



the  
**STEEL**  
centre

*celebrating five years of challenging traditional boundaries*

2020

**ANNUAL REPORT**

Dr. Robert Driver  
Director



**CISC Centre for Steel Structures Education and Research**  
University of Alberta  
Faculty of Engineering  
Department of Civil and Environmental Engineering

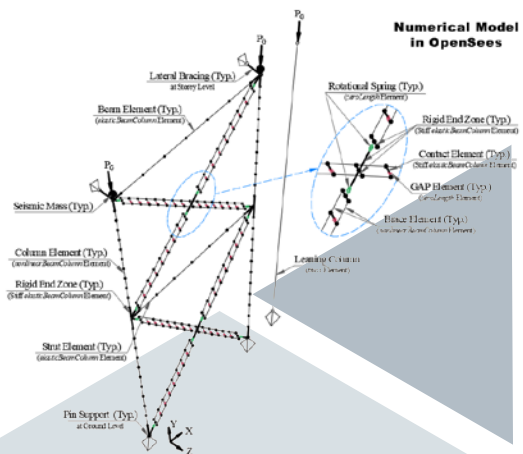
**challenge  
traditional  
boundaries.**

# five successful years

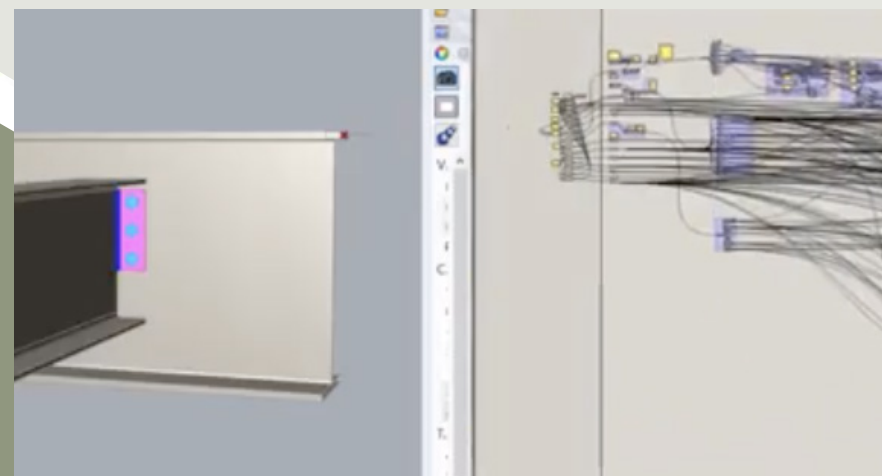
**Stability and connections**  
 Embedded plates, lateral-torsional buckling, and cantilevered systems

## research

**Machine learning and emerging technologies**  
 Understanding and developing tools for a modernized construction industry



**Seismic design guidelines**  
 Efficient methods for safe construction in Canada's seismic areas



**Research partners**  
 Students collaborate with industry partners to enhance research outcomes



**The Steel Squad**  
 Hands-on, active learning for undergrads in partnership with industry



**SCORE**  
 Students tackle real-world problems with practicing professionals

## mentorship

**Steel Centre Research Group meetings**  
 Monthly research presentation practice, collegial feedback, and professional collaboration

**Ultrasonic testing**  
 Mapping residual stress patterns for modern welded girders



**Top-ranked students**  
Steel Centre students are recognized for their excellence with over \$50k per year in scholarships and awards, plus numerous academic and research honours

**Collaborative learning for students and the engineering community**

Steel for Lunch seminars provide essential knowledge, case studies, coaching, and training for attendees from across Canada

# training

**Engineers in Action**

Our students have led two teams on international trips to design and erect pedestrian suspension bridges for isolated communities



**One of only five SEI Fellows in Canada**  
Steel Centre Director Dr. Driver is recognized as an international expert



**Academic Centre status**

Superior level of development, leadership, and a purpose that supports the University's mission

One of just three Academic Centres in the entire Faculty of Engineering

**Doubling of membership**

From seven founding members to 13 companies and organizations with \$155,000 in annual funding leverageable to over \$450,000 in research spending

# growth



# innovation

**Reimagining the future of structural steel education and research**

Continuous efforts to dive deep into how we can reshape and evolve our practice, convening external and international partners to "challenge traditional boundaries" with us



by the **STEEL** centre

**Not waiting for change**

The Steel Centre dreams, plans, and launches new programs to fill the needs of students, research partners, and industry professionals

**T3**

**Think Tank**

Developing technology pathways toward a modern steel construction industry

# five successful years



# from the director

Five years of “challenging traditional boundaries” at the Steel Centre have passed quickly—so quickly that it’s easy to gloss over our accomplishments in this short period since our launch. What began as just an ambitious idea that required a healthy dose of trust and faith on the part of our seven founding members has evolved into a strong, officially-recognized University of Alberta Academic Centre with a diverse array of industry partners, reliable funding, and, most importantly, a rich learning and growth environment for students.

