Ten Years of Studies on the State of the Art

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INTRODUCTION

This issue of "Current Steel Structures Research" for the *Engineering Journal* focuses on the entire 10 years of reporting on steel structures research around the world. The first paper appeared in the journal in the first issue of 2005 (Vol. 42, No. 1). The current paper is number 36 in the series; it will be the final contribution from the current Research Editor.

The collaboration and active support of the highly competent staff of AISC has been essential—most importantly, the efficient and knowledgeable efforts of Keith Grubb, the Editor of the *Engineering Journal*. At the start of the effort, your Research Editor established a support group that would prove to be a critical feature of the information gathering. This was the International Steel Structures Research Advisors (ISSRA), and the members were invaluable in an effort that was very complex and could easily have turned out to be impossible. The members and their affiliations are provided in a separate section of this paper.

Research is conducted in many universities around the world, along with governmental and private industry research laboratories and other institutions that continue to contribute significantly to the state of the art. Although levels of funding vary greatly, the fact of the matter is that our knowledge has continued to expand and to reach high levels of performance.

Originally, the data collection effort was to focus entirely on other countries, with no information coming from current U.S. projects. It was quickly decided to incorporate American projects as well, considering the magnitude and importance of the U.S. research and construction communities.

Quality universities of all sizes have researched hundreds of issues, producing results that have advanced our knowledge by orders of magnitude. Equally important is that design standards and codes have allowed new theories and approaches to enter into design and construction practice.

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As is typical of many engineering research projects, many are multiyear and multipartner efforts—some are also multicountry efforts. The outcomes of the projects focus on industry and professional needs and the incorporation of results within educational systems. Implementing the results into the legal framework of the myriad codes and standards that govern the work of the engineering profession has been difficult but ultimately successful. Significant credit is due the researchers and their colleagues in practice, as well as their willingness to share their findings across national borders. The entire enterprise is indeed a global undertaking.

INTERNATIONAL STEEL STRUCTURES RESEARCH ADVISORS (ISSRA)

The members of the ISSRA group were specifically selected because of their continuing research work and involvement for many years. Each was selected to cover research efforts in a specific country or region. In addition, your Research Editor continually reviewed international research reports and surveys and contacted key individuals to incorporate additional projects that may have been overlooked. The ISSRA group consisted of the following individuals, shown with their home institutions and the countries or regions they were asked to cover:

- Carlos Aguirre, Technical University Federico Santa Maria, Valparaíso, Chile (*Chile, Colombia and Argentina*)
- Sergio M. Alcocer, Institute of Engineering, National Autonomous University of Mexico (UNAM), Mexico City, Mexico (*Mexico*)
- Eduardo Bayo, University of Navarra, Pamplona, Spain (*Spain*)
- Darko Beg, University of Ljubljana, Ljubljana, Slovenia (*Slovenia, Croatia and Greece*)
- Frans S. K. Bijlaard, Delft University of Technology, Delft, The Netherlands (*The Netherlands*)
- Mark Bradford, University of New South Wales, Sydney, NSW, Australia (*Australia*)

