

ENGINEERING JOURNAL Fourth Quarter EJ Now Available

The fourth 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:

- **Technical Note: Post-Fire Axial Load Resistance of Concrete-Filled, Double-Skin Tube (CFDST) Stub Columns**

Reza Imani and Michel Bruneau

This technical note reports findings on a series of squash tests to investigate the effects of a significant fire loading history on the axial load strength of concrete-filled, double-skin tube (CFDST) stub columns. Axial loading tests were conducted on two stub columns that were previously subjected to the first 60 minutes of the standard ASTM E119 (ASTM, 2012) fire. Results were compared to the resistance of an identical virgin stub column. Comparisons indicated an average reduction of 28% in the axial load strength of stub columns when subjected to the mentioned fire loading history.

- **Quantifying Inelastic Force and Deformation Demands on Buckling Restrained Braces and Structural System Response**

Justin D. Marshall, Brandt Saxey and Zhongliang Xie

Buckling-restrained braced frames (BRBFs) have become a very popular lateral-resisting system due to their balanced, full hysteresis and the ability to tailor stiffness, within limits, and strength to meet specific design requirements. This paper reports the results of an analytical investigation on the performance of buckling-restrained braces (BRBs) and the global performance of BRBFs, with a focus on the ductility and overstrength demands on the braces. Non-linear analytical models of various three- and six-story steel frames were subjected to a suite of earthquake records to determine the demands on the BRB elements and the overall frame response. The structure variations include the location (i.e., seismic hazard), seismic importance factor, I_e , brace configuration (chevron versus single diagonal) and BRB yielding core length.

- **Local Strength of Single-Coped Beams**

Bo Downswell

In beam-to-beam connections, the top flange of the supported beam is usually coped to clear the supporting beam flange. Due to flexural and shear stresses in the coped portion of the web, the local strength can be limited by buckling. Design recommendations in previous editions of the AISC *Manual* imposed limits on the cope geometry and were based on an allowable stress philosophy, limiting the flexural strength to the first-yield moment. To eliminate the limits of applicability and provide equations that take advantage of any available post-yield strength, the design guidance in the 15th Edition AISC *Steel Construction Manual* has been revised from previous editions of the AISC *Manual*. This paper discusses the development of the revised design procedure and validates the equations with the results of 25 experimental tests from five independent research projects.

- **Steel Structures Research Update: Seismic Performance and Design of Steel Panel Dampers for Steel Moment Frames**

Judy Liu

Ongoing work on the seismic performance and design of steel panel dampers for steel moment frames is highlighted. Dr. Keh-Chyuan Tsai, professor in the Department of Civil Engineering at National Taiwan University, leads the team from National Taiwan University and the National Center for Research on Earthquake Engineering (NCREE) in Taipei. In 2018 at NCREE, one recent collaboration with the University of Washington included cyclic tests of a three-story chevron special concentrically braced frame (SCBF). Current seismic design provisions require large beam sizes to resist the unbalanced forces from the chevron braces after brace buckling. The research has explored options for alternative ductile mechanisms and reduced beam sizes. Steel research at NCREE has also included studies on steel beam-to-box-column moment connections and electro-slag-welded (ESW) joints in those connections.

People and Companies

"Insatiable appetite to learn coupled with the fear of failure," says Ron Klemencic, SE, PE, chairman and CEO of Magnusson Klemencic Associates (MKA) on his motivation to innovate. Klemencic is interviewed in the latest episode of AISC's *Steel Profiles* podcast series at www.aisc.org/podcasts. Tune in to hear his fascinating hour-long conversation with Margaret A. Matthew, PE, AISC senior engineer and host of *Steel Profiles*. He gives an inside look at this life and career including his innovative ideas on tall building design, a revolutionary new composite structural steel framing system, his crusade to give back to the industry and even the scoop on his fear of heights.

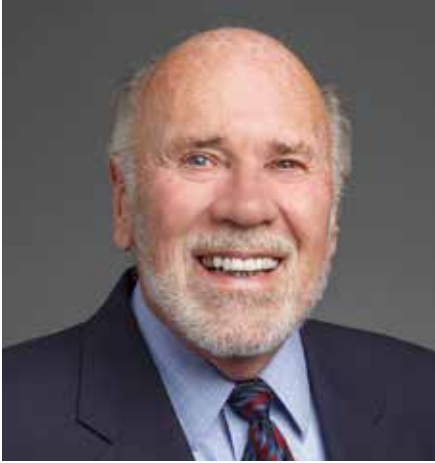
Klemencic has led the development of the SpeedCore system, aiming to replace the reinforced concrete core in steel office-tower construction. The system is expected to take 40% less time to build than a steel frame with a reinforced concrete core. To learn more about this revolutionary system, visit www.aisc.org/speedcore.

You can play or download all 28 episodes of *Steel Profiles* at www.aisc.org/podcasts or on iTunes. In iTunes, simply search for "Steel Profiles" to access all of the episodes. You can also subscribe to the series for free, and each new episode will automatically be downloaded for you.