Our excellence in steel structures research is evident, but I am most proud of the Steel Centre’s unique structure that has spawned many authentic multi-directional mentorship relationships among our members and students. Industry and academia come together here unlike in any traditional research partnership. Students see how their work connects to real-world problems, and graduate with a stronger sense of how their decisions fit into the steel design, fabrication, and construction processes. Members get to know our students well and in a variety of contexts and have confidently hired them on with smooth transitions. We work together with industry to reveal research and education needs for driving the industry forward with the aid of structural engineering ingenuity and emerging technologies.

The Steel Centre has deployed four entirely new programs since our initial launch: The Steel Squad for undergraduate active learning with industry mentors, S.C.O.R.E., modelled as an authentic engineering consultancy with member companies as clients; Steel for Lunch, providing opportunities to connect and grow as a professional community; and most recently T3, the Steel Centre Technology Think Tank formed to help bring the steel construction industry into the cutting-edge world of emerging technologies. In 2020, we took our already successful programs and moved them online, even going so far as to launch the Steel for Lunch webinar series mid-pandemic.

The Steel Centre is now poised to charge into the next five years with bold new ideas and the desire to create opportunities for meaningful change in both business and education. To those who believed before ever seeing: my sincerest gratitude. You made today’s celebration of successes possible. To those who joined us along the way: thank you for helping to shape the future of the steel construction industry and the future of structural engineering education!

Dr. Robert Driver  
Director  
The Steel Centre



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Then and now:  
Five years of membership growth



## vision

The Steel Centre **imagines and transforms** the future of structural steel design, fabrication, and construction.

## mission

We are an **industry-driven, student-centred** education and research network dedicated to **continually advancing the steel industry**, engaging in interdisciplinary collaborative research, providing **innovative education opportunities**, and developing leaders of the future.

## values

We **challenge** traditional boundaries.

We are a **collaborative community** with uncompromised integrity.

**Excellence** is in our DNA.

We do **cool stuff** for the real world!



# welcome new members in 2020



The Steel Centre's diverse and growing membership continues to expand our insight into every step of the construction process, from design and analysis to fabrication and installation. This year's two new members bring expertise in high-tech hardware and software solutions, engineering consulting, and steel design. Together, we are building a movement not just to improve steel construction, but to rethink and effect real change in how we design and build with steel.

Our growth continues into 2021 as more organizations join our mission to imagine and transform the future of structural steel education and construction.



# congrats 2020 graduates!



**Harsh Patel (M.Eng.)**  
Supervisor: Dr. Imanpour  
*Quantification of Large P-Delta Effect on Seismic Design Forces of Wide-Flange Steel Columns in MRFs*



**Adam Coleman (M.Eng.)**  
Supervisor: Dr. Driver  
*Stability of Extended Shear Tabs*



**Isaac Derakhshan Horeh (M.Sc.)**  
Supervisor: Dr. Imanpour  
*Development of Simplified Seismic Design Guidelines for Steel Concentrically Braced Frames in Regions of Low and Moderate Seismicity*



**Akram Zain (M.Sc.)**  
Supervisors: Dr. Imanpour, Dr. Driver  
*Performance and Design of Prefabricated Steel Braced Frames for Industrial Buildings*

# people

## support

## current students



**Matt Jeppesen**  
Programs Administrator



**AJ Darras**  
Research Associate



**Greg Miller**  
Structural Engineering Technician



**Cam West**  
Structural Engineering Technician

## researchers

**Dr. Robert Driver, P. Eng.**  
Supreme Steel Professor  
Steel Centre Director  
*Steel Structures*

**Dr. Ali Imanpour, P. Eng.**  
Assistant Professor  
*Steel Structures*

**Dr. Roger Cheng, P. Eng.**  
Professor, C.W. Carry Chair of  
Steel Structures  
*Steel Structures*

**Dr. Doug Tomlinson, P. Eng.**  
Assistant Professor  
*Steel/Concrete Composite Systems*

**Dr. Leijun Li, P. Eng.**  
Professor  
*Welding Metallurgy*

**Dr. Yong Li**  
Assistant Professor  
*Reliability & Advanced Analysis*

**Dr. Yasaman Balazadeh Minouei**  
Post-doctoral Fellow  
*Steel Structures*

**Dr. Mojgan Yaghoubsahi**  
Post-doctoral Fellow  
*Steel Structures*





# Steel Centre Technology Workshop

Members and invited guests dive into future opportunities

It is no great secret that the construction industry has, for the most part, not taken part in the digital revolution. Paper and manual work abound, and the few companies who do embrace new workflows find themselves incompatible with the rest of the project partners. How do we help move the construction industry forward?

Industry representatives from across the construction process chain, including guests from Stantec and Magnusson Klemencic Associates, joined the Steel Centre for a focused exploration of how technology is used presently, and how that use could and should change for the future.

## What we learned

Improved communication is essential, through both technological and cultural means. Many of the present frustrations are actually avoidable, but longstanding habits prevent changes in workflows. The biggest challenge our participants identified to modernizing the construction process is incomplete

and disjointed communication. Great tools are already available, and in use by some organizations, but their impact is limited without full participation from all stakeholders. What are the barriers to further adoption, and could the Steel Centre be part of the solution?