- Dinar R. Z. Camotim, Technical University of Lisbon, Lisbon, Portugal (*Portugal and Brazil*)
- S. L. Chan, Polytechnic University of Hong Kong, Hong Kong, China (*China and Hong Kong*)
- Hennie de Clercq, Southern African Institute of Steel Construction (SAISC), Johannesburg, South Africa (*South Africa*)
- G. Charles Clifton, University of Auckland, Auckland, New Zealand (*New Zealand*)
- André Colson, National University of Science and Technology of Strasbourg, Strasbourg, France, and the French National Construction Association (FNTP), Paris, France (*France*)
- Dan Dubina, Polytechnic University of Timisoara, Timisoara, Romania (*Romania and Bulgaria*)
- Jostein Hellesland, University of Oslo, Oslo, Norway (*Norway, Sweden and Denmark*)
- Miklos Ivanyi, Budapest University of Technology, Budapest, Hungary (*Hungary and Russia*)
- Jean-Pierre Jaspart and René Maquoi, University of Liège, Liège, Belgium (*Belgium and Luxembourg*)
- Jouko Kouhi, Finnish Constructional Steel Association, Helsinki, Finland (*Finland*)
- Sand-Dae Kim, RIST, Korea University, and Hyo-Nam Cho, Nanyang University, Seoul, Korea (*Korea*)
- Yoshihiro Kimura, Nagasaki University, Nagasaki, Japan, and Masayoshi Nakashima, Kyoto University, Kyoto, Japan (*Japan*)
- Ulrike Kuhlmann, University of Stuttgart, Stuttgart, Germany (*Germany and Austria*)
- Guo-Qiang Li, Tongji University, Shanghai, China (*China*)
- Richard Liew, National University of Singapore, Singapore (*Singapore and Malaysia*)
- David H. McKinnon and Michael I. Gilmor, Canadian Institute of Steel Construction (CISC), Toronto, Ontario, Canada (*Canada*)
- David B. Moore, British Constructional Steel Association (BCSA), London, England (*United Kingdom and Ireland*)
- Alain Nussbaumer and Manfred Hirt, ÉPFL, Lausanne, Switzerland (*Switzerland*)
- Thomas Schlafly, American Institute of Steel Construction (AISC), Chicago, Illinois, United States (*United States*)
- Luis S. da Silva, University of Coimbra, Coimbra, Portugal (*Portugal and Brazil*)
- K. C. Tsai, National Taiwan University, Taipei, Taiwan (*Taiwan*)
- František Wald, Czech Technical University, Prague, Czech Republic (*Czech Republic and Slovakia*)
- Riccardo Zandonini, University of Trento, Trento, Italy (*Italy*)

Locations of Research Projects

Table 1 identifies the countries where research projects have been reported, along with the number of projects for each.

Because many of the projects within the European Union (EU) are multinational efforts, the lead research institution and its country have been used in the tabulation; simply adding the numbers for each of the EU member countries would have given a distorted picture. On the other hand, the aggressive funding model that is used for the EU countries expresses a gratifying emphasis on the importance of research, which goes hand in hand with the European emphasis on education at all levels.

It is also interesting to note the large number of projects in the United States and Canada, for a total of 74. Although the funding mechanisms and levels of support are very different in the two countries (e.g., professors are paid for 12 months in Canada, as opposed to the 9 that is common in the United States), they have similarly aggressive attitudes toward conducting research and publishing papers and reports.

Research Project Subjects

It is sometimes difficult to identify a single primary goal for a project because typical studies may involve material choice, material performance, frames, members, connections, stability and many other subjects. Also, for the last 30 to 40 years in the United States, studies focusing on the response characteristics for seismic conditions and the mitigation of the accompanying problems have been extremely important. That broad subject is now probably the single most important area for structural engineering, not in the least because so many additional areas have been identified as vulnerable to seismic events. In North America alone, what used to be an issue for primarily the West Coast is now a consideration for most of the continent.

The ductility and energy absorption capacity of steel and steel-framed buildings and bridges have placed steel in the forefront of practical solutions for seismic structural

Table 1. Geographic Distribution of Research Projects					
Country	Number of Projects Reported	Country	Number of Projects Reported	Country	Number of Projects Reported
Argentina	1	Germany	32	Portugal	18
Australia	7	Greece	5	Romania	6
Austria	1	Hong Kong	6	Singapore	11
Belgium	20	Hungary	2	Slovenia	11
Brazil	3	Italy	13	South Africa	3
Canada	34	Japan	19	Spain	6
Chile	7	Korea	4	Switzerland	8
China	19	Lithuania	1	Sweden	12
Czech Republic	6	The Netherlands	10	Taiwan	4
Denmark	1	New Zealand	5	United Kingdom	21
Finland	2	Norway	2	United States	40
France	14	Poland	1		

concerns. But even more knowledge is needed, and the labor of researchers and code writers continues to be complex, demanding and—above all—expensive.

