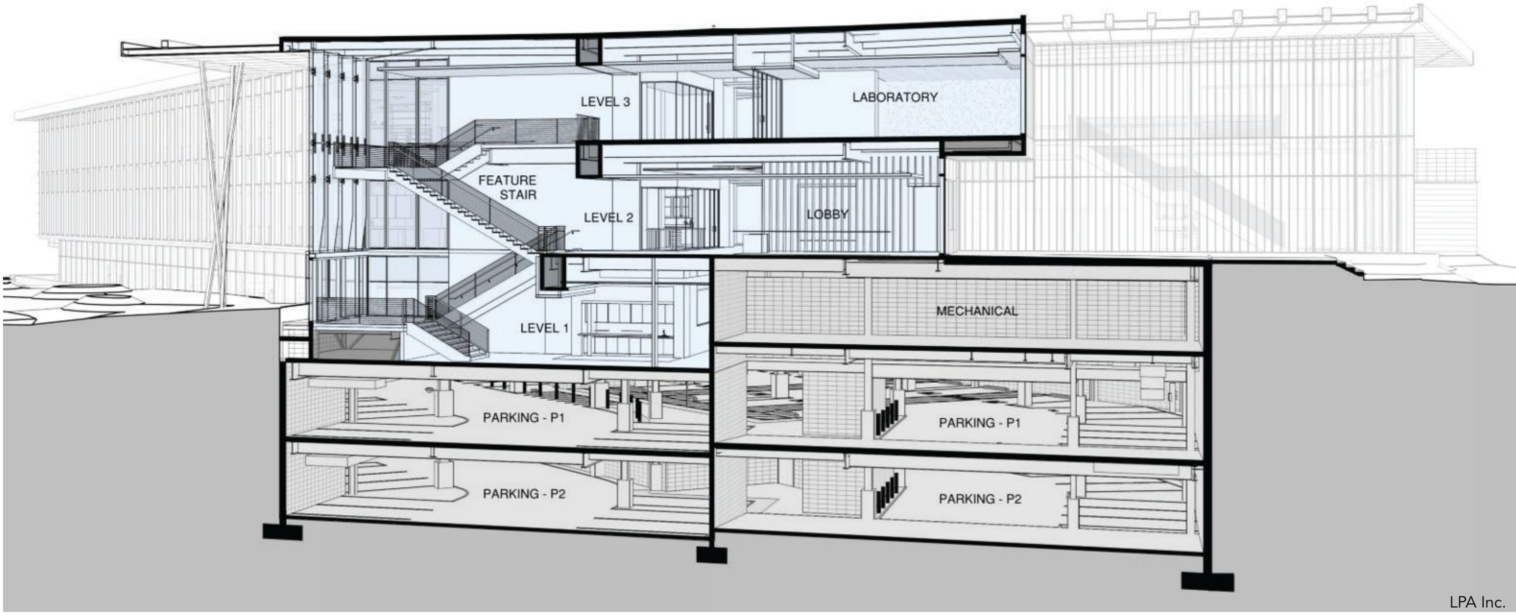
Detailer
Dowco Consultants, Ltd., Langley, B.C., Canada

Costea Photography Inc.

Costea Photography Inc.

LPA Inc.

Costea Photography Inc.



LPA Inc.

Costea Photography Inc.

Aislinn Weidele

Jeff Ervin

Aislinn Weidele

NATIONAL AWARD $15 Million to $75 Million

UT Austin Engineering Education and Research Building Atrium, Austin, Texas

WHEN PLANNING WAS UNDERWAY for the University of Texas at Austin's Engineering Education and Research Center (EERC), Deans Greg Fenves and Sharon Wood, both structural engineers, made it clear from the start that engineering ingenuity should be on display throughout the building.

The new facility, part of UT's Cockrell School of Engineering, is comprised of two nine-story towers with research and teaching space, joined by a central atrium. It is in this steel-framed atrium where the most dynamic and exciting structural engineering is displayed.

Rather than performing structural feats as follies, the steel features work together as a symphony of exposed structural steel to accomplish four objectives: (1) publicly display the genius of the engineering community at work inside, (2) inspire users and visitors by celebrating the beauty of great engineering, (3) connect people physically and visibly to promote collaboration and interdisciplinary research, and (4) manage daylighting and heat gain.

Entering the atrium from the west, on the third floor, visitors are treated to the expanse of the grand foyer containing the connector bridge, V-column, and three-story spiral stair. The stair's treads cantilever out from a 48-in.-diameter central steel pipe made of ¾-in.-thick plate displaying pattern of diamonds that gradually elongate as they go up the pipe. Above that, the west bridge connects the two research wings at levels 5 through 8, with the upper shade canopy floating atop the space between the wings.

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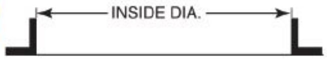

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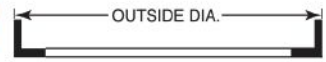
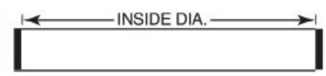
2 **Angle Leg In**


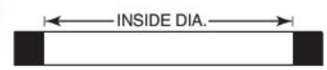
10" x 10" x 1" Angle

3 **Flat Bar The Hard Way**

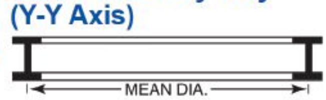

24" x 12" Flat

4 **Flat Bar The Easy Way**


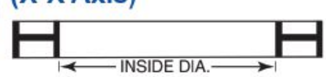
36" x 12" Flat

5 **Square Bar**


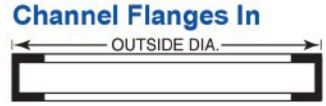
18" Square

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


44" x 335#, 36" x 925#

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


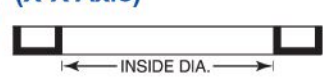
44" x 285#

8 **Channel Flanges In**


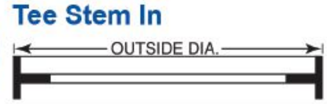
All Sizes

9 **Channel Flanges Out**


All Sizes

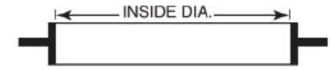
10 **Channel The Hard Way (X-X Axis)**


All Sizes

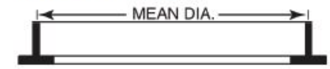
11 **Tee Stem In**


22" x 142 1/2# Tee

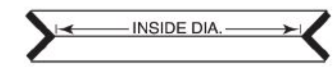
We bend ALL sizes up to:

12 **Tee Stem Out**


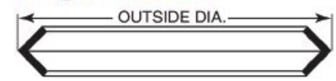
22" x 142 1/2# Tee

13 **Tee Stem Up**


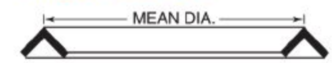
22" x 142 1/2# Tee

14 **Angle Heel In**


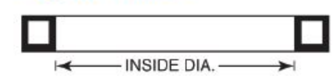
8" x 8" x 1" Angle

15 **Angle Heel Out**


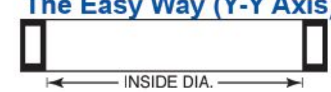
8" x 8" x 1" Angle

16 **Angle Heel Up**


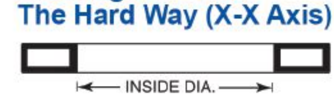
8" x 8"x1" Angle

17 **Square Tube**


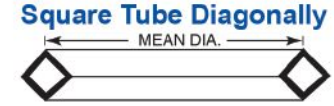
24" x 1/2" Tube

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


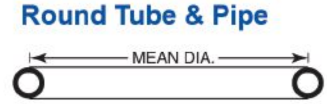
20" x 12" x 5/8" Tube

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


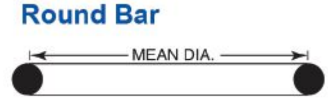
20" x 12" x 5/8" Tube

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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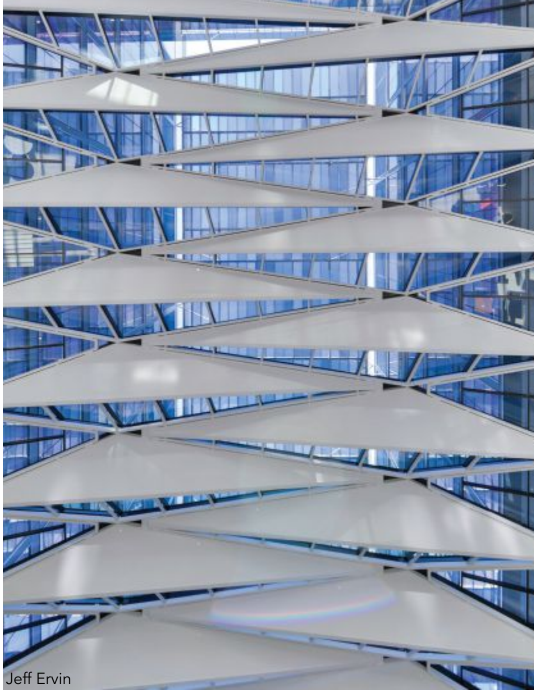
Kelly Thibodeaux