Research is needed to develop and understand AI-powered design tools, including generative design and AI optimization. These tools will enable new, more exciting steel designs while controlling costs and taking into account fabrication and erection needs. AI-enhanced workflows already show promise in other industries, so we need to start now to lay the groundwork for its incorporation into construction.

Learn more about T3, the Steel Centre's proposed response to the issues raised in this fact-finding workshop, on [p. 19](#).

# education

The Steel Centre prides itself on putting education first, because a strong education program is also a strong research and training program. In this section, learn more about our multiple efforts to invigorate education for tomorrow's engineers.

## The Steel Squad ([p. 17](#))

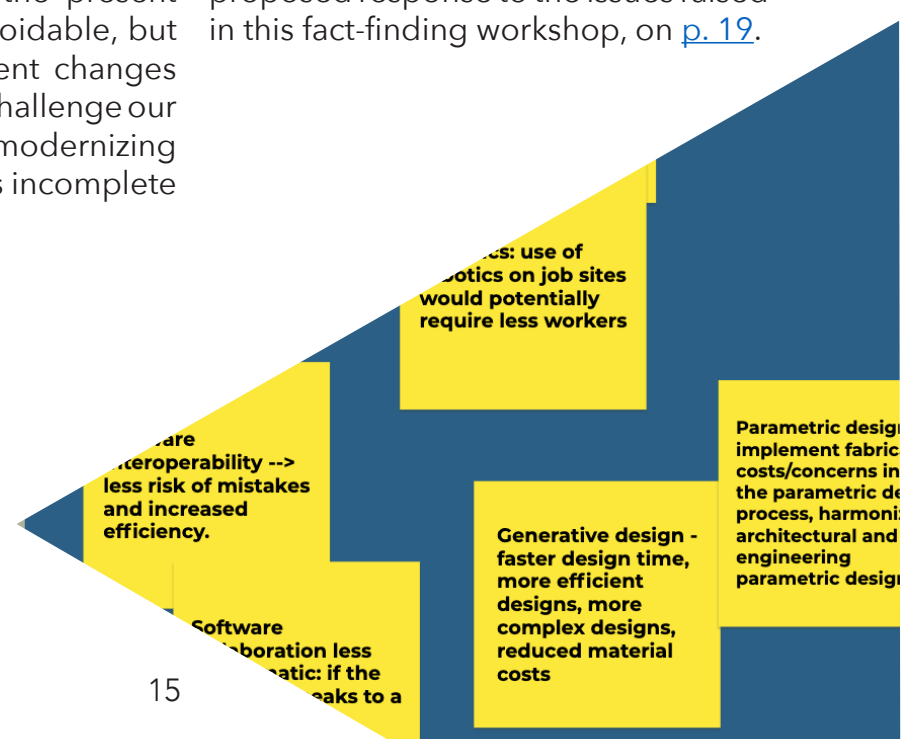
Hands-on, active learning and mentorship opportunities for undergrad students with demonstrated interest in steel.

## Steel for Lunch ([p. 18](#))

Friday lunchtime seminars, workshops, and invited speakers to create a space for students and professionals to connect and learn together.

## SCORE ([p. 20](#))

A first-of-its-kind student-run engineering consultancy, where students take on real projects alongside member companies.



# student awards 2020


Steel Centre students are top performers, receiving a number of honours and awards each year for academic and research accomplishments. In 2020, students were awarded scholarships totalling an impressive \$188,100. The Steel Centre's excellent students have attracted direct support from outside organizations, most recently the CWB Foundation's Welding Advancement Award, given each year to a Steel Centre student or students whose research advances the welding field. We are honoured by this support, and proud of our students and their accomplishments. Read more about Steel Centre research beginning on [p. 22](#).





## \$188,100 total awards & scholarships in 2020

-  Alexander Graham Bell Canada Graduate Scholarship (\$35,000)
-  Hadhramout Establishment for Human Development (\$25,000)
-  Alberta Graduate Excellence Scholarship (4 recipients; \$12,000 each)
-  NSERC Canada Graduate Scholarship (2 recipients; \$17,000 each)
-  CISC Alberta Region G.L. Kulak Scholarship (2 recipients; \$7,500 each)
-  NSERC Undergraduate Student Research Award (2 recipients; \$6,000 each)
-  Gordon F. Anderson DIALOG Graduate Scholarship (\$5,000)
-  CWB Foundation Welding Advancement Award (2 recipients; \$2,500 each)
-  Norman and Tess Reid Graduate Scholarship (\$3,800)
-  Brian Gerbrandt Memorial Graduate Scholarship (\$2,800)
-  Parya Foundation Scholarship (\$1,500)
-  Dean's Research Award (2 recipients; \$500 each)

**Legend**

National award 

Alberta award 

Steel Centre exclusive award 

# unique opportunities for undergrads

Undergraduate students often have to wait until their final year to really dive into a discipline— but what if that could change? The Steel Squad offers undergraduate students in any year of their program real-world experiences such as shop tours, jobsite tours, job shadowing and mentorship, and hands-on welding and software demos.

