

BRIDGES

NSBA Updates LRFD Simon Software

The National Steel Bridge Alliance (NSBA) recently released several updates to the Load and Resistance Factor Design (LRFD) Simon software, which aids bridge engineers in preliminary steel plate and box girder design. The new additions include:

- 8th Edition AASHTO *Specification* support. All specification checks are now consistent with the current AASHTO *Specification*.
- Input file verification. When opening files and before running the analysis engineer, LRFD Simon now performs an input verification.

- “Best Design” input file creation. After a successful design run, LRFD Simon now generates an input file containing the web and flange dimensions of the successful design.

- Updated user documentation.

LRFD Simon is a powerful line-girder analysis and preliminary design program for steel I-shaped plate girders and multiple single-cell box girders. It allows users to quickly produce complete steel superstructure designs in accordance with the 8th Edition AASHTO *LRFD Bridge Specifications*. And it's free! You can download it at www.aisc.org/nsba/design-resources/simon.

ENGINEERING JOURNAL

Third Quarter *EJ* Now Available (cont. on page 64)

The Third Quarter 2018 issue of AISC's *Engineering Journal* is now available. You can access the current issue as well as past issues at www.aisc.org/ej. Below are summaries of this edition's articles:

- **Experimental Investigation of a Steel-Framed Building for Disproportionate Collapse**
Ebiji Akab, Curtis Wood, Kai Li and Halil Sezen

This paper presents the experimental and numerical investigation of the progressive collapse vulnerability of an existing steel building, Haskett Hall, on the Ohio State University campus. The building was tested by removing one of the first-story columns to observe its collapse resistance and to evaluate the effectiveness of current modeling and analysis guidelines. Progressive collapse is a relatively large partial or complete collapse of a structure due to the loss of a vertical load-carrying element—a column in this case. Few researchers have been able to conduct full-scale experiments to understand the progressive collapse mechanism. In this research, deflections and deformations of steel structural components were measured during the field experiment. Computational models and simulations were examined and compared with the experimental data from the field tests. The contribution and effects of infill

walls to progressive collapse resistance of frame structures were investigated. The test data collected in this research can be used to help develop recommendations for improved procedures for progressive collapse analysis of frame buildings.

- **Nonlinear Behavior and Design of Mid- to High-Rise Diagrid Structures in Seismic Regions**
Esmael Asadi and Hojjat Adeli

The aesthetics and structural advantages of the diagrid structural system have made it an attractive choice for many buildings across the world, including several notable high-rise building structures built in recent years. This paper presents an investigation of nonlinear behavior and design of mid- to high-rise steel diagrid structures. Weight, story drift, fundamental period, lateral stiffness, and sequence of plastic hinge formation in steel diagrids are studied and compared with corresponding moment-resisting frames and concentrically braced frames. To improve the nonlinear behavior and increase the collapse load capacity of diagrid structures in high seismic regions, practical design guidelines are proposed by using virtual work/energy diagrams and by performing nonlinear static analysis. So far, the diagrid system has been used mostly in the design of tall buildings in the range of 20 to 100 stories. A conclusion of this research is that the

People and Companies

- **U.S. Secretary of Commerce Wilbur Ross** recently presented AISC full member fabricator **CoreBrace, LLC**, with the President's E Award for Exports. The award is the highest recognition any U.S. entity can receive for making a significant contribution to the expansion of U.S. exports.

“The E Awards Committee was very impressed with CoreBrace's more than 300% increase in employment, supported by exports,” said Secretary Ross in his congratulatory letter to the company announcing its selection. “CoreBrace's achievements have undoubtedly contributed to national export expansion efforts that support the U.S. economy and create American jobs.”

“Exporting is an important part of our sales,” said **Dieter Klohn**, president of CoreBrace, which produces buckling restrained braces (BRBs). “Buyers and builders in foreign markets want quality products made in the United States, and we are honored to receive the E Award.”