Jeff Ervin

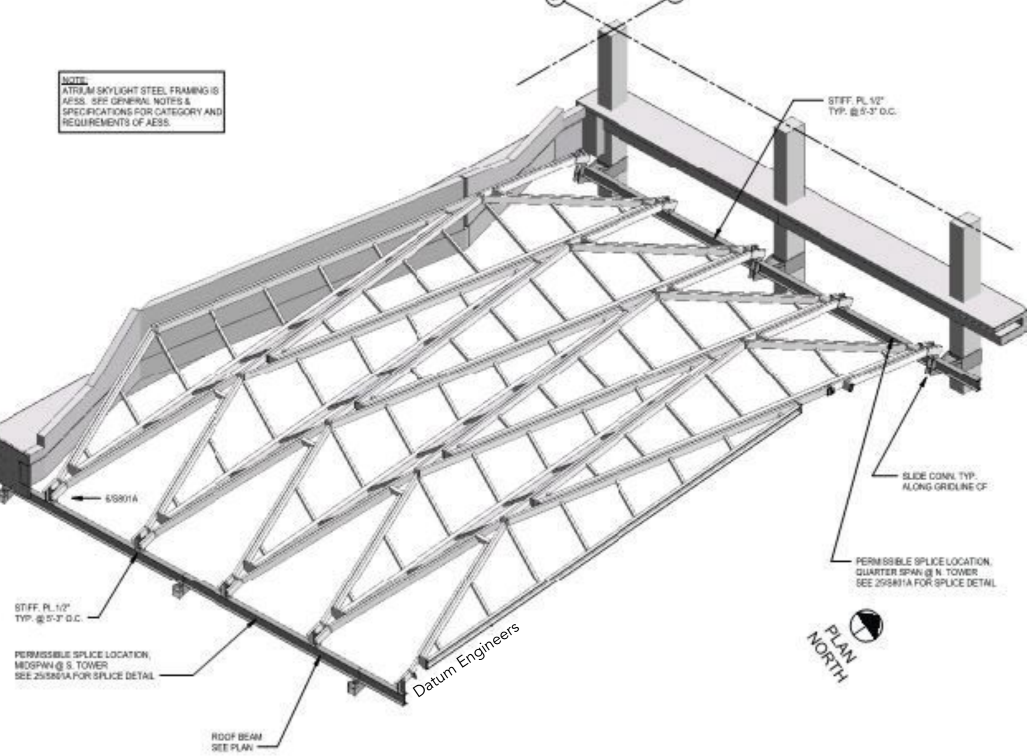

Kelly Thibodeaux

A faceted, pleated skylight roof spans 150 ft by 70 ft and the westward facets are filled with zinc panels to manage light and heat gain. The unique, complex geometry demanded an ingenious engineering approach as the alternating truss frames are interrupted 17 ft short by an opposing truss springing from the other side.

In response, structural engineer Datum devised a unique 3D “raft-truss” solution. Much like a wooden raft is built by lashing logs together, the alternating truss frames of the atrium roof are stitched together side-by-side to help each other finish the span on either end. Datum was also able to delete diagonal web members from the frames, creating a more elegant design. The trusses were detailed so the modular frames could be prefabricated, erected, and infilled with smaller “puzzle pieces,” speeding erection and reducing cost. The roof was assembled at fabricator Patriot Erector’s shop for practice, then broken down and shipped to the site for assembly.

The bowstring connector bridge was built with a twist—literally. The two bottom chords swoop in toward one another at midspan without touching. The twist is that the web members from each top chord connect across to the opposite bottom chord, creating a unique woven look. The bridge was detailed and fabricated with clean shop welds and erected in one piece. The built-up steel V-column, which supports a concrete ribbon stair, is comprised of two tapered steel plates, 1 in. by 8 in., joined together by 3-in. spacers, and expressive pin assemblies at the top and bottom.

The four-story west bridge connects the two towers, shades the atrium and is highlighted by an X-truss configuration. Two key details make this striking structural element stand out. First, the use of steel castings at the nodes provided an efficient way to build the trusses to stand out from the chords and the rest of the bridge, emphasizing the truss form. Second, the diagonals are not continu-

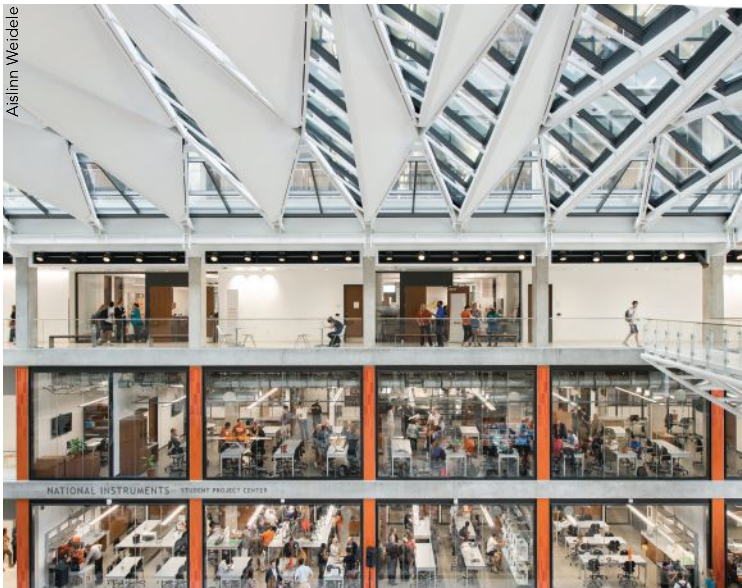


Datum Engineers

Aislinn Weidele

Jeremy Klahorst

Patriot Erectors



Aislinn Weidele

"This project's central atrium, with its skylit roof, pedestrian bridge, and spiral staircase that winds around a plasma-cut column, is practically an ode to steel construction." —Eric Wills

ous between floors. Rather, they swoop in waves halfway above and below each floor, meeting in what appears to be a hinge in the middle. The "hinge," however, was designed and built (as a casting) to avoid buckling in compression and distribute the loads more evenly.

The upper canopy shades the atrium and towers. An iterative parametric model determined the optimal shading density to balance daylighting with heat gain, allowing the glazing of the towers facing the atrium to be completely transparent—crucial for providing visual connectivity across the atrium. The thin structure seems to float above the space between the towers, thanks to minimal attachments, and was designed to move vertically as the towers move independently.

The EERC has been a huge success in providing a collaborative, cross-disciplinary home for the Cockrell School, created opportunities for interdisciplinary research and been a boon to recruiting. The integration of structural steel elements to inspire, bring people together, and shade the building demonstrates that engineering can be beautiful as well as functional and sustainable.

Owner
University of Texas at Austin Cockrell School of Engineering, Austin, Texas

General Contractor
Hensel Phelps, Austin

Architects
Ennead Architects, New York
Jacobs, Fort Worth, Texas

Structural Engineer
Datum Gojer Engineers, Austin

Steel Team

Fabricator and Erector
Patriot Erectors, Dripping Springs, Texas (AISC Certified Fabricator & Erector)

Detailer
Tectonix Steel, Mesa, Ariz. (AISC Detailer)

MERIT AWARD $15 Million to $75 Million

Apple Michigan Avenue, Chicago

APPLE MICHIGAN AVENUE advertises its wares via the building itself.

The tech giant's new retail store, situated prominently along the Chicago River and North Michigan Avenue, appears as a light, open-span glass box—with a laptop for the roof.

Due to its versatility and strength, structural steel was at the center of each creative solution to the project's program requirements—particularly exemplified in the steel roof frame, the four columns, and the balcony framing.

The store features an extremely thin carbon-fiber-reinforced-polymer (CFRP) roof, resembling a MacBook, supported on a tightly integrated structural steel frame of built-up steel box sections approximately 24 in. square. Tapered structural steel plate "fins" cantilever to the glass line, from which point the CFRP ribs cantilever the remaining distance to the edge of the roof canopy. Together, the steel fins and the CFRP ribs cantilever 27 ft, 4 in. to the south, 24 ft, 3 in. to the north, and 30 ft, 4 in. to the east and west.

The four steel box columns—with drain pipes concealed inside—provide the entire lateral and vertical support for the roof. The two south columns are finished in stainless steel and are unbraced for the full height of the store, while the two north columns are clad in stone and support the roof, the cantilever mezzanine balcony, and a portion of the plaza.

A single, giant steel torsion box girder (nicknamed the "Miracle Girder") supports the south line of reactions from the plaza beams and simultaneously supports the cantilevered mezzanine balcony.

Nigel Young Foster + Partners

Foster + Partners

Nigel Young Foster + Partners

This element is a built-up steel box measuring 3 ft, 8 in. wide by 4 ft, 4 in. tall and weighing approximately 1,100 lb per ft. The girder simultaneously supports the steel plaza beams, forms the frame that stabilizes the north pair of columns, and supports the cantilevering mezzanine balcony.

The structural steel roof frame uses a combination of flexure and torsion to resist gravity, wind, and snow loads. Numerous optimization studies revealed torsion boxes as the most compact and efficient solution. The use of torsion as a primary structural action resulted in a unique and innovative solution that freed the ceiling space for other essential program elements. The torsional beams permitted the exceptionally tight structural depth to be achieved. Similarly, the Miracle Girder uses torsion significantly to support the entire cantilever balcony. The south two box columns are architecturally exposed structural steel (AESS), with welded stainless steel cladding plates that were milled and brushed while on the column, an innovative approach to AESS design.