Now in its third year, the Steel Squad program is learning and growing, even in this year's virtual climate. Steel Squad students get exclusive access to Q&A sessions with Steel for Lunch presenters, staying behind to ask questions and chat with presenters. These one-on-one conversations are rare for students early in

their program, and building relationships at this stage helps to create solid mentorship and professional contacts for the future.

Education is at the core of the Steel Centre mission, and we will continue to work with industry partners, academic institutions, and students to craft new opportunities to dramatically improve the educational experience of engineering students at the University of Alberta.



# community learning by the Steel Centre

Before anyone knew the words “COVID-19” or “lockdown”, the Steel Centre had landed on a new idea to build community and provide opportunities for genuine mentorship connections at the University of Alberta. Just before the new program was ready to launch, the world transitioned to Zoom, and Steel for Lunch was born in an unexpected but highly effective format, as a virtual space that has connected students, professionals, and engineers across Alberta and beyond.

## Training, lessons, and reflection

Steel for Lunch is a Friday lunchtime connection space. Sessions are not restricted to a particular format or topic, and instead reflect the broad range of interests and experience



present at the Steel Centre and our partner organizations. Steel for Lunch has provided software training on popular structural engineering tools used in modern practice, with a series

on Tekla Structures presented by Steel Centre member BuildingPoint, with introductions to the connection design software Qnect presented by IDEA StatiCa, case studies on difficult or unique projects, and research presentations from our young engineers in training.

The response has been strong! An average of 30 participants join each session, and there is momentum building. Check out upcoming sessions [on our website](#), and catch up on previous session recordings as well at our [YouTube channel](#).

# T3, The Steel Centre Technology Think Tank

A bold new initiative sets out to imagine next-gen construction


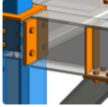
The Technology Workshop (described in detail on [p. 15](#)) uncovered a range of thematically related problems facing today’s construction partners. Upon analysis and reflection, a central concept of poor communication as a result of low technology adoption seemed to permeate the issues: time wasted getting and clarifying information, incompatible methods for exchanging drawings and designs, long turnaround times on information requests, and so on. Therefore, the Steel Centre and the Industry Advisory Council are actively preparing a new working group focused on technology, training, teamwork, and transitions toward modern solutions: a think tank, but with a conscious

purpose to remain firmly planted in the industry-driven world of thinking and planning for real outcomes.

The group’s form and membership is itself an iterative process, responding and reshaping as circumstances demand. T3 is a tangible expression of the Steel Centre’s mission to unify industry and academia with a collaborative and mutually beneficial endeavour.

T3 targets a medium- to long-range future, setting the stage today to actively bring about a more productive future for the steel construction industry.



OCT 9		Steel for Lunch: Qnect, the revolutionary connection design software Online event Friday, October 9, 2020 at 12:00 PM MDT	24
NOV 6		Steel for Lunch: Winning or Losing – It can be in the Connections! Online event Friday, November 6, 2020 at 12:00 PM MST	40

# a project close to home

Our student-run engineering consultancy partnered with Steel Centre member DIALOG to design the strong wall anchorage system for the upcoming renovation of the IF Morrison Structures Laboratory

For many U of A Structural Engineering students, the IF Morrison Structures Laboratory forms the heart of their research training. Every Engineering student, in any discipline, will recognize it for its distinctive 'structures tree' outside, but only Structures students really know what lies within. It has been home to some of the most important structural engineering research in North America, shaping building codes and construction practice for several decades. Now, as the Structures Lab is about to undergo a major renovation, Steel Centre students are taking part in designing its future.



The IF Morrison Structures Lab at the University of Alberta  
Photo Courtesy R. Helfrich

their NDAs and then learned that they had been called to collaborate in designing the new 9.14 m tall strong wall and extended strong floor in the renovated lab (pictured below, left).

SCORE members became part of DIALOG's design team, meeting regularly to review possible directions and ideas. There is no 'off the shelf' solution for this kind of unique structure. The strong wall must resist enormous loads in any direction for the hundreds of future research projects that it will host. This project was a new level of challenge for the SCORE team, and they dove in.