- **Fabreeka**, which provides shock control, vibration isolation and thermal break solutions to clients on all continents, turns **100** this fall. (For commentary on the topic of thermal bridging from Fabreeka and other structural thermal break manufacturers, see “Breaking Up Is(n't) Hard to do” on page 43.)

AWARDS

IDEAS² Awards Submissions Still Being Accepted

There's still time to submit your project for AISC's 2019 IDEAS² Awards. Architectural and engineering firms, structural steel companies, general contractors and owners are encouraged to enter steel-framed building projects in the competition.

Conducted annually by AISC, the awards program—IDEAS² stands for Innovative Design in Engineering and Architecture with Structural Steel—recognizes excellence and

innovation in the use of structural steel on building projects across the country. Entries are judged in three categories according to constructed value: Less than \$15 million; \$15 million to \$75 million; and Greater than \$75 million. There is also a category for sculptures, art installations and non-building structures.

Winning projects receive their awards at the project sites during special presentations to which the project team and local dignitar-

ies will be invited. The winning projects will also be recognized at NASCC: The Steel Conference in St. Louis, April 3-5, 2019.

The IDEAS² entry process is conducted online. For the full eligibility requirements, instruction on how to enter and access to the online entry form, please visit www.aisc.org/ideas2. The deadline for entries is SteelDay, September 28, 2018 (www.aisc.org/steelday).

letters to the editor

All Can Be Learners and Teachers

I read the July Business Issues article "Hey, Hotshot!" (www.modernsteel.com) with great interest. As a retired Air Force/Nebraska Air National Guard officer, pilot, instructor/evaluator pilot and finally vice wing commander, I lived in an environment like you describe for most of 34 years. While there were some senior folks who did not appreciate learning from their subordinates, those who thrived and proved to be the most effective senior leaders promoted organizational learning bottom-to-top as well as top-to-bottom. Especially in the dynamic environment of the fighter community, rank was not as important as expertise. The most experienced, current and highly trained individuals lead the important missions, regardless of rank. Young captains—even lieutenants—recently returned from the war zone, typically lead flights with their commanders on their wing.

Most importantly, during the debriefing, where 50% of the learning happens, rank was not allowed into the room. Debriefings were no-holds-barred evaluations of the mission, good and bad, room for improvement, what everyone learned, etc. In other words, what you call reverse mentoring was built into the system. It was, and remains, a cultural strength of fighter squadrons throughout the Air Force, Navy and Marine Corps.

All good leaders learn that their primary mission is to continually prepare and develop their replacements. Learning from those who are newer to

the organization naturally occurs as the senior person develops the new person in the higher-level functions of leadership and management.

The Army recently started a new school to teach new enlisted personnel how to deal with cyber-threats. After a couple of days, the general in charge realized that those new people already knew more about the subject than those who had created the curriculum and started over, putting the "kids" in charge of developing the program. The kids weren't ready to lead the organization, but they were better prepared to deal with the emerging threat than any of the old heads. As digital technology increasingly becomes integrated into even the most basic processes—from cyber-security to multi-axis machining and steel fabrication—this new knowledge life cycle will get shorter and shorter. The need for speed should overcome traditional age related ideas of superiority.

Of course, for certain functions, old age and trickery will always overcome youth and enthusiasm. As I approach my seventh decade, it is enjoyable and satisfying to be able to trade expertise with the young folks. I want them to rapidly learn what we required years and decades of experience to learn, but I also want them to realize that we can continue to learn as long as we decide to.

—Barry J. Bruns, Col, USAF (Ret)

Puma Steel Board Member

Where There's a Will...

Regarding the May Business Issues article "The 'Will' vs. the 'Why,'" (www.modernsteel.com) it is not only the followers who are responsible for the attitude of will vs. why. I have often encountered the CEOs of corporations suddenly making changes without making a proper introduction to those changes. When a product needs changing or discarding and the bosses make the decision to do so, there should be a valid explanation given. This not only educates the workforce but also gives logic and incentive to produce a better product.

I have run across a large workforce in the U.S. that does not wish to be educated to achieve advancement. They seem to have the mindset that the corporations owe them jobs and advancements simply for showing up. The will is an internally driven force that includes education, achievement and satisfaction of progress, regardless of the compensation. The why is always given to me as an excuse for failure to be blamed on others. That is not exactly the way to advance in a career. Those who "will" are seldom noticed until late, when success is analyzed and found to be the result of some person or team making the change quickly and owning up to the change.

I would love to see follow-up articles on how to present change, how to establish a will culture and how to teach and empower those with the will.

—Wolfgang Schenck, Detailing Checker
Shawnee Steel and Welding

ENGINEERING JOURNAL

Third Quarter EJ Now Available *(cont. from page 62)*

diagrid system can also be an efficient and economical structural system for mid-rise buildings in the 8- to 15-story range.

- **Technical Note: Fracture and Fatigue Design of the Wilshire Grand Tower**

Amit Kanvinde, Peter Maramian, Leonard Joseph and Jeff Lubberts

The 1,100-foot Wilshire Grand Tower in Los Angeles owned by the Hanjin Group is the tallest building in the United States west of Chicago. The building, whose architect is AC Martin Inc., has a slender elevation in one direction, necessitating the use of heavy steel box columns filled with concrete on the perimeter, connected to the concrete core with outrigger trusses. The building has a slender, 272-ft-tall spire, also constructed from steel plates. The height and slenderness of the tower, as well as the spire, and its location in a seismically active zone motivated comprehensive analysis to mitigate the risk of steel fracture within a performance-based design framework. This analysis includes the following components: (1) development of acceptance criteria for earthquake-induced fracture, especially when it may follow years of wind-induced fatigue crack growth; (2) wind tunnel testing; (3) linear and nonlinear time-history simulations to determine stress demands in critical components un-

der appropriate wind and seismic hazards; and (4) fracture mechanics simulations to characterize trade-offs among various design variables to meet the acceptance criteria. The analysis indicates that wind-induced oscillations have the potential to grow fatigue cracks in some components, affecting their performance during a subsequent maximum considered earthquake. This situation is unusual for steel buildings, being the result of the extraordinary height, geometry, heavy steel members, and location of this particular building. The analysis also indicates that fracture risk may be successfully mitigated through existing design and detailing approaches and acceptance criteria, along with use of steel material exhibiting high, but commercially available and affordable, specified Charpy V-notch toughness values.

- **Web Crippling Strength of Longitudinally Stiffened Steel Plate Girder Webs Subjected to Concentrated Loading**

Nelson Loaiza, Carlos Graciano and Rolando Chacón

Currently, the AISC *Specification* provides guidance for the calculation of the ultimate strength of unstiffened plate girder webs subjected to concentric edge loads. Specifications consider three categories: local web yielding, web crippling, and sideways

web buckling. Based on previous studies, the presence of longitudinal stiffeners in the web has not been considered in the calculation procedures. Longitudinal stiffeners in steel plate girders are primarily used to increase bending. In the last two decades, a number of projects regarding the positive effect of longitudinal stiffening on the strength of plate girder webs to concentrated load have been conducted around the world. The results have shown that this type of stiffening enhances ultimate strength for web crippling, depending on the position of the stiffener that modifies the slenderness of the directly loaded panel and flexural and torsional rigidities of the stiffener. This paper presents a methodology for the consideration of longitudinal stiffening on the ultimate strength of plate girders webs subjected to concentrated loads. The methodology is based on the plastic collapse mechanism observed experimentally, in which plastic hinges are formed in the loaded flange and yield lines result in the portion of the web limited by the loaded flange and stiffener. Then, a closed-form solution accounting for the influence of the stiffener is developed following the current expression available in the AISC *Specification*. Theoretical predictions are compared with available test results, showing that the predicted ultimate loads are in good agreement with experimental results.