

AWARDS

Hearst Tower Wins Tall Building Award



The Hearst Tower in New York has received the 10 Year Award in the Council on Tall Buildings and Urban Habitat's (CTBUH) annual awards program. The award recognizes the proven value and performance of a building over a decade of its completion and operation.

The 46-story tower in Manhattan combines 40 stories of new construction with the Hearst Corporation's original six-story headquarters. The 1920s-era stone façade of the original structure serves as the shell of the headquarters' lobby and provides the architectural base for a 40-story exterior steel diagonal grid (diagrid) system, designed by Foster and Partners architects

and engineered by WSP Cantor Seinuk. Cives Steel Company (an AISC member and certified fabricator) performed the project's connection design and fabricated its 11,500 tons of structural steel. Fabrication began in early 2004 and steel erection, performed by subcontractors Cornell and Company of Woodbury, N.J. (an AISC member and certified fabricator and erector) was completed by the end of 2005. The building opened the following year.

For more about the project, see the July 2006 article "A New Angle" (available at www.modernsteel.com). You can view all of this year's CTBUH award winners at <http://awards.ctbuh.org>.

PROJECTS

New Tappan Zee Bridge Reaches Steel Milestone

Steel erection on the westbound approach lanes for the new Tappan Zee Bridge in New York has recently been completed. "Over a period of about 18 months, we have erected approximately 88,000 tons of structural steel on the Hudson River," stated Neil Napolitano, area manager for approach spans on the massive bridge project. "At one point, we put up five assemblies in five days. It sure showed what can be done when you have the commitments of some of the most capable fabricators and builders in our country."

The new bridge is being constructed mere yards from the original bridge, which opened in 1955. A replacement is needed to accommodate the heavy traffic on the bridge, which has increased from fewer than 40,000 vehicles per day to more than 140,000. When completed, the new bridge will be one of the widest bridges of its kind in the world and one of the longest cable-stayed spans in the nation.

The 1,200-ft main span serves as the iconic signature of the new bridge. The 419-ft-high towers support more than 14 miles of stay cables and create a sleek and clean aesthetic.

The new bridge is being built by Tappan Zee Constructors, a design-build LLC composed of Fluor Corporation, American Bridge Company, Granite Construction Northeast and Traylor Bros. Three AISC/NSBA member fabri-

cators, High Steel Structures, Hirschfeld Industries and Canam-Bridges, will together provide more than 110,000 tons of structural steel while playing a key role in the support of more than 7,700 jobs. And just as the fabrication was provided domestically, so too was the steel production, with 160,000 tons of steel plate for both the superstructure and sheet piling coming from AISC member ArcelorMittal. The design-build approach generated more than \$1 billion in savings compared with the state and federal cost estimates.

"Our prefabricated steel sections have been a huge value to us," Napolitano said. "Our subcontractors have done a significant amount of their work at off-site facilities, rather than on the river, which would be more time consuming."

The new Tappan Zee Bridge features a proven steel girder system, with center-to-center spacing of 25 ft and additional

floor beams to support the deck. Essentially, it's the same system used on bridges throughout the United States, simply on a far greater scale. As John O'Quinn, formerly of Hirschfeld Industries and now with High Steel Structures, explains, "This has been a fantastic project to work on. It's very straightforward in terms of fabrication and constructability, which makes our job as fabricators much easier. We spoke numerous times with the design team on how best to construct a bridge of this magnitude. Everything we used on this bridge can typically be seen on bridges the general public drives over/under in their daily travels—the only major difference being that most of the Tappan Zee girders are 12 ft deep and weigh upwards of 100 tons."

The new bridge is expected to last at least 100 years without the need for major repairs. For more about the bridge, visit www.newnybridge.com.



BRIDGES

AISC Supports ARTBA's Grassroots Effort to Impact Infrastructure Activity



AISC is supporting ARTBA's (American Road and Transportation Builders Association) grassroots effort to impact infrastructure activity. As such, AISC is encouraging everyone to visit ARTBA's Grassroots Action Center (at www.artba.org), which will automatically send an email message, a tweet and Facebook post to your representative and two senators.

The U.S. House of Representatives and the Senate won't reconvene until early January and when they do, there's a lot of work to get done. AISC encourages everyone to contact their congressional representatives and senators while they're back home about a host of unresolved issues. ARTBA offers the following advice:

- First, please thank them for the December 2015 passage of the Fixing America's Surface Transportation (FAST) Act, but also explain that the job's not close to being done. Before adjourning, Congress passed a government-wide spending proposal that would delay roughly \$1.5 billion in highway and public transportation investment increases until at least seven months into FY 2017. The proposal would hold virtually all federal pro-

grams at the FY 2016 level through the end of April. Consider conveying that you expect Congress to live up to the letter of the FAST Act law and restore those funding levels next year.