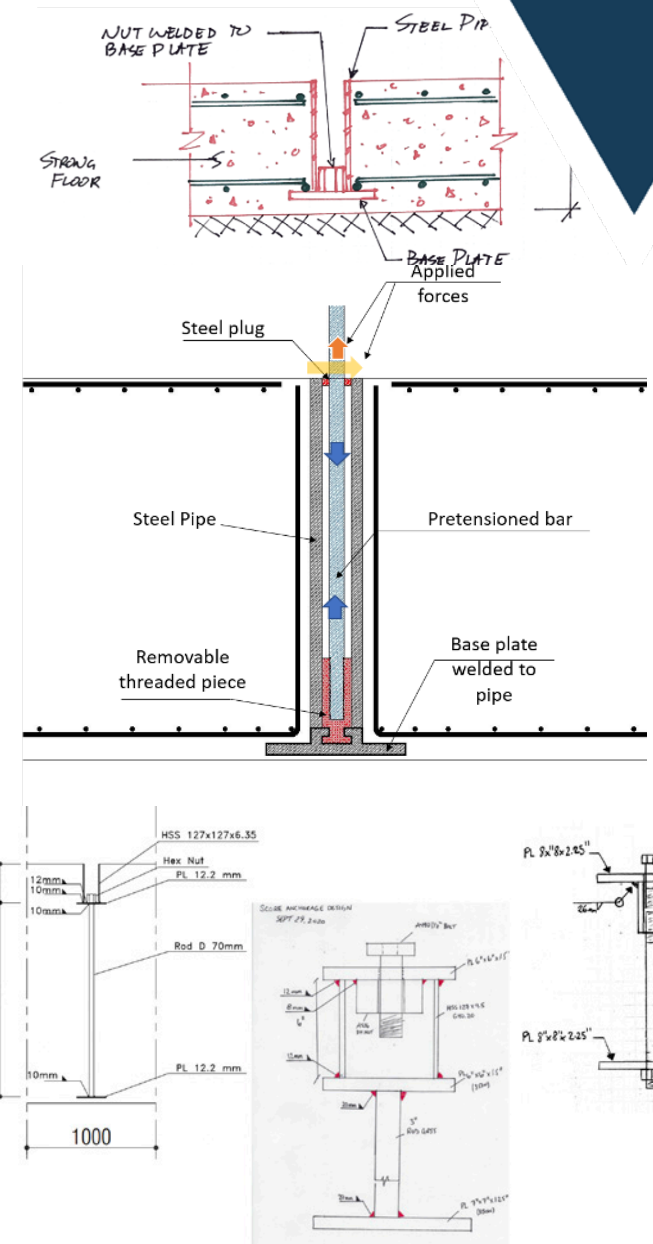
The unusual potential loading scenarios already created a complex

design factor, but there were also lifecycle issues to consider: *how would it be built? what happens if an anchor is damaged? how can specimens be connected and disconnected efficiently?* Early design schematics explored a number of different basic methods for securing the anchorages. This was a major decision, and there was no immediately clear answer. Working with their partners at DIALOG, the SCORE team iterated through hand sketches and discussed the potential drawbacks of different systems.

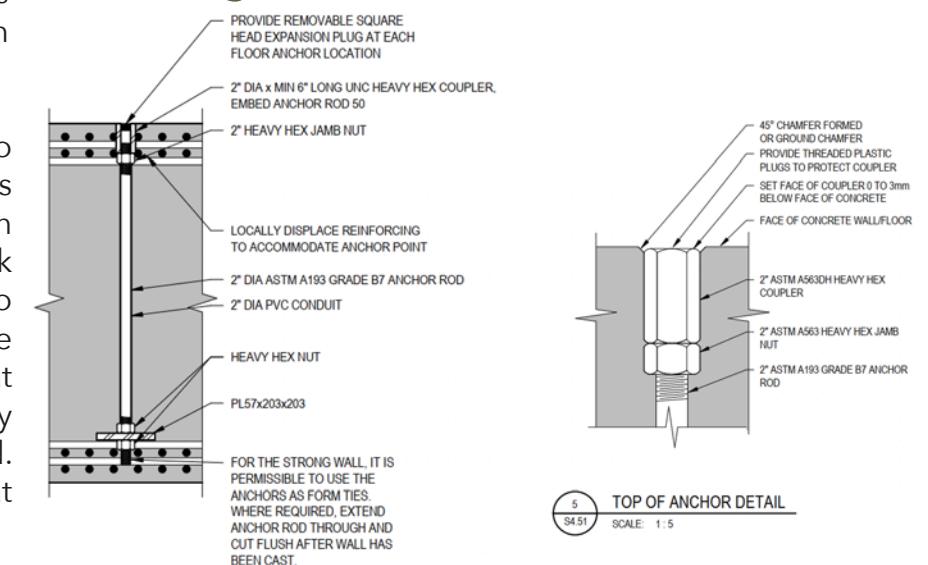
Finally, the team agreed on a solution using a threaded coupler at the surface of the floor and wall. They balanced constructability and user flexibility to create a custom solution for generations of students who will use the new laboratory. Soon, they'll be able to point to the Structures Lab and not just say "I did research there" but also "I designed that!"

SCORE got a unique chance to work on a project in their own backyard, but it won't be the last time they collaborate on a live project. Already, a new project is in the initial stages to work with Steel Centre members S-FRAME and IDEA StatiCa on software integration.

You can get involved, too! Do you have a design or analysis challenge? SCORE takes on a variety of engineering work with partners who are excited to mentor, collaborate, and create something great in a format that has been enthusiastically received by all involved. The team can be reached at [SCORE@steelcentre.ca](mailto:SCORE@steelcentre.ca).



## final design detail



# research



At the Steel Centre, every student, including undergraduates, is involved in a research project. This hands-on experience coupled with outstanding education quality produces students that have a deeper, more natural understanding of steel construction. Steel Centre students work closely with partners from Alberta's leading companies to identify and solve real problems faced by the steel construction industry.

Steel structures research at the University of Alberta typically involves both large-scale testing in the I.F. Morrison Structural Engineering Laboratory, as well as computer modelling including high-fidelity applications. Steel structures research carried out at the University of Alberta has been influential in the development of design codes and standards world-wide.

A new Emerging Technologies stream is taking shape, using generative design and AR applications to understand new ways to design, build, and teach.

See the list at right for a snapshot of significant areas of research at the Steel Centre.

## recent research topics

### structural stability

- Structural Stability and Design of Steel Cantilever Systems
- Assessing the Inelastic Lateral-Torsional Buckling Provisions of Canadian Design Standards for Welded Girders
- Design Method for Steel Gerber Systems
- Quantify Contribution of Large P-Delta Effect to Design Forces of Columns in Steel MRFs
- Stability of Extended Shear Tabs
- Progressive Collapse Resistance of Composite Steel Frame Structures

### emerging technologies

- Single-Storey Building Design Optimization using Evolutionary Algorithms
- Machine Learning for Optimization of Steel Shear Connections

### seismic design guidelines

- Seismic Response Evaluation and Design of Steel Multi-tiered Eccentrically Braced Frames
- Test-based Design Methods for Steel Multi-tiered Concentrically Braced Frames
- Advanced Hybrid Steel-Timber System for Seismic Applications
- Development of Enhanced Design Methods for Deep Wide-Flange Columns in Steel Moment Resisting Frames under Earthquake Loading
- Development of Simplified Seismic Design Guidelines for Steel Concentrically Braced Frames in Regions of Low and Moderate Seismicity
- Application of the Hybrid Simulation Technique to Evaluate the Seismic Response of EBF Links
- Predictive Fracture Model for Hollow Structural Sections subjected to Earthquake Loading

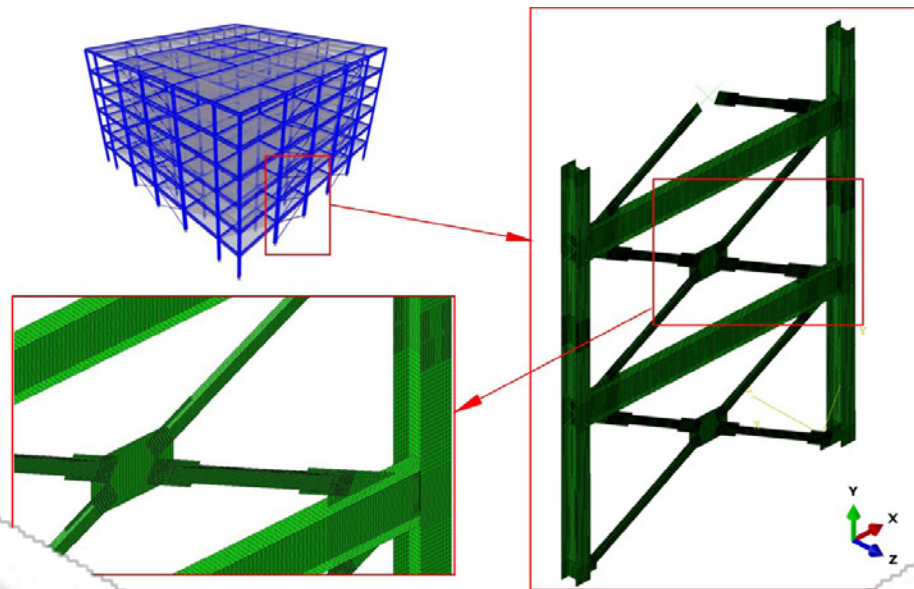
### construction & rehabilitation

- Rehabilitation of Deficient Concrete Columns with Steel Confinement Collars
- Standardization of Embedded Plates for Steel/ Reinforced Concrete Connections
- Improving the Design and Constructibility of Steel/Reinforced Concrete Connections

### prefabricated structures

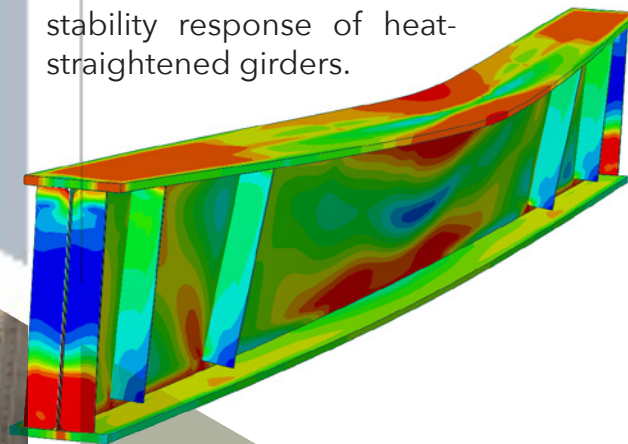
- Performance and Design of Prefabricated Steel Braced Frames for Industrial Buildings
- Development of a resilient steel modular moment-resisting system for seismic and wind applications

# current projects



**Modular multi-storey structures**  
 M.Sc. student Akram Zain worked to develop this design for a modular system that can be fabricated off-site to improve construction efficiency.

**Lateral-torsional buckling**  
 Sheldon Twizell (M.Sc., pictured below) continues a large-scale investigation into design guidelines for modern welded girders, with a focus on the stability response of heat-straightened girders.



**Standardization of embedded plates**  
 M.Sc. students Ian Chin and Caine Smithaniuk are developing design proposals for standardized embedded plates to reduce complexity and costs for designers, fabricators, and installers. Plate designs are verified by physical lab tests to ensure their performance meets expectations.

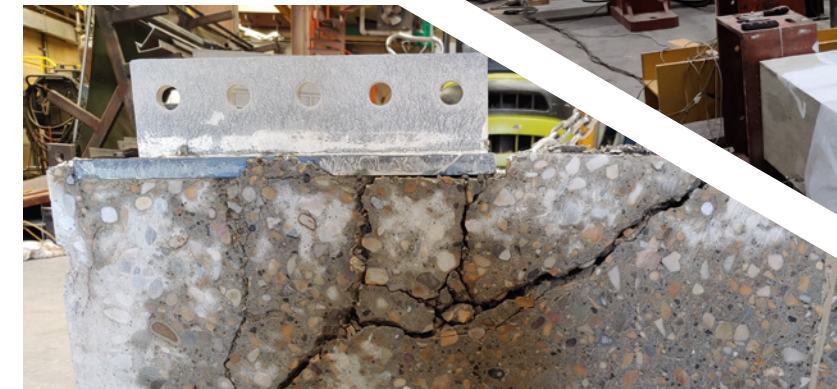
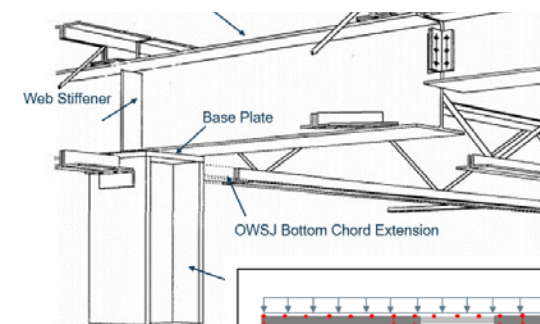
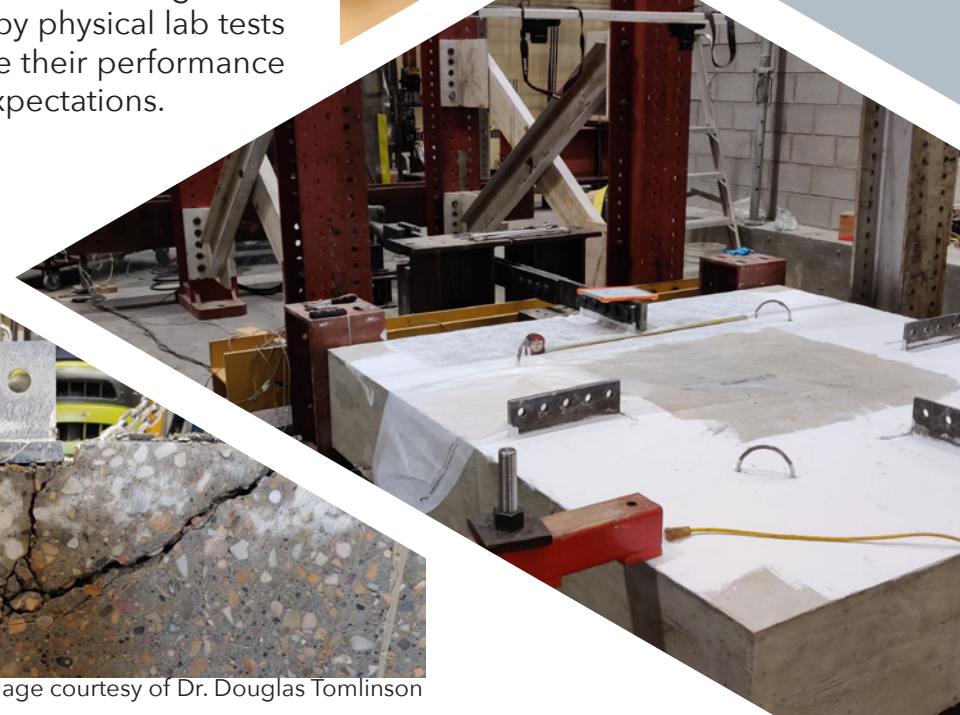
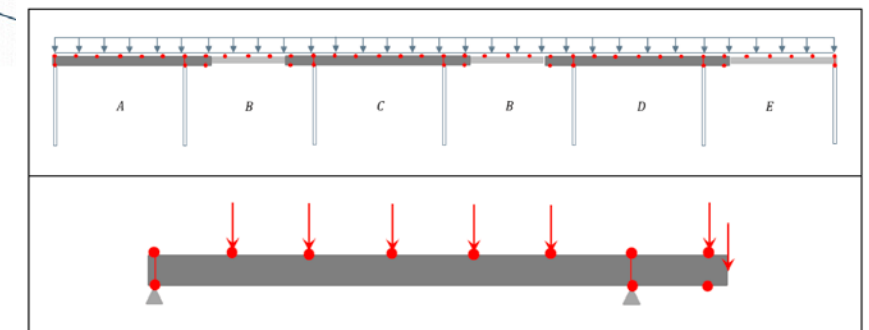
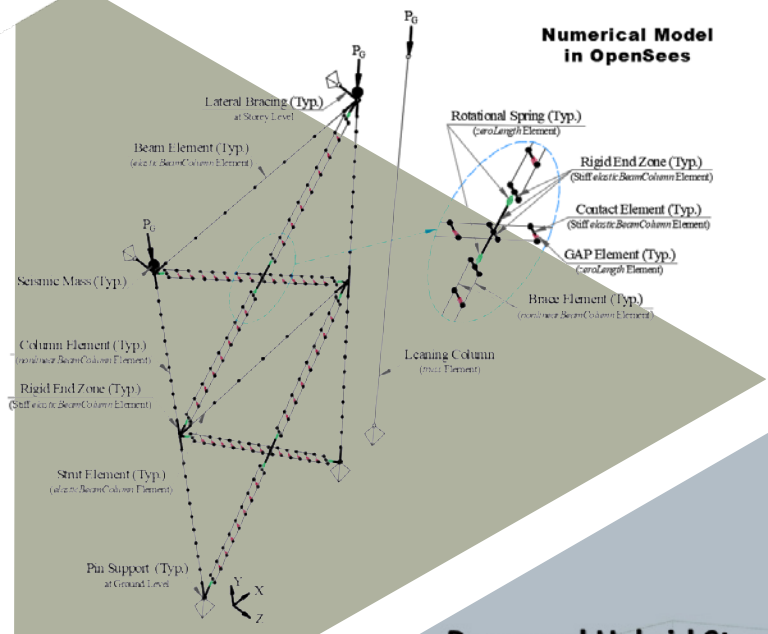


Image courtesy of Dr. Douglas Tomlinson



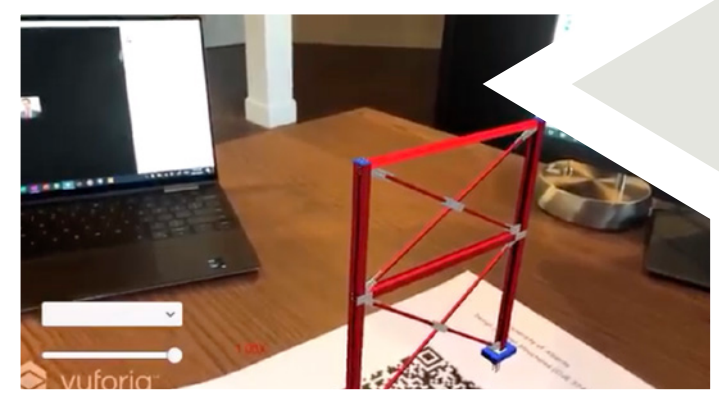
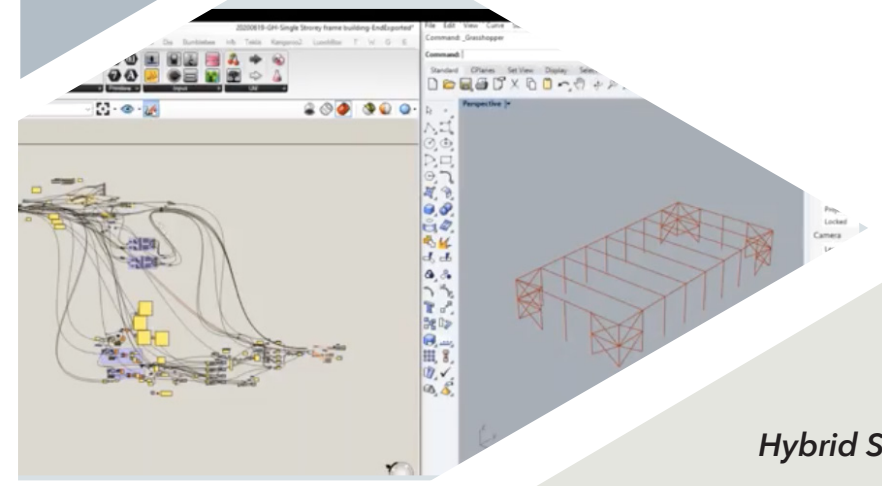