The extensive use of torsion as a primary structural action was another innovation for structural steel design. Rather than eschew torsion, the team embraced its use—both in the steel roof frame and the Miracle Girder—for its efficiency and its compactness. It was postulated that torsion makes full use of the cross section, compared to alternative solutions.The dynamic response of the lightweight steel cantilevering mezzanine balcony was analyzed for the expectations of heavy pedestrian foot traffic. A shallow tuned mass damper, tucked inside the shallow balcony framing, was provided to improve the vibration response.

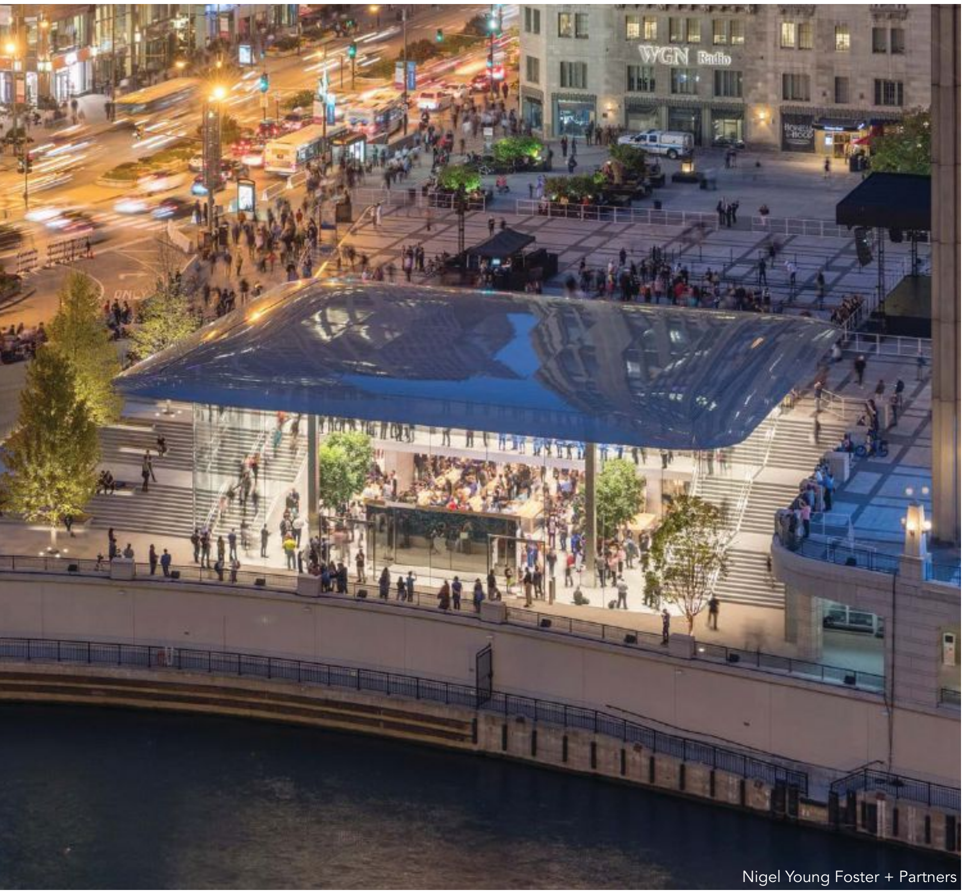
The new F3125 Grade 2280 twist-off bolts were used in the steel connections to resist combination loading effects. Also, Dacromet-coated F3125 Grade A490 bolts were used at the façade line where high strength and corrosion resistance were required. Structural steel bolted connections were also used in an inventive way to clamp the cantilever CFRP ribs.

Foster + Partners

Nigel Young Foster + Partners

“A well-concealed built-up steel box beam does a lot of heavy lifting in the structural system and allows for customers to take in the beautiful yet relatively minimalistic architecture of the building.”
—Devin Huber

Foster + Partners



Nigel Young Foster + Partners

The existing plaza slab at adjacent Pioneer Court was retained through a creative strengthening scheme involving pairs of heavy wide-flange beams (W36×487) spanning more than 50 ft and straddling the existing columns. The beams were cleverly designed and sequenced to replicate the same support conditions as the original structure, thereby allowing removal of the existing columns.

In addition to erecting the steelwork, erector Chicago Steel Construction was commissioned to erect the CFRP roof panels. Due to site limitations resulting in a shortage of laydown space, a barge was moored in the Chicago River, from which point the panels were assembled and lifted into place.

The client recognized the need for a collaborative process with a sophisticated steel fabricator and employed Zalk Josephs early in the design process, resulting in a highly coordinated steel framing plan. A 3D Tekla model was the basis for the final coordination, shop drawings, and fabrication. Zalk Josephs fabricated the cantilever balcony beams in large sections in an effort to reduce the number of pieces handled in the field.

Structural steel also enabled the long, cantilevering roof canopy, which shades the southern face against unwanted solar heat gain in summer while still capturing low-angle winter sun for passive heating. In addition, the grand steel stairs are tightly integrated with the displacement ventilation system.

Owner
Apple, Inc., Cupertino, Calif.

General Contractor
Power Construction, Chicago

Architects
Foster + Partners, New York
Ross Barney Architects, Chicago

Structural Engineers
Simpson Gumpertz & Heger, Chicago
Foster + Partners, London

Steel Team

Fabricator
Zalk Josephs Fabricators, LLC, AISC CERTIFIED FABRICATOR
Stoughton, Wis.

Erector
Chicago Steel Construction, LLC, AISC ASSOCIATE AISC CERTIFIED ERECTOR
Merrillville, Ind.

Detailers
Ken Boitz Associates, Bloomington, Ill. AISC DETAILER
Computerized Structural Design, S.C., Milwaukee

Nigel Young Foster + Partners

MERIT AWARD $15 Million to $75 Million

The Exchange at 100 Federal Street, Boston

AN ANGULAR plate steel and glass prism, inspired by a folded piece of graph paper, makes quite the entrance for the 100 Federal Street office building in the heart of Boston's Financial District.

Known as The Exchange at 100 Federal Street, the entry pavilion is a sharply faceted form with an exposed steel structure whose main rib plates form the main lateral load-resisting system.

Several steel options were considered for the structure and its design requirements of achieving 75-ft main spans via steel members less than 6 in. wide. W-shapes, hollow structural sections (HSS), built-up box girders, and cable truss options were all considered, but none could be cost-effectively sized to achieve these design goals. But thanks to guidance from the steel fabricator, Cives, the design team of architect Perkins+Will and structural engineer McNamara Salvia produced a final design using solid plate members with exposed bolted connections.

Though not as weight-efficient as rolled W-shapes or tubes, solid plate steel presented an opportunity to significantly reduce fabrication costs over the built-up shapes that might have satisfied aesthetic requirements. The plate shapes did present a challenge for structural stability in that they required frequent lateral bracing, a problem that was solved by adding sufficient additional steel bracing plates and matching the panel spacing of the curtain-wall system, thereby eliminating additional aluminum mullions in the process.

Typically, a steel detailer would begin the modeling process with fully dimensioned drawings and a Revit model from the architect and engineer. However, the exposed, mitered shop connections and the fact that the steel would serve as the curtain wall mullions meant that many tweaks needed to be made to the steel geometry before finalizing the steel locations and orientations. To simplify the workflow, the structural drawings provided member sizes, but member locations were determined solely through 3D model coordination.

McNamara Salvia issued a Revit model with member sizes and approximate member positions while Perkins+Will simultaneously supplied a precise Rhinoceros model of the curtain-wall system and mitered steel joints, which was imported through Revit into the SDS/2 steel model. Cives then located and oriented all plate members to accurately maintain the 5⅜-in. offset required by the curtain wall system. Where the vertical rib members were not oriented perpendicular to the plane of the glass, outside plate edges parallel to the glass plane were chamfered.

For more on this project, see "Functional Folds" in the January 2018 issue, available at ***www.modernsteel.com****.*