Table 2 provides an overview of research topics during the past 10 years. The primary emphases of the projects are generally clear, but it must be understood that what may have started as a secondary focus was, in some cases, expanded to become the primary direction of subsequent studies. Such evolution is a common and, generally, very fortunate occurrence for improving the state of the art. However, so-called scope creep is an ever-present source of frustration to graduate student researchers and their advisors. Academic research is a complex proposition, and practical, "business-focused" solutions to every research problem are elusive. Nonetheless, researchers in the United States, Canada and many other locales appreciate the involvement of industry and their emphasis on practical needs. Engineering research is really *applied* research, aiming at solutions that can be used. There is no greater satisfaction for engineering researchers than to have their solutions used in actual practice and to have relevant criteria adopted in a national specification or standard. It is the ultimate acknowledgment and recognition by their peers.

Table 2 concentrates on primary research topics, which by necessity have to be somewhat broad. Many of these topics apply to building structures; many cover a range of efforts that apply to all types of structures.

Topics Reported in the "Current Research" Papers

In the following section of the paper, the research topics that have been discussed in the individual papers are identified, including the volume and issue number of the relevant *Engineering Journal*. Readers are encouraged to review journal issues of interest to determine specific topics, the researchers and their institution(s). Publication references are also given for most of the projects, although it was quite common that the status of the relevant project had not advanced sufficiently to have produced papers or reports in the public domain. One or more years later, it is likely that a web search might provide the relevant publication data, and readers are encouraged to seek such information.

Paper No. 1—Vol. 42, No. 1, 2005

Simple beam connections in combined shear and tension
Influence of weld imperfections on earthquake performance
Influence of column web stiffening on seismic behavior
Seismic performance of buckling-restrained brace-to-gusset plate connections
Ductility and moment redistribution requirements for high-strength beams with bolted connections
Applicability of high- and ultra-high-strength steels for civil engineering structures
Lateral-torsional buckling of composite beams during the building construction stages
Composite action and confinement effects in tubular composite columns
Structural behavior of horizontal shear studs
Composite beam and slab panel fire design procedure
Simulation-based design of slender structures
Seismic retrofitting of framed structures using steel braces
Pseudo-dynamic testing of a full-scale 3-story, 3-bay buckling restrained composite frame
Competitive steel and composite bridges by innovative steel-plated structures

Table 2. Research Topic Distribution		
General Subject	**Brief Description**	**Number of Projects**
Materials	Material properties and testing for same	17
Bolts and welds	Installation, fabrication, construction	13
Members	2D and 3D, static and dynamic, seismic, limit states, elastic and inelastic	38
Connections	Bolted, welded, 2D and 3D, limit states	43
Connections, seismic	Bolted, welded, rotation capacity, energy absorption, limit states	24
Frames	Including stability, seismic and fire effects, limit states	71
Composite construction	Members, connections, stability, seismic and fire effects, limit states	30
Fabrication and construction	All aspects	6
Bridges	All aspects of design, fabrication and construction, limit states, fatigue and fracture	28
Special structures	Mill buildings, warehouses, towers, cranes, load effects, fatigue and fracture, limit states	48

Composite bridge research program (MIKTI) of France
Rehabilitation of fatigue-damaged orthotropic steel bridge decks

Paper No. 2—Vol. 42, No. 2, 2005
Analysis and behavior of beams curved in plane
Shear resistance of longitudinally stiffened panels
Understanding the behavior of U-section steel sheet piles
Integrated blast and fire analysis of steel-framed structures
Validation of English portal frame practice for use in continental Europe
Rotation capacity of moment connections
Design of simple beam connections in steel buildings
Bolted links for eccentrically braced steel frames
Static and cyclic behavior of connections in steel and composite structures
Connection design for steel buildings at risk for terror attack
Behavior and strength of composite columns subjected to fire
Load-carrying capacity of anchor plates with welded studs
Improvement of fatigue life of welded structural components
Effective use of high-strength steels in welded structures subjected to fatigue loading
Design of a new type of orthotropic plate
Design of composite bridges with twin steel girders
Optimization of a symmetric welded I-section

Paper No. 3—Vol. 42, No. 3, 2005
Characteristics and behavior of plasma-cut welded H-shaped steel columns
Design of steel and composite cellular beams subjected to fire
Failure of floor slabs under extreme loading
Behavior and design of steel structures under fire
Reinforcing of blast walls using energy absorbing impact barriers
Progressive collapse of tall buildings
Seismic performance of steel frames by using simplified methods
Glued connections and members for structural steel applications
Effect of a midspan diaphragm on the dynamic behavior of a composite railroad bridge