- Second, please ask them to lead in fixing the Highway Trust Fund (HTF) and doing so in a manner that will support growing highway and public transportation investment. Simply maintaining the status quo, as Congress has done in the last two bills, will not create jobs or boost the U.S. economy.
- Third, please tell them they will have an opportunity to deliver permanent transportation revenue reform as part of any final tax package or infrastructure initiative that goes to President Trump in 2017. Both vehicles are appropriate for fixing the HTF shortfall once and for all and providing the expanded investment necessary to support President Trump's spot-on vision for doing what is necessary to upgrade our commerce-critical transportation corridors.

Face-to-face contact with elected officials during a holiday party or town hall meeting is the best way to discuss these issues, when possible.

People and Firms

Nucor Corporation (an AISC member) recently announced that it has closed on its acquisition of Chicago-based Independence Tube Corporation, an independent manufacturer of hollow structural section (HSS) steel tubing (and also an AISC member), for approximately \$435 million.

"We are pleased to welcome the 335 teammates at Independence Tube to the Nucor family," said John Ferriola, chairman, CEO and president of Nucor Corporation. "This is a great acquisition for Nucor, giving us another growth platform and enhancing our position as the most comprehensive provider of steel solutions to the construction and infrastructure markets."

"This is an exciting opportunity for the employees and customers of Independence Tube," commented Dave Grohne, founder and CEO of Independence Tube. "Both Nucor and Independence Tube have a strong cultural compatibility, particularly the importance and focus each put on safety, quality, productivity and treating our employees fairly."

ITC operates four facilities in Illinois and Alabama that annually produce roughly 600,000 tons of HSS steel tubing. HSS is used in a broad array of structural and mechanical applications including nonresidential construction, infrastructure, and agricultural and construction equipment end-use markets. ITC has the second highest market share in HSS, selling its products primarily through service centers, which are also an important channel to market for Nucor, Nucor stated.

Doug Jellison will serve as president of Nucor Tubular Products. He previously served as vice president of corporate strategic planning for Nucor.

NASCC

NASCC is Next Month! Have you Registered?

If you're involved in the design or construction of steel buildings or bridges, NASCC: The Steel Conference is your once-a-year opportunity to engage with more than 4,500 of your peers and learn the latest design concepts, construction techniques and cutting-edge research. The 2017 conference takes place March 22-24 in San Antonio at the Henry B. Gonzalez Convention Center and will offer more than 130 technical sessions and feature over 220 exhibitors showcasing the latest equipment, software and tools. Registration for the conference is now open at www.aisc.org/nascc.

"The NASCC is a can't-miss event if you have an interest in structural steel—the educational and networking opportunity is unmatched," said 2016 attendee Tom Nunziata of Nabih Youssef and Associates.

Attendees can earn up to 17 PDHs by attending the conference's dynamic, expert-led sessions (plus an additional 4 PDHs if they attend the optional pre-conference short course). Topics will

range from "Practical Advice for Reviewing Software Generated Connection Designs" to "Lateral Torsional Buckling and its Influence on the Strength of Beams" to "Keeping OSHA out of your Bank Account." In addition, AISC has created a new program to explore "Solutions for Equity in the Workplace." This special 2.5-hour session is being held on the opening day of the conference and offers a look at what diversity means for the design community and construction industry, with an emphasis on what works and what doesn't when creating solutions that can increase equity within the workplace.

Attendee Frank Lancaster of EYP Architecture & Engineering, commented, "A great meeting of the minds among engineers, fabricators,

detailers and erectors. Educational sessions presented the latest research and thinking in the profession, and participants in the exhibit hall showcased how things are getting done."

One low registration fee gains you access to all of the technical sessions, the keynote address, the T.R. Higgins Lecture and the exhibition hall. Visit www.aisc.org/nascc to register or view more conference information, including the advance program.



PROJECTS

Banker Steel Awarded Contract for One Vanderbilt Skyscraper in Manhattan

Banker Steel (an AISC member and certified fabricator) recently announced that it has been awarded the structural steel framing contract for the One Vanderbilt project in New York City—a new, 1,464-ft-high, 1.6 million-sq.-ft building located at 42nd Street and Vanderbilt Avenue, immediately adjacent to Grand Central Terminal. Banker Steel will be under contract to provide all structural steel framing (26,500 tons) for the project as well as responsibility for the erection, beginning next summer. The project is slated for completion in 2020.

SL Green Realty Corporation is the project's developer. Banker Steel will be under contract to Tishman Construction, the general contractor.

"One Vanderbilt is precisely the type of large-scale, complex, heavy steel fabrication project that fits the unique capa-

bilities of Banker Steel," said Don Banker, chief executive officer and co-owner of Banker Steel. "This project will literally transform the New York City skyline, creating a more vibrant district around Grand Central Station. Banker Steel is thrilled to partner with SL Green Realty and Tishman Construction to bring this amazing new office tower, and doorway to Manhattan, to life for thousands of visitors and commuters."

Banker Steel subsidiary NYC Constructors will be erecting the steel that is fabricated at plants located in South Plainfield, N.J. and Lynchburg, Va. Banker acquired New York City-based NYC Constructors and New Jersey-based MRP LLC, together referred to as NYCC, this past March.

For more about the project, visit <http://onevanderbilt.com>.

First-Quarter 2017 Engineering Journal now Available

The first-quarter 2017 issue of AISC's *Engineering Journal* is now available at www.aisc.org/ej. You can view, download and print the current digital edition. Articles in this issue include:

► Simple-Made-Continuous Steel Bridges with Steel Diaphragms

Robert I. Johnson and Rebecca A. Atadero

Simple-made-continuous (SMC) bridges are a relatively new innovation in steel bridge design. The majority of SMC bridges currently in use are constructed with concrete diaphragms. This article presents the results of numerical analysis and physical laboratory testing of an alternative simple-made-continuous (SMC) connection scheme that uses steel diaphragms in lieu of concrete diaphragms. A bridge using steel diaphragms was constructed by the Colorado Department of Transportation in 2005, and the connections on this bridge serve as the basis for the research discussed herein. The results of the analysis and testing provided information for the development of a design methodology based on the physical behavior of the SMC connection. The paper also compares the steel-diaphragm SMC connection to concrete-diaphragm SMC connections and demonstrates that the steel-diaphragm design has several desirable features. For a diaphragm cost, which is similar in cost to other SMC schemes, the steel-diaphragm design requires less total construction time. Additionally, because the girder ends are exposed, it is easy to verify that the girders have fully weathered (for weathering steel), they may be easily inspected, and there is no concern about cracking of a concrete diaphragm at re-entrant corners around the steel bridge girders.

Keywords: steel bridges, composite steel girders, steel diaphragms, simple-made-continuous (SMC)

► Investigation of Web Post Compression Buckling Limit State and Stiffener Requirements in Castellated Beams

Fatmir Menkulasi, Cristopher D. Moen,

Matthew R. Eatberton and

Dinesha Kuruppuarachchi

The research presented in this paper addresses the need for a design method to estimate the nominal capacity of castellated beams against concentrated loads. The limit state investigated is that of web post buckling due to compression loads. The purpose of the paper is twofold: (1) to investigate the limit state of web post buckling due to compression loads and (2) to quantify the enhanced capacity of the web post against concentrated loads when stiffeners are provided. Five castellated beam depths are considered, which cover a wide range of the available depths. For each beam section, three load cases are investigated: (1) center of load aligns with the middle of web post, (2) center of load aligns with the center of the hole, and (3) center of load aligns with a point half-way between the center of web post and center of hole. For each load position, two cases are considered: one without a stiffener and one with full-height transverse stiffeners. Each case is investigated using nonlinear finite element analysis to examine the behavior of the web post to failure. The efficiency of stiffeners to increase the resistance of castellated beams against concentrated loads is examined. For each investigated beam depth and stiffener arrangement, the loads that cause failure are noted. In addition, a simplified approach for checking the limit state of web post buckling in compression is proposed.

Keywords: castellated beams, web post buckling in compression, stiffeners

► Observations from Cyclic Tests on Deep, Wide-Flange Beam-Columns

Gulen Ozkula, John Harris and

Chia-Ming Uang

As part of a National Institute of Standards and Technology (NIST) comprehensive research program to study the seismic behavior and design of deep, wide-flange structural steel beam-column members for application in seismic design and construction of steel special moment frames, 25 deep column speci-

mens were subjected to inelastic cyclic loading with three different levels of constant compression axial load ($C_u = 0.2, 0.4$ and 0.6). The test matrix included five W24 sections (W24×55 to W24×176) to cover a wide range of element slenderness ratios for flange and web local buckling and member slenderness ratios for lateral-torsional buckling and weak-axis flexural buckling. The specimens satisfied AISC 341 requirements for highly or moderately ductile elements. All specimens were subjected to strong-axis bending, except for three specimens that were subjected to weak-axis bending and one specimen that was subjected to biaxial bending. Test results showed that the slenderness ratios had a significant effect on the failure mode—local versus global buckling. The presence of an axial load produced significant local buckling and axial shortening. The level of axial load also affected the plastic rotation capacity. Specimens with weak-axis bending were ductile, showing no local buckling up to a high story-drift ratio. Most of the strong-axis bending specimens were not able to deliver a plastic rotation of 0.03 radians.

Keywords: beam-column, cyclic behavior, plastic rotation, local buckling, lateral-torsional buckling

► Shear Capacity of High-Strength Bolts in Long Connections

Raymond H.R. Tide

Current design codes reduce the shear strength of individual bolts to account for potentially uneven distribution of force among the bolts including a 0.75/0.90 (83.3%) step function at 38 in. Available test data indicate there is no justification for a bolt shear strength reduction, especially the step function, due to the length of connection, provided that second-order effects are limited and gross and net section areas slightly exceed the AISC *Specification* limits (2010). A practical, empirical solution is proposed that maintains a reliability, β , slightly greater than 4.0 for all connection lengths, using the current AISC resistance factor, ϕ , of 0.75.

Keywords: bolt shear, reliability, resistance factor, connection length