Owner
Boston Properties, Boston

General Contractor
Turner Construction Company, New York

Architect
Perkins+Will, Chicago

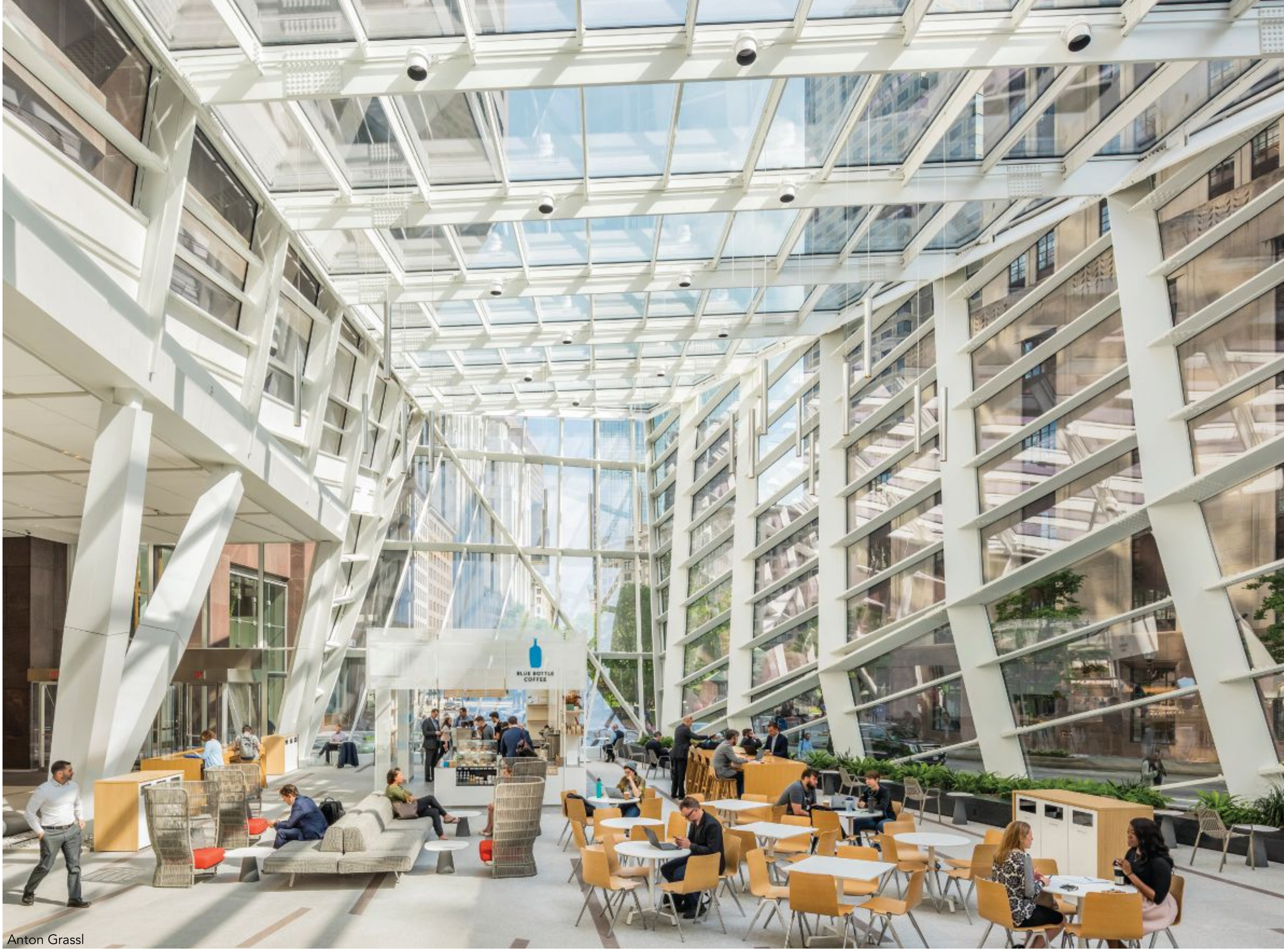
Structural Engineer
McNamara Salvia Inc., Boston

Steel Fabricator
Cives Steel Company–New England Division, Augusta, Maine
AISC CERTIFIED FABRICATOR

"This unique design and skillful construction demonstrates an effective use of structural steel plate material."
—Maggie Kwan

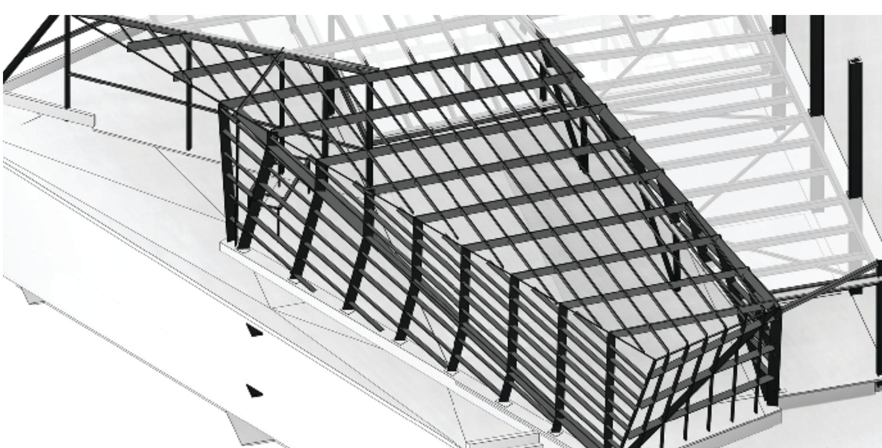

Anton Grassl


Anton Grassl



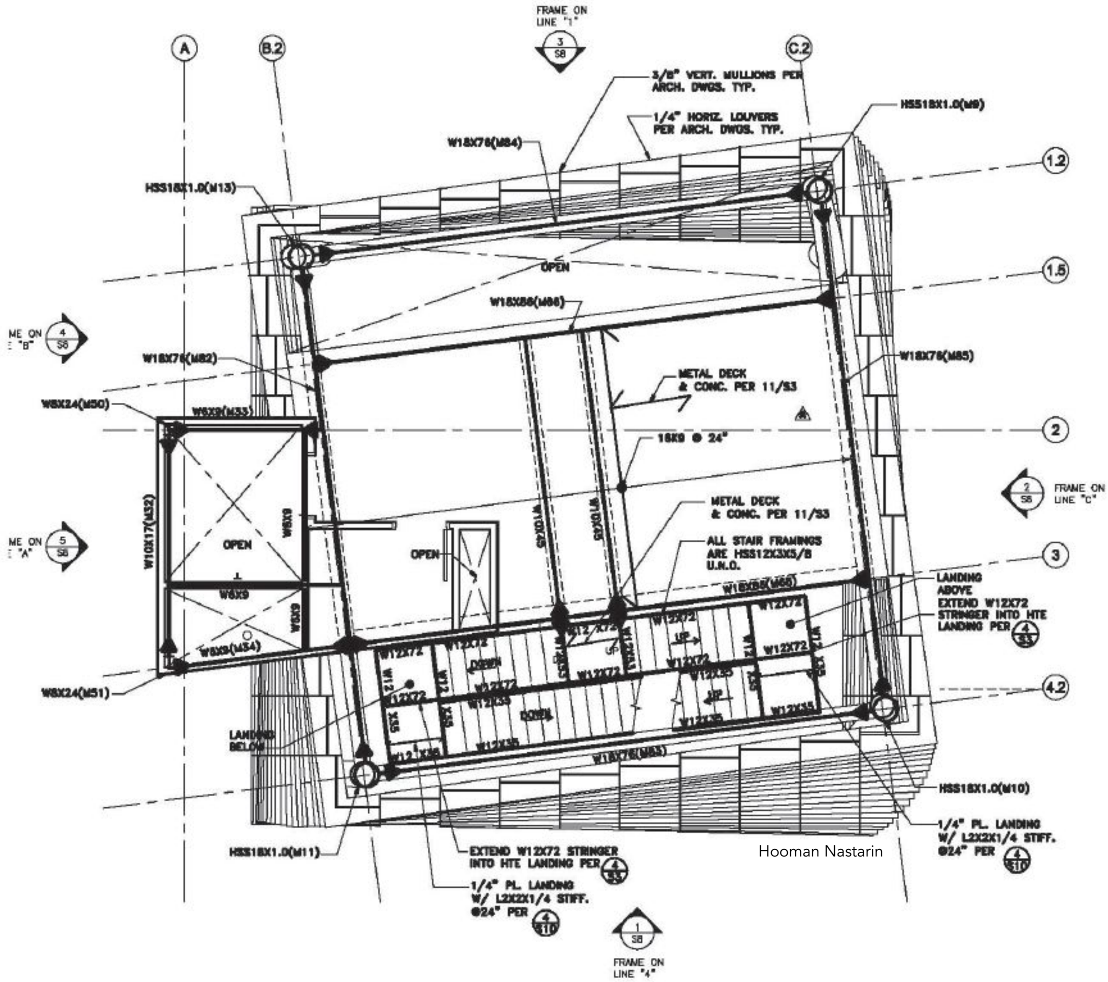
Anton Grassl

Anton Grassl

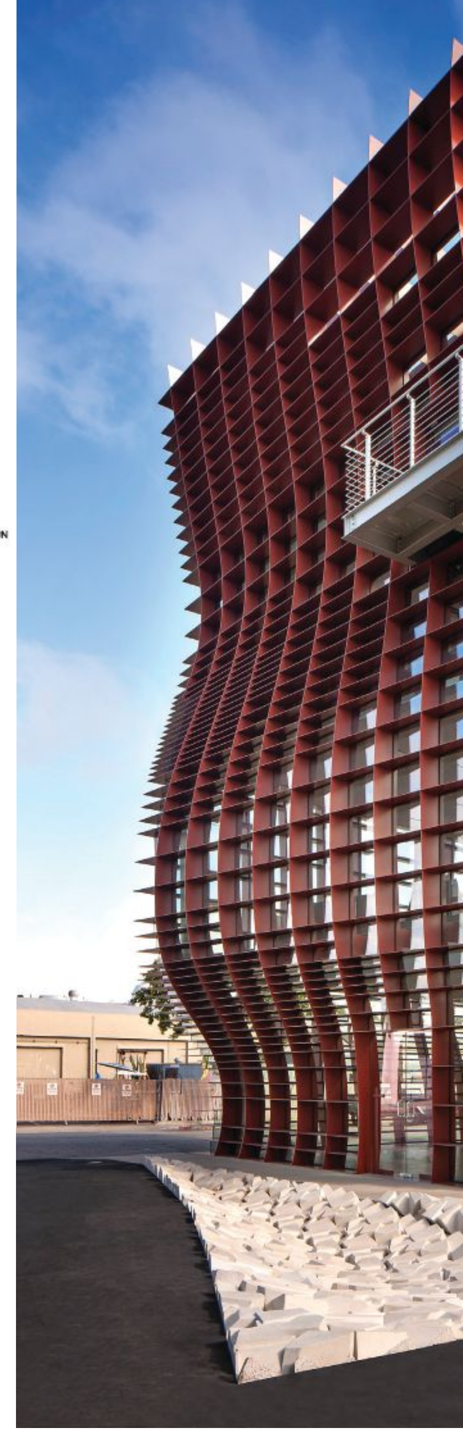


Perkins & Will McNamara Salvia

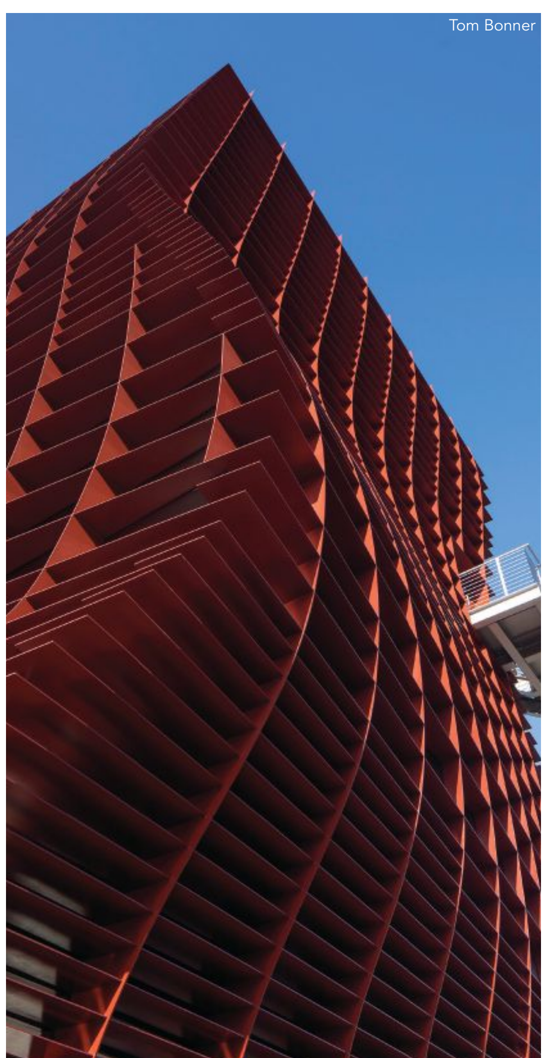
Jonathan Bayreuther



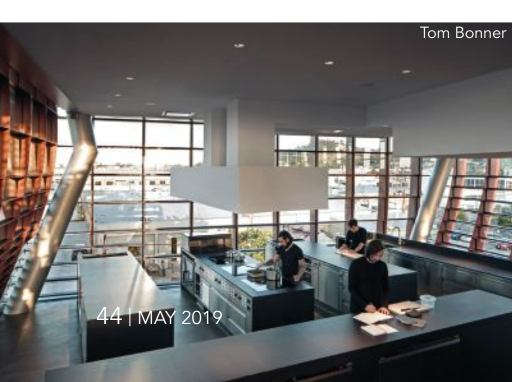
Hooman Nastarin



"This surrealist looking building looks as though it could go for a walk if it wanted to, with structural columns that kink and undulate in and out of plane freely. While aesthetically unique, the structural system is also robust."
—Devin Huber



Tom Bonner



Tom Bonner

Tom Bonner

Tom Bonner

NATIONAL AWARD Less than $15 Million

Vespertine, Culver City, Calif.

IF STRUCTURAL STEEL BUILDINGS were common in Lewis Carroll's Wonderland, they might look like the Vespertine building.

The four-story building, which is currently home to a modern restaurant (also called Verspertine) stands out thanks to a gently curving surface sculpted by vertical and horizontal steel fin plates—⅜ in. thick and ¼ in. thick, respectively—painted red.

At each of the building's four corners are silver steel pipe columns, twisting and bending with precise fabrication accuracy, as they follow the undulating pattern of the exterior surface in careful harmony. These four columns provide a majority of the structural support for the floating three levels above the ground level.

The shell's crate-like geometry added a new level of complexity to the deflectional computation of the building and its performance. Each side of the shell is flexible in plane yet highly rigid in the out-of-plane direction, posing a great challenge to the supporting building, which itself is flexible in an uneven direction. In addition, the horizontal planes pivot along the building's height more aggressively as it reaches from the top toward the bottom while maintaining a square shape in the plan view.

The conceptual design demanded multi-directional frames with circular columns at each corner. The four columns are 18 in. in diameter with a ⅝-in. wall thickness. Bottom fixity is provided by welded reinforcement bars through the walls of the columns doweled into concrete grade beams within the foundation. To achieve the desired slope of the northeast column, an internal 9-in.-diameter steel sleeve was inserted within the column and had to follow the complex bending of the column up to the top of the second-level connection. Internal doughnut-shaped continuity plates inside the columns at each connection and bend provided wall stiffness. The perimeter beams provided out-of-plane rigidity for the shell connections and were required to be reduced beam sections (RBS) at the connection to the pipe face so as not to overpower the pipe walls. Additional vertical external continuity plates were added to help stiffen and stabilize the pipe walls at the point of connection.

The challenge of the exterior shell was not limited to the directional stiffness. While the building was expected to rotate as construction progressed, the steel shell—to be installed as separate panels—posed a new heavy load after the fact. Also, due to the slenderness of the fins, each component had to remain in tension under all load conditions. The vertical fins are supported via gusset plates to the face of perimeter beams on the third level, whereas the connection points at the levels below are carefully tuned slip connections.

One of the critical directives of the project was that the final alignment of the fins needed to create perfectly vertical lines aligned with the perfectly horizontal plates after construction. Careful deflection studies were performed with numerous construction phases to locate the connection point at each level for the final at-rest horizontal location of the connection plates, since all the levels rotated in deferring directions as the shell panels were to be loaded onto the building core. On the other hand, specific tolerances were allowed at each connection, diverting the overall movement to the face of elevator shaft to accommodate daily thermal expansion of the shell plates. The exterior shell is intricately configured and connected to the tower structure for maximum flexibility and minimum deflection during extreme seismic acceleration. The delicate stiffness and support relationship between the core and the shell help maintain the free-flowing shape of the building.

Owner and General Contractor
Samitaur Constructs, Culver City, Calif.

Architect
Eric Owen Moss Architects, Los Angeles

Structural Engineer
NAST Enterprises Corp., Los Angeles

Steel Fabricator, Erector, and Detailer
Plas-Tal, Santa Fe Springs, Calif.

Hooman Nastarin

Fredrik Brauer

Fredrik Brauer

Fredrik Brauer

NATIONAL AWARD Less than $15 Million

Caddell Building, Atlanta

THE GEORGIA INSTITUTE OF TECHNOLOGY'S Caddell Building project transformed a 1950's-era Naval Reserve motor pool building into the campus' new School of Building Construction. The overall strategy was to promote maximum visibility, campus engagement, and energy reduction through the use of a whole-building shading structure and interior daylighting.

What was previously a diminutive background structure has become an engagingly transparent and high-efficiency example of contemporary reuse in an urban campus setting. While the functional assignment was to create a 10,600-sq.-ft facility with flexible-format teaching areas, collaborative spaces, and faculty offices, the larger ambition was to create a building "that excels in collaboration, sustainability, and technology."

Taking advantage of its unique function and location on the campus—a facility focused on making buildings, directly alongside a major pedestrian thoroughfare—the design prioritizes visibility and performance as a progressive vehicle for the more functional attributes of the program. Where the building was once entirely closed and concealed, it is now revealed by the removal of the exterior enclosure and the placement of a new full-height structural silicone glazed curtain-wall system. Every space on the interior is visible to and from the exterior, including faculty offices, conference rooms, and collaborative workspaces—a strategy that supports the concept of an "open campus" that facilitates interdisciplinary work, student-faculty engagement, and a collective community.

This primary material strategy of "reveal and reuse" puts the original building's hybrid concrete-encased steel frame—with 36-in.-deep girders under the second floor and steel angle trusses at the roof—on display. During selective demolition, everything except these steel and concrete elements, floor and roof slabs, and portions of the exterior brick assembly were removed. As part of the LEED Platinum goal for the project, waste was managed, diverted, and recycled to the highest degree possible.

The renovation started from a conceptual framework of building back only what was needed, without excess or ornament, to promote the larger goals of transparency, connectivity, and sustainability. The perimeter is defined by a new curtain wall to maximize daylighting. Interior walls are framed with drywall only where needed for acoustical separation and privacy; otherwise, glass partitions and transoms allow for "borrowed" light. In the primary flexible format teaching space, moveable partitions are hung from the original steel girders instead of fixed walls and doors. New elements such as stairs and railings are detailed to reinforce their tectonic relationship to the existing steel structure, and the benches in the lobby are even made from excess steel sections from the project.

While choices of materials and expenditures were strongly guided by these sustainable factors, it would be misleading to say that the architecture is simply a result of these efforts. There was a specific material and tectonic agenda developed to emphasize both the lateral transparency of the building and the delicacy of the overhead shading structure. The design team considered the building as a community asset, one that would be noticed on the way to class more than it might ever be entered. The material choices, density, color, and reflectivity of the shading canopy were manually and digitally modeled and mocked up to ensure that the performance of the shading could be rigorously met without sacrificing the experiential lightness of the structure itself.

The most significant architectural element of the project has its roots in an agenda of sustainability. The new east-facing façade is remade with 100% glazing but is almost entirely shaded with a whole-building steel-framed shading canopy. This canopy shades both the new window wall and, equally importantly, the primary campus pathway that passes by the east side of the building. Cantilevering 28 ft beyond the building face, it transforms the path into a porch-like space, drawing passersby into a closer association with the interior program.

Owner
Board of Regents, University System of Georgia, Atlanta

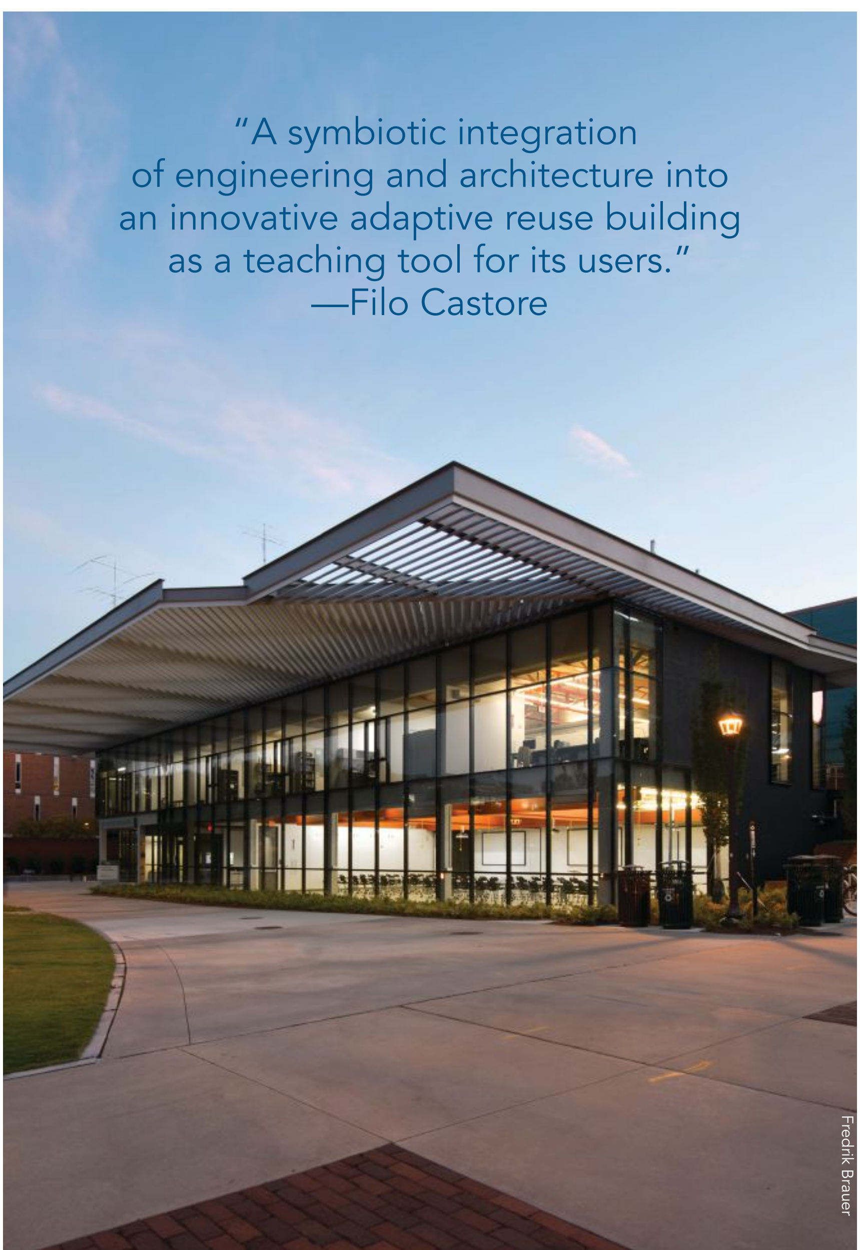
General Contractor
Evergreen Construction, Atlanta

Architect
BLDGS, Atlanta

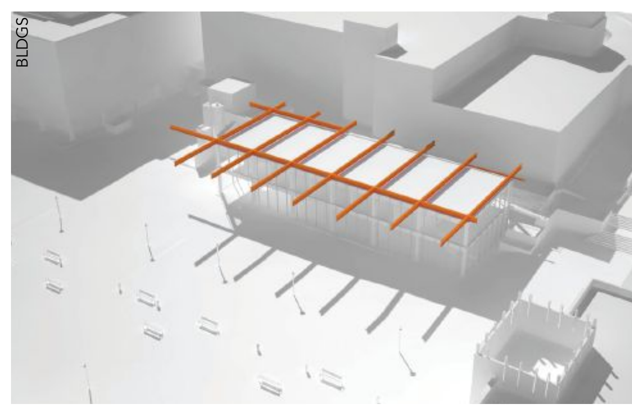
Structural Engineer
CFD Structural Engineering, Roswell, Ga.

Steel Fabricator and Erector
King Steel Company, Inc., Lawrenceville, Ga.

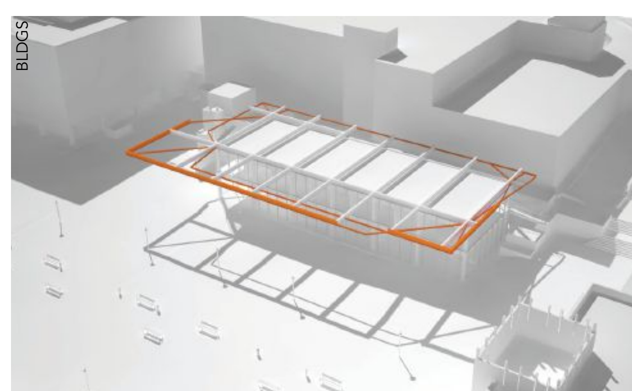
"A symbiotic integration of engineering and architecture into an innovative adaptive reuse building as a teaching tool for its users."
—Filo Castore



Fredrik Brauer



BLDGS



BLDGS

BLDGS

MERIT AWARD Less than $15 Million

Saxum Vineyard Equipment Barn, Paso Robles, Calif.

THE SAXUM VINEYARD Equipment Barn is quite the departure from the typical notion of what a barn should look like.

Located in the Templeton Gap area of West Paso Robles, Calif., this simple agricultural storage structure rests at the toes of the 50-acre James Berry Vineyard, with the adjacent Saxum Winery sitting just over 800 ft away. Designed as a modern pole barn using reclaimed oil field drill stem pipe, the structure's primary objective is to provide an armature for a photovoltaic roof system, which offsets more than 100% of the winery's power demands, as well as covered open-air storage for farming equipment, workshop, and maintenance space and storage for livestock supplies.

Designed to harness the local climate and maximize cross ventilation, daylight, and solar energy, the recycled oilfield pipe structure holds a laminated glass photovoltaic roof system that produces one-third more power than needed (roughly 87,000 kWh per year) eliminating the dependence of grid-tied power for the winery and its vineyard irrigation wells through net metering. By using the laminated glass solar modules as both the actual primary roof and the renewable energy generator, any additional costs to construct an additional roof with separately mounted crystalline solar panels were offset.

Minimalistic materials were selected to withstand the particularly dry climate, based on regional availability, to achieve long-term durability and to minimize the need for maintenance. The primary column and roof structure is constructed of welded Schedule 40 reclaimed drill stem pipe, in 2-in., 3-in., and 3.5-in. diameters, left to weather naturally. The lateral force-resisting system (LFRS) consists of diaphragm rod cross-bracing and vertical tension-only cross-braced frames. Laminated glass solar modules, serving as both the solar system and the roofing, are supported on wood and WT steel flitch purlins welded to the pipe trusses. An 8-in.-diameter Schedule 40 half-pipe gutter is situated at the low end of the roof to accommodate future rainwater harvesting. In addition, weathering corrugated perforated steel panels provide shading and filtered privacy to the equipment bays, and the barn doors are clad in weathered steel cutoffs that were saved for reuse from the adjacent winery shoring walls, reused in a "calico" pattern to mesh the oddly shaped panels to the tube steel-framed door leafs.

Standing sentry as the foremost structure upon entering the vineyard lined property, the barn and its renewable energy system speak to the winery's commitment to sustainability and subservience to the natural landscape. The barn is completely self-sufficient and operates independently from the energy grid, maximizing the structure's survivability and resilience.

Owner
Saxum Vineyards, Paso Robles, Calif.

General Contractor
Rarig Construction, Inc., San Luis Obispo, Calif.

Architect
Clayton & Little Architects, San Antonio

Structural Engineer
SSG Structural Engineers, San Luis Obispo, Calif.

Casey Dunn

"Sustainability meets natural beauty in this one-of-a-kind building nestled in the scenic vista of wineries and olive gardens. This structure is much more than just a canopy, as its solar roof panels perched upon its minimalist steel frame convert beautiful California sunlight into useful electricity."
—Devin Huber

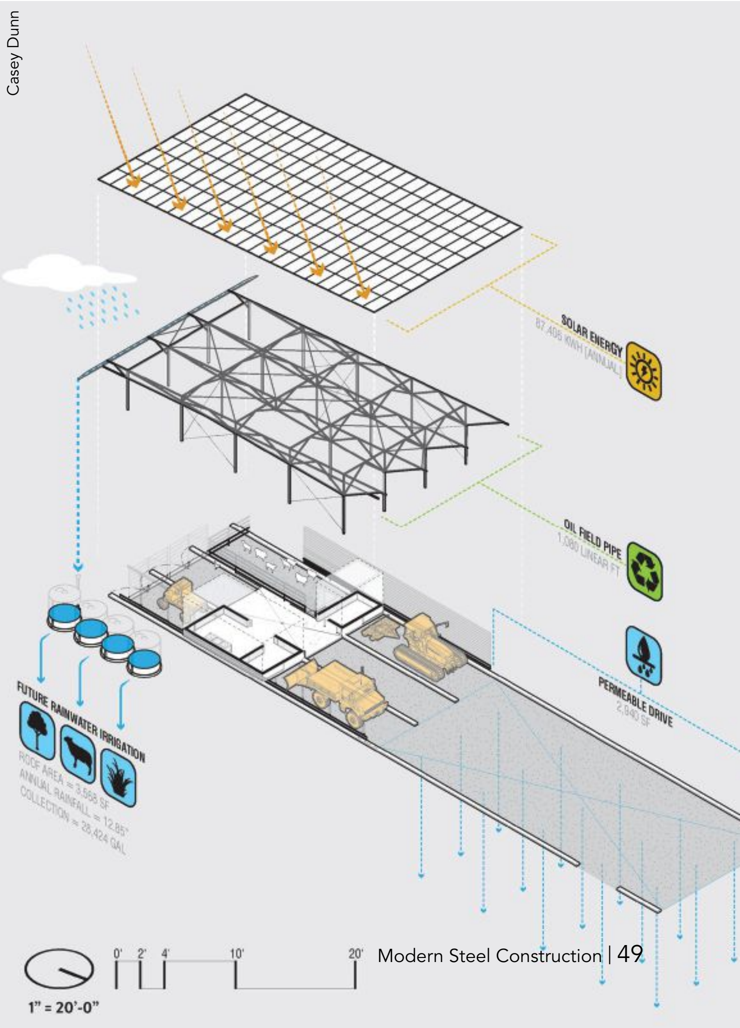
Casey Dunn

Casey Dunn

Casey Dunn

Casey Dunn

Casey Dunn



SCULPTURE/INSTALLATION/NON-BUILDING STRUCTURE

Helen Diller Civic Center Playground, San Francisco

THE HELEN DILLER Civic Center Playground, a design collaboration between Andrea Cochran Landscape Architects and Endrestudio, feature three expressive steel-framed play structures inspired by the often mercurial weather patterns of San Francisco: Fog Valley lopes slowly along the ground, Lenticular Cloud creates a layered world of blue mesh nets, and Sky Punch spirals up above the park in an open helical sweep.

The structures emerged through a synthesis of parametric form exploration, circulation strategy, and fundamental geometric principles. In this way, the forces are resolved through form rather than solely relying on strength of materials. To facilitate the aggressive project schedule and simplify assembly, a bolted splice connection was designed that could be used with a range of curvatures for each structure.

At night the park's focus shifts to the nearly 70 "pixel poles"—stainless steel posts with built-in LED display caps that are centrally controlled and fully programmable. The poles glow, flicker, and dance, joining in the hum and buzz of an evening at the Civic Center.

"Learning while playing through real-life 3D structural diagrams! I will not see the playgrounds the same way again."
—Filo Castore


Luke Downen

Owners
The Trust for Public Land, San Francisco
City of San Francisco Parks and Recreation Dept., San Francisco

General Contractor
Bothman Construction, Santa Clara, Calif.

Architects
Endrestudio, Emeryville, Calif.
Andrea Cochran Landscape Architecture, San Francisco

Structural Engineer
Endrestudio, Emeryville, Calif.

Consultant
Anticlockwise Arts, Oakland, Calif.

NBBJ Sean Airhart

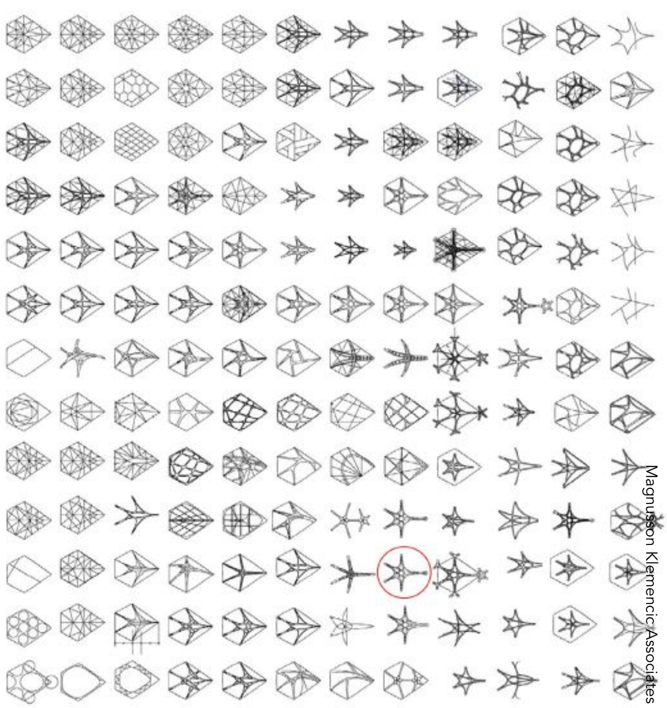
"The Spheres are simply amazing to behold. They are part bio-dome, part gathering area, and fully spectacular."
—Devin Huber

NBBJ Sean Airhart

Magnusson Klemencic Associates

NBBJ Sean Airhart

Magnusson Klemencic Associates



Magnusson Klemencic Associates

Magnusson Klemencic Associates

Bruce Damonte

PRESIDENTIAL AWARD FOR EXCELLENCE IN FABRICATION

The Spheres, Seattle

IF YOU'VE VISTED downtown Seattle recently, you may think that you have stumbled upon a giant's terrarium.

In reality, you've discovered The Spheres, three intersecting steel-and-glass orbs housing five, freestanding floors of unorthodox workspaces for Amazon employees—as well as more than 40,000 exotic plants from 30 countries.

Magnusson Klemencic Associates (MKA) collaborated with architect NBBJ to construct this iconic, city-altering structure. The first-of-their-kind spheres were built from intricately shaped steel sections whose highly organic appearance reflects their interior use—a space cohabited by nature and people. Spanning as an independent structure around the interior floors, the exterior skeleton is comprised of curved tube steel members and nodes fabricated from curved plates.

Deriving from a 60-sided shape, a pentagonal hexecontahedron, the structure's principal advantage is repetition; each of the 60 sides are the same pentagon, allowing for efficient fabrication. The pentagons join at their edges in different ways, yielding an organic final form. The repeating piece, dubbed a "Catalan," honors the 19th Century mathematician who first defined this shape. A total of 105 Catalans, 620 tons of steel and 3,045 panes of glass form The Spheres.

The engagement of the architect, contractor, structural engineer, and steel fabricator/detailer/erector team at project inception was essential to realizing the complex geometry, analysis, fabrication, and erection. The collaboration yielded many improvements to the project, such as imperceptible rationalizations of the initial architectural geometry of the Catalan that allowed for standard hollow structural sections (HSS) thus reducing the number of members built from steel plate. The team was also able to establish architecturally exposed structural steel (AESS) standards through building mock-ups of critical welding details, then selectively apply these standards depending on occupant proximity to the steel.

In addition, the team was able to streamline the documentation, detailing, and shop drawing process for a "mass customization" fabrication approach where each piece used the same base parts and fabrication jigs but had variable amounts of welding and internal stiffeners appropriate to individual structural demands. And the collaborative process also helped the team identify the detail and splice locations for fabricating the largest transportable pieces in the shop, thus speeding up the erection process. The integrated design team workflows were exceptionally efficient, requiring only 18 sheets of structural drawings for the Catalan structural steel.

Perhaps most importantly, integrating steel fabrication/erection constraints into the design at the earliest stages ensured that NBBJ's vision was executable within the owner's challenging schedule and budget requirements. Prefabricating the structural steel components at fabricator Supreme's Portland, Ore., facility made the final product seamless; erection took only six weeks.

Owner
Amazon, Seattle

General Contractor
Sellen Construction Company, Seattle

Architect
NBBJ, Seattle

Structural Engineer
Magnusson Klemencic Associates, Seattle

Steel Team

Fabricator
Supreme Steel Portland, Portland, Ore. AISC CERTIFIED FABRICATOR

Bender-Roller
Albina Co., Tualatin, Ore. AISC ASSOCIATE

PRESIDENTIAL AWARD FOR ERECTION ENGINEERING TO FACILITATE ADAPTIVE REUSE

75 Rockefeller Plaza, New York

WHEN THE 34-STORY 75 Rockefeller Plaza was built in 1947, it was the tallest completely air-conditioned building in New York and the first skyscraper at Rockefeller Center.

Located on 51st Street between Fifth and Sixth Avenues in Midtown Manhattan, the steel-framed building totals 623,000 sq. ft, with typical floor plates ranging from 14,000 sq. ft to 30,000 sq. ft. The building has recently undergone a major repositioning, including restoration of the façade and base metalwork, retail, and lobby enhancements and new mechanical infrastructure.

Every aspect of the updated building, which anticipates LEED Gold certification, has been meticulously reinvented to provide a building worthy of its stature and location. The street-level façade is reinstated with tempered monolithic glass, bronze mullions, and Deer Isle granite. A new private terrace overlooking 51st Street and Rockefeller Plaza—home of the annual Rockefeller Center Christmas tree—invokes the original design of 75 Rockefeller Plaza. The revitalized streetscape features a distinctive, bronze curvilinear entrance, an architectural detail that also serves as a focal point for new retail space.

One of the most significant structural updates included reconfiguring the lobby into a double-height, 24-ft-high space connecting 51st and 52nd Streets. The former black granite at the lobby's interior has been replaced with white marble walls and terrazzo floors. The same Indiana limestone that clads the exterior of the building is also used for two walls of the interior. The lobby includes a skylight and gallery space that will exhibit revolving public art. The main lobby finishes continue to the ground-floor elevator lobbies, where artist-designed bronze elevator doors open to reveal refurbished elevator cabs.

The lobby renovation required the removal of four columns at the ground floor, three of which supported existing transfer girders. Multistory transfer trusses and removal of each column from the top down were among the schemes considered before the final design of a composite steel box girder was selected. While the multistory truss would have obstructed too much leasable space, column removal and transfer floor by floor would have provided a large column-free area across all floors—but was prohibitively expensive.

Courtesy of RXR Realty

Courtesy of RXR Realty

Gilsanz Murray Steficek

Courtesy of RXR Realty

The unique box girder solution (as opposed to a pair of built-up wide-flange beams) coordinated nicely with the planned sculpted lobby ceiling, which required the transfers to be as narrow and shallow as possible. The composite box girder had to be carefully specified, as this configuration and method are typically applied to bridges rather than buildings. As such, both the AISC *Specification for Structural Steel Buildings* (ANSI/AISC 360, available at **www.aisc.org/specifications**) and AASHTO bridge specifications were consulted. Other design challenges included eccentrically reinforcing existing columns and modifying the existing partially restrained wind frame. Of particular note were the constructability challenges of erecting and preloading a new steel box girder around the existing transfer girders to effectively extend these transfers to the next column line. A scaled 3D model was printed to help communicate the design concept and erection/preloading procedures to the steel fabricator and the owner.

To preload the girders, a solution was developed that maintained redundancy throughout the entire loading procedure and did not require any temporary structure or shoring. This method, involving a yolk system with 500-ton jacks, pushes the girder and pulls the below column up, loading the girder in flexure without any significant displacement. At that point, the final connections are completed and the existing column removed.

Effects of column shortening and resistance from the steel moment frame above were all considered during the loading process. Maintaining the building's lateral stiffness was a primary focus throughout the project. The building was originally designed under New York's 1938 building code, which included no wind or seismic requirements and therefore accounts for a small amount of lateral stiffness relative to modern buildings. Careful attention was paid to reinforcing connections and keeping the relative increase in member loads to a minimum. ■

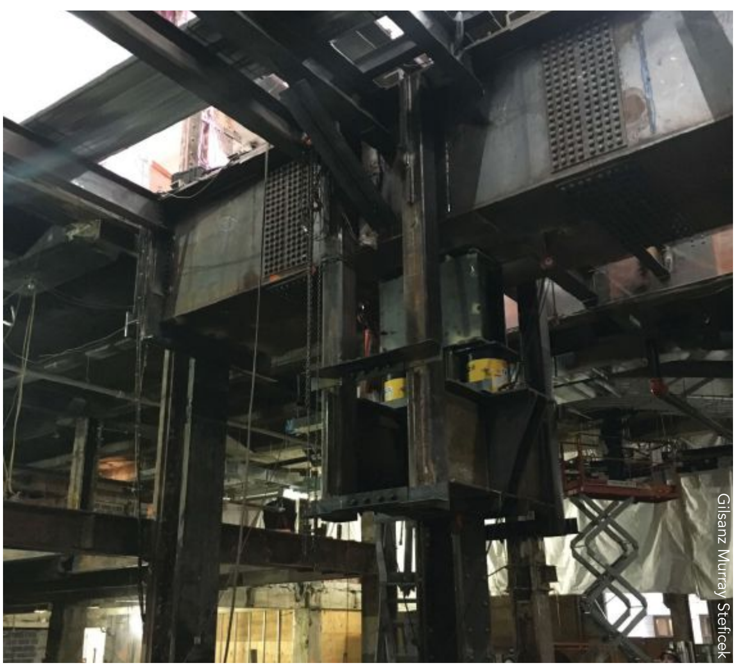
For more on this project, see "Playing to the Base" in the February 2018 issue, available at ***www.modernsteel.com****.*

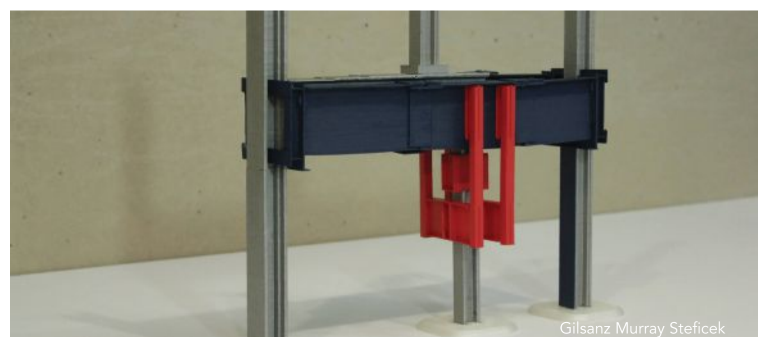
Owner and General Contractor
RXR Realty, New York

Architect
Kohn Pederson Fox, New York

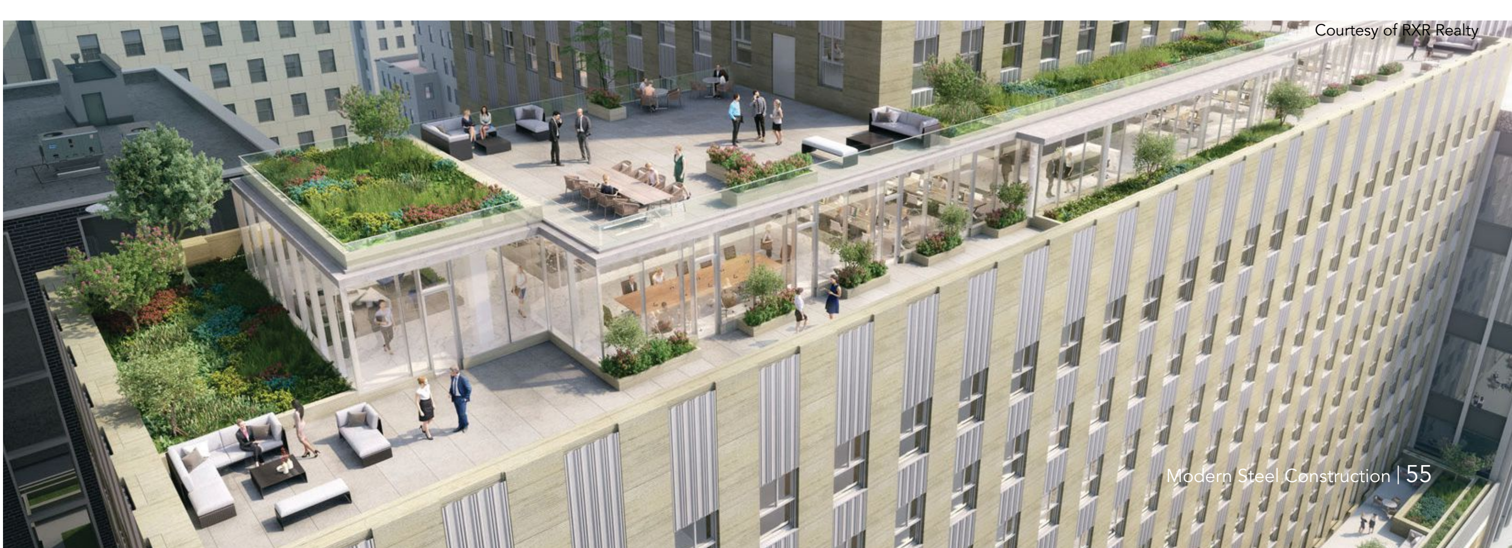
Structural Engineer
Gilsanz Murray Steficek, New York

Steel Fabricator, Erector, and Detailer
Orange County Ironworks, Montgomery, N.Y. AISC CERTIFIED FABRICATOR & ERECTOR


Gilsanz Murray Steficek


Gilsanz Murray Steficek

"The adaptive reuse of the 1947 building shows the long-term viability of a steel structure and the endless possibilities of structural modifications."
—Craig Wehrmann


Courtesy of RXR Realty