Paper No. 4—Vol. 42, No. 4, 2005
Improved weathering steels for bridge applications
Extra-high-strength steel plasticity and modeling
Shallow composite beams with web openings as connectors
Socket-type footings for composite columns
Improved modeling and assessment of lattice towers
Behavior and strength of scaffolding systems
Strengthening reinforced concrete columns by encased steel shapes
Buckling-restrained braced frames with backup moment frames
Performance of steel plate shear wall frames with low-yield steel
Hysteretic performance of shear panel dampers
Patch load resistance of longitudinally stiffened girder webs
Fatigue tests for welded joints with ultra-thick plates

Paper No. 5—Vol. 43, No. 1, 2006
High-strength bolted connections in high-strength steels
Bolted connections made with high-strength steel S690
Behavior of beam-to-beam and beam-to-column end-plate connections under fire conditions
Use of plasma cutting in the preparation of bolt holes
Design of cast iron columns, including tension fracture capacity

Cracking in galvanized steel elements
Effective width of composite girders with reduced height for the calculation of deflections
Overhead traveling crane support structures
Storage racks in seismic areas
Competitive steel and composite bridges through improved steel plated structures

Paper No. 6—Vol. 43, No. 2, 2006
Fatigue behavior of welded circular hollow section connections
Fatigue behavior of cast steel nodes in tubular bridges
Probabilistic study of fatigue in post-weld treated tubular bridge structures
Earthquake protection of historical buildings by reversible mixed technologies
Large cyclic deformation capacity of steel members
Robust structures by joint ductility
Passive control design through tuning of structural properties of elastoplastic damping devices
Capacity of semi-compact steel shapes
Deformation-based approach to determine the minimum degree of partial shear connection in composite beams
Decision-making tools for steel structures engineering

Paper No. 7—Vol. 43, No. 3, 2006
Beam-to-column connections with beams of unequal height
Design of extended shear tabs
Evaluation of the plastic rotation capacity of beam-to-column connections
Experimental behavior of standardized end-plate connections under arbitrary cyclic loads
Moment-rotation characteristics of slender portal frame connections
Making bolt holes in the fabrication of structural steel
Partially encased composite columns with high performance concrete
Semi-analytical buckling strength analysis of stiffened plates
Analysis and design of rehabilitated built-up hybrid composite members
Use of stainless steel for welded bridges in aggressive environments

Paper No. 8—Vol. 43, No. 4, 2006
High-strength steel moment connections
Contact splices for columns
Strength and stiffness requirements for column splices
Hybrid experiments of large-scale steel braced frames and steel shear walls
Reduced beam section connections with built-up box columns
Composite action through adhesive shear connection
Cost estimation, optimization and competitiveness of composite floor systems
Connections by adherence for steel-concrete composite bridge structures
Shear connections in composite girders with corrugated steel webs

Paper No. 9—Vol. 44, No. 1, 2007
Robustness of common steel connections in fire
Performance-based fire engineering design of steel and composite structures
Performance-based design for the fire situation
Testing and numerical modeling of welded joints for very high strength steel
Reliability of semi-rigid (PR) beam-to-column welded joints
Structural behavior of anchor plates
Self-centering steel moment-resistant frames

Paper No. 10—Vol. 44, No. 2, 2007
Cyclic testing and analysis of steel columns subjected to high axial loads and rotation demand
Evaluation of cumulative plastic deformation capacity for buckling-restrained braces in frames
Seismic behavior and response modification factors of structural steel systems
Seismic design of buckling-restrained braced frames (BRBFs)
Strength and ductility of welded high-strength steel connections
Robustness in structural steel framing systems
Robustness test for a steel-concrete composite floor
Renovation techniques for fatigue cracked orthotropic steel bridge decks