IN MEMORIAM

Steel Industry Mourns Terry Peshia, Former AISC Board Chair



Terry F. Peshia, CEO of Garbe Iron Works, Aurora, Ill. (an AISC member and certified fabricator), and former chair of the AISC Board of Directors, passed away on August 9 at the age of 80. Fittingly, his company provided the steel fabrication for the hospital, Rush-Copley Medical Center in Aurora, where he died.

“The AISC Board is saddened by the loss of our friend and mentor Terry Peshia,” said David Zalesne, current AISC chair and president of Owen Steel Company (an AISC member and certified fabricator). “Terry joined the Board in 1996 and served as Board Chair from 2001 to 2003. He remained actively engaged in many Board activities over the years, including his current service as Chair of AISC Holdings, Inc., with oversight of AISC treasury and intellectual property assets. Even as the industry changed and evolved, Terry remained a strong advocate for its core values, which he lived out through his entire professional career at Garbe Iron Works, and his personal dedication to his wife, Connie, and their sons, Ted and John. The AISC Board will miss his presence, guidance and friendship.”

A recognized leader in the structural steel industry, Peshia began as an ironworker and joined Garbe Iron Works in 1964, where he spent his entire career. In

addition to his significant contributions to AISC, he served as chair of the Central Fabricators Association and was a member of the Associated Steel Erectors. In 2009 he received the prestigious AISC Stupp Award for Leadership Excellence. He was a 1961 graduate of Worsham College of Mortuary Science and served his country proudly as a member of the United States Army.

“Terry’s influence and impact on the steel industry cannot be overstated,” said Charlie Carter, AISC’s president. “He served and led AISC, CFA and the Ironworkers faithfully for many decades, all with wisdom, vigor and dedication. A master of appropriate, helpful criticism, he also was your strongest supporter as you adapted to resolve it. His vision was always of what could be. His talent was orchestrating it to happen.”

Roger Ferch, former president of AISC, said, “I first met Terry 20 years ago when I joined the AISC Board. From the beginning, Terry was a mentor to me and very welcoming to new Board members. He was always very informed on topics of discussion and certainly never bashful about making his opinions known. But perhaps his greatest strength was that of being a team player and supporting the organization once a decision was made. As strong as he was working behind the scenes and voicing his thoughts during Board meetings, once a vote was taken, Terry transferred his tireless volunteerism into executing the plan. I have many fond memories of Terry and will remember him as both a great friend and a mentor. He was a genuine leader and I listened closely to his sage advice. Terry was also the most influential in recruiting me to move from sunny California to Illinois to become AISC’s president in 2006.”

Larry Kruth, AISC’s vice president of engineering, added, “Terry has been a major influence to many people in the steel industry, not only through his leadership at AISC but also his many years as a member and leader of CFA, and he will be greatly

missed. He was a great inspiration to me personally by getting me actively involved in both organizations, which eventually led to the position I now hold at AISC after working at Douglas Steel [an AISC member and certified fabricator] for over 30 years. I will truly miss his guidance and in-depth knowledge of the industry, and will always treasure his friendship and the help he has offered to me over the years. One of the most memorable experiences I had with Terry was the time he had the CFA Dinner hosted at the Auburn Cord Duesenberg Automotive Museum. In addition to the great experience, the most amazing part was to have Terry show us his 1932 Auburn Boattail Speedster.”

An avid car collector, Peshia was a member of the Auburn Cord Duesenberg Club and lifetime member of the ACD Museum in Auburn, Ind. He was also a freemason and a member of the Jerusalem Temple Lodge in Aurora, Ill. He was very involved in many county and community organizations, including the Kendall County Board, the Oswego Village Board and the Kendall County Historical Society, where he was a past president, and he was also a former Oswego police commissioner.

“In every organization, there is a committed individual that has a major impact on the success of the group,” said Lou Gurthet, former president of AISC. “Terry Peshia was that person with his family, with Garbe Iron Works and with AISC. Quiet, thoughtful and determined—even downright stubborn—he played that role in support of AISC. He had the ability to articulate what was needed, how it could be achieved and the strength to hold to his conviction. He was the person you wanted as a friend and on your team.”

Tom Schlafly, chief of engineering at AISC, added, “I worked with Terry over 20 years ago and for many years since. He impressed me with his attention and success with some of the more arcane issues of running his business that many others did not show interest in.”

news

TARIFFS

U.S. Imposes Tariffs on Chinese Steel

In August, the Office of the United States Trade Representative (USTR) released its list of approximately \$16 billion worth of imports from China that will be subject to a 25% tariff as part of the U.S. response to China's unfair trade practices related to the forced transfer of American technology and intellectual property. The list contains 279 of the original 284 tariff lines proposed, **including those AISC requested for inclusion in its two separate testimonies**

in front of the USTR Section 301 Committee. This is the first time that tariffs have been extended beyond mill products to include fabricated structural steel, and they went into effect on August 23.

To read AISC's most recent testimony given by David Zalesne, chairman of AISC and president of Owen Steel Company (an AISC member and certified fabricator) visit www.aisc.org/tariffs.

Charlie Carter, president of AISC,

said, "On behalf of AISC and the American structural steel industry, we appreciate USTR's willingness to listen, and commend the USTR for including fabricated steel tariff codes on the current list for action under Section 301. This is a very positive step toward protecting downstream users that have been left exposed to foreign fabricators circumventing current 232 trade actions."

BRIDGES

SSSBA Publishes Research on New Steel Tub Girder Bridge Technology

A new report from the Short Span Steel Bridge Alliance (SSSBA), *Development and Experimental Testing of Press-Brake-Formed Steel Tub Girders for Short Span Bridge Applications*, reveals new technology that allows for accelerated construction and reduced traffic interruptions.

The five volumes, compiled by Karl Barth, PhD, and Greg Michaelson, PhD, PE, can be downloaded for free at www.shortspansteelbridges.org.

- Volume I – "Development and Feasibility Assessment of Shallow Press-Brake-Formed Steel Tub Girders for

Short Span Bridge Applications"

- Volume II – "Experimental Evaluation of Non-Composite Shallow Press-Brake-Formed Steel Tub Girders"
- Volume III – "Evaluation of Modular Press-Brake-Formed Tub Girders With UHPC Joints"
- Volume IV – "Field Performance Assessment of Press-Brake-Formed Steel Tub Girder Superstructures"
- Volume V – "Fatigue Performance of Uncoated and Galvanized Composite Press-Brake-Formed Tub Girders"



STEEL SYSTEMS

Connection Testing Leads to More Testing—and New Connections

Sometimes testing yields further, unanticipated testing.

Earlier this year, in testing its bolted special moment frame connection at the University of California San Diego test lab, seismic connection manufacturer SidePlate successfully deformed a W27×102 beam on an HSS20×20× $\frac{7}{8}$ column with no damage to the connection after full cycle testing at 1.0%, 2.0%, 3.0%, 4.0%, 5.0%, 6.0% and 7%. Realizing the connection was fully intact, the team decided it could be tested again.

So an identical beam was installed (all tests were done with a story height of 14 ft and a span of 22 ft) but to make it more interesting this time around, the research team removed the VSE (vertical shear element) bolts and tested again, resulting in a full test cycle up to 6%—far exceeding the code required limit of 4%—and the connection

was still in undamaged. The test team met and decided that the connection offered significant versatility and, based on finite element analysis performed in-house, the company's engineers developed a new tuck connection that minimizes the spatial impact of the joint. This configuration, tested with a W33×106 "built-up" beam, saw 1.0%, 2.0% and 3.0% cycles and two full cycles at 4%. In other words, one connection and column had now been through 18 cycles and was still ready for further testing.

"We didn't set out on a resiliency test path in developing this new connection, but things happen in engineering," exclaimed SidePlate's president, Henry Gallart.

Test four used a duplicate "built-up" beam and after achieving a successful 4% test, the plate finally showed some deformation but held up through another 4% test, which was performed for good measure. In all, the con-

nection completed 23 test cycles and resulted in two new connections configurations.

Additionally, the column used in the testing allowed a b/t ratio of up to 21, far exceeding the standard of 14. By pushing the limits, the team was able to turn the costs associated with testing into certification testing, validating a new design and opening up a new era of design with the larger HSS columns.

"Conducting four successful full-scale tests with the same column and side plates means that a building using our connections can be subjected to a code-level earthquake four times and still be operational after replacing the beams," noted SidePlate's director of research and development, Bezhad Rafezy. "It validates our philosophy for our field-bolted connection design: life-safety performance that gives a building owner reduced downtime after a major earthquake."

STUDENT STEEL BRIDGE COMPETITION**2019 Student Steel Bridge Competition Rules Released**

Each year, the Rules Committee creates a new mock scenario and set of rules for the Student Steel Bridge Competition (SSBC), keeping the competition challenging and exciting for the student teams—and the 2019 rules are now available.

This year's problem statement involves historic steel railroad bridges in Hawaii that must be rebuilt due to volcanic flows and earthquake activity. But there's a twist: Each bridge must include a cantilever supported by offset footings on one end.

As in past competitions, the rules include design, construction, equipment and safety requirements. After constructing their bridges, teams will perform vertical and lateral load tests.

Starting in early spring of 2019, 18 regional competitions will be hosted by

universities nationwide. AISC will offer funding and assistance in finding sponsors for bridge teams and host schools. Depending on the number of teams at each competition, between one and four teams will move on to the 2019 Student Steel Bridge Competition: National Finals at the University of Texas El Paso, May 24-25.

For the complete problem statement and rules, visit www.aisc.org/ssbc.

In addition, AISC, in coordination with its many professional, industry and academic volunteers, will conduct all aspects of the 2019 SSBC as the sole organizing sponsor, including regional competitions. For more on the new organization of the SSBC, see the related August 16 news item at www.modernsteel.com.

correction

In the July article "Intensified Care" (available at www.modernsteel.com) the bender-roller for the CHI Health project was erroneously left off the project team list. Curved steel was provided by AISC associate member Chicago Metal Rolled Products.