Paper No. 11—Vol. 44, No. 3, 2007
Analytical studies of the behavior of welded T-stub moment connections
Large web openings for service integration in composite floors
Elasto-plastic collapse deflection analysis of three-dimensional steel frames
Experimental evaluation of steel and composite shear walls
High-strength frames in seismically resistant building structures
Behavior of restrained beams and beam-to-column connections
Behavior of composite beams under fire conditions
Economic and durable design of composite bridges with integral abutments
High-strength steel tower for wind turbines

Paper No. 12—Vol. 44, No. 4, 2007
Tests on bolted shear connections in high-strength steel
Development of a hysteretic model with pinching for steel connections
Estimation of cyclic characteristics for thin web plates after shear buckling

System behavior factors for composite and mixed structural systems
Practical design methods for steel and composite frames with semi-rigid connections

Paper No. 13—Vol. 45, No. 1, 2008
Residual stresses in hot-rolled shapes of S460 steel
Influence of the Bauschinger effect on deflections of cambered beams
Equivalent moment distribution factors for lateral-torsional buckling
Controlled rocking of steel-framed buildings with replaceable energy dissipating fuses
Software for design of plate structures against plate buckling

Paper No. 14—Vol. 45, No. 2, 2008
Three-dimensional behavior of semi-rigid connections
Behavior of longitudinal double plates-to-RHS connections
Welded steel beam design using particle swarm analysis
Modeling of micro- and macro-structural size effects for fatigue of welded tubular structures
Advanced engineering for orthotropic bridge decks and surfacing solutions
Ponding of roof structures

Paper No. 15—Vol. 45, No. 3, 2008
Special concentrically braced frames (SCBFs)
Energy dissipation characteristics of semi-rigid connections
Cross-sectional stability of hot-rolled shapes
Behavior and strength of steel columns with partial damage of the fire-retardant coating
Composite beams with precast hollowcore slabs
Hybrid steel plate girders
Design of stainless steel plate girders for shear

Paper No. 16—Vol. 45, No. 4, 2008
Behavior and strength of link-to-column connections in eccentrically braced frames
Use of cast steel connectors for bracing connections in special concentrically braced frames
Minimizing the strength of bracing connections
Block shear evaluation for members with uncommon failure paths
Testing of shear lugs for column bases
Punching shear resistance of tension bolts
Three-dimensional web-based semi-rigid steel frame analysis with graphical interface
Monitoring of crane girders in actual structures
Cold-formed stainless steel hollow structural sections

Paper No. 17—Vol. 46, No. 1, 2009
Sustainability of steel structures
Seismic design and analysis of rectangular concrete-filled steel tube members and frames
Market opportunities for innovative fastening solutions for steel structures
Size effects in the fatigue behavior of tubular bridge connections
A methodology for an integral life cycle analysis of bridges in view of sustainability
Load rating of curved composite steel I-girder bridges through load testing with heavy trucks

Paper No. 18—Vol. 46, No. 2, 2009
Static and seismic behavior of steel and composite bolted end-plate beam-to-column connections
Behavior of slip-critical connections with fillers
Applications of connections using cast structural steel elements
Design of composite steel-concrete systems for multistory building construction
Structural performance of steel-concrete-steel sandwich composite structures
Innovative solutions for beam connections in small and medium span composite bridges

Paper No. 19—Vol. 46, No. 3, 2009
Robustness of seismically resistant multistory frames with accidental column loss scenarios
Robustness of parking garages against localized fire
Robust structures for joint ductility
Uplift criteria for unanchored circular tanks subjected to seismic loads
Geometric nonlinear analysis of slender structures
Seismic response of cold-formed steel structural systems in special bolted moment frames
Application of optimization techniques to assess effects of imperfections

Paper No. 20—Vol. 46, No. 4, 2009
Performance of dual-steel connections of high-strength components under monotonic and cyclic loading
Performance-based approaches for high-strength tubular columns and connections subjected to seismic and fire loads
Design and integrity assessment of high-strength tubular structures for extreme loads
Imperfections for global analysis of frames: EC3 drawbacks and energy-based procedures
Extension of service life of existing and new welded steel structures

Paper No. 21—Vol. 47, No. 1, 2010
Slender thin-walled box columns
Behavior of composite beams with deep trapezoidal slabs containing headed stud shear connectors
Buckling of slender composite concrete-filled steel columns
Strength and behavior of steel storage racks
Stability of girders using U-frames
Use of adhesives to strengthen steel structures

Paper No. 22—Vol. 47, No. 2, 2010

Development of improved welded moment connections for earthquake-resistant design

Seismic behavior of reduced beam section moment connections to deep columns

Horizontally curved tubular flange girders

Damage-free, seismic-resistant, self-centering, concentric braced frames

Steel plate shear walls with partially encased composite columns

Repair of fatigue cracks in steel structures

Crack propagation in tubular joints under compressive loading

Bending-shear interaction in plate girders

Paper No. 23—Vol. 47, No. 3, 2010

Progressive collapse of steel and composite building structures

Behavior of semi-rigid (PR) wide-flange beam-to-tubular column connections

Structural use of stainless steel

Structural steel elliptical hollow sections

The continuous strength method for structural steel design

Application of cast nodes and very high strength steel in the offshore industry

Fatigue strength of hybrid truss girders

Development of an improved design method for cold-formed stainless steel members

Paper No. 24—Vol. 47, No. 4, 2010

Development of distributed hybrid testing techniques and their application in collapse simulation of steel moment frames

Performance and retrofit of steel beam-to-column connections of high-rise buildings

Friction resistance developed between the steel base plate and the mortar surface

Slit-wall system serving as a structural damping mechanism and as a condition assessment device for the structure

Response control of steel structures using dampers

Structural behavior of beam-column subassemblies with damper connections

Stability conditions of buckling-restrained braced frames

Buckling and post-buckling behavior of steel members

Evaluation of the ultimate earthquake resistance of moment frames

Identification of displacement-induced fatigue using a wireless sensor network

Effect of compressive residual stress to improve the fatigue strength under variable stress conditions

Seismic response of steel structures with tubular bracing members

Paper No. 25—Vol. 48, No. 1, 2011

Steel-precast concrete composite girders with nonconventional shear connectors

Predicting the effect of post-weld treatment applied under load

Full-scale testing of Gerber frames

Behavior and design of steel single-angle beam columns

Strengthening of steel beams under load

Structural performance of HSS steel frame assemblies with moment connections in fire

Paper No. 26—Vol. 48, No. 2, 2011

Performance of concrete-filled steel tubular beam-to-column connections

Performance of high-strength steel structures

Analysis and design of high-strength steel fabricated columns

Fatigue performance of welded H-beam with corrugated web

Construction process analysis of large and complex spatial steel structure

Behavior, strength and construction of cold-formed steel structures

Direct analysis for structures in steel, composite and reinforced concrete construction

Modeling of long-span composite beams with high-performance materials and deformable shear connectors

Enhancing the performance of steel structures with fiber-reinforced polymers

Paper No. 27—Vol. 48, No. 3, 2011

Economical and safe design of steel joints subjected to natural fires

Robustness of car parking garages against localized fires

Sustainable steel and composite bridges in the built environment

High-strength steel towers for wind turbines

Detection of cracks in steel components by means of ultrasound excited thermography

Adhesive bonded cast steel—structural steel connections

Optimization of supporting structures for offshore wind energy converters

High-strength steel in seismic-resistant building frames

Displacement-based seismic design of steel structures

Laboratories' university network of seismic engineering

Paper No. 28—Vol. 48, No. 4, 2011

Second-order effects in steel frames with locally buckled members

Direct strength method of design of simple and complex thin-walled shapes for combined actions

Drive-in racks subject to impact loads

Long-term behavior of composite steel-concrete members and its effect on their ultimate response

Ultra-high-strength concrete-filled columns for high-rise construction
Fatigue behavior of tubular connections fabricated with enhanced partial joint penetration welds
Lightweight composite sandwich panels subjected to extreme loads
Residual stress in high-strength steel joints
Experimental and numerical studies on steel beam-to-column connections subjected to sudden column removal scenario
Fatigue study of partially overlapped circular hollow section K-joints

Paper No. 29—Vol. 49, No. 1, 2012
Design of connections to composite columns for improved fire robustness
Modeling of membrane action of floor slabs exposed to fire
Composite beams with high ribbed concrete deck
Performance of small-diameter headed stud shear connectors
Composite beams with high-performance concrete and high-strength steel
Development of innovative steel-glass structures for architectural and structural applications
Behavior and strength of bolted connections in bearing
Longitudinally stiffened plate girders subjected to moment and shear interaction
Intermediate transverse stiffeners in plate girders
Flame straightening of structural steel elements
Self-centering sliding hinge joint
Effects of floor slab resistance on the inelastic behavior of chevron-type eccentrically braced frames

Paper No. 30—Vol. 49, No. 2, 2012
Flexural and lateral-torsional buckling of steel frames by a general second-order approach
Assessment of structures with welding discontinuities
Toughness requirements for plastic design with structural steel
Composite bridges with integral abutments
Development of innovative steel-glass structures for architectural and structural applications
Cold-formed steel construction
Performance of steel-concrete composite structures
Behavior of steel and composite structures under fire conditions
Double split tee moment connections

Paper No. 31—Vol. 49, No. 3, 2012
Analysis of thin-walled steel structures using generalized beam theory (GBT)
Distortional mode interaction in cold-formed steel columns
Energy-absorbing fuses for seismic-resistant steel frames
Steel-concrete composite truss bridges
Steel-concrete composite cable-stayed bridges
Bolted and screwed connections under ambient and elevated temperatures

Paper No. 32—Vol. 49, No. 4, 2012
Design of beam to composite column connections for improved fire robustness
Progressive collapse modeling of steel-framed structure in fire
Dynamic behavior of steel connections with high strain rate and noncyclic dynamic loading
Making the case for design for deconstruction
High steel towers for wind turbines—projects 1 and 2
Optimization of frames for effective assembly
Stability of industrial steel pallet racks
Base plate connections for rack structures
Structural robustness of composite frames

Paper No. 33—Vol. 50, No. 2, 2013
Improved structural systems for performance-based earthquake engineering
Assessment of gravity framing contributions to system behavior
Development of collapse-prevention systems
Hybrid frame systems
Effect of defects on the seismic behavior of steel moment connections
Super-high-strength tension bolts
Ring-shaped steel plate shear walls
Self-centering beams for resilient earthquake resistance
Seismic moment connections for deep beams with slender webs
Testing of long and very slender composite tubular columns in high strength steel and concrete
Seismic composite systems for high performance
Broad evaluation of common approaches to composite system strength and serviceability
Steel beam deflections and stresses during lifting
Capacity prediction of open-web steel joists partially braced by a standing seam roof
Limit state design of metal building wall and roof system
Strength prediction of steel columns and beams with holes
Highway bridge fire hazard assessment
Fracture critical system analysis
Design and fabrication standards to eliminate fracture critical concerns for steel members traditionally classified as fracture critical

Paper No. 34—Vol. 50, No. 4, 2013
HSS under impulsive loading
Welding of HSS
Elliptical hollow section connections
Cast steel connectors
Self-centering energy dissipative braces for the protection of structures against extreme loading

Eccentrically braced steel frames with replaceable yielding links
Base rocking steel frames with higher mode control mechanisms
Hybrid (analytical-experimental) simulation method
Ductile fuses for HSS and I-shaped braces
Seismic response of X-braced frames
Slotted gusset plate connections for slotted HSS brace connections

Paper No. 35—Vol. 51, No. 2, 2014
Collapse prevention of low ductility concentrically braced frames
Shaking table testing of advanced seismic force resisting systems
Future experimental research on column buckling under seismic demand
Innovative connection solutions
Fabrication of connections
Experimental and numerical studies
Connection design
Grouped shear connection

Paper No. 36 –Vol. 51, No. 4, 2014
Survey of 10 years of "current steel structures research"

SUMMARY

After 10 years of examining steel structure research around the world, it is clear that innovative and practical developments continue to take place. All aspects of steel construction benefit—not the least because there is an efficient mechanism for review and practical adoption into design specification and standards. While change may not occur as fast as some engineers would like, the importance of carefully developed criteria with attention to the needs of practice and industry is paramount.

My thanks to everyone who assisted in this effort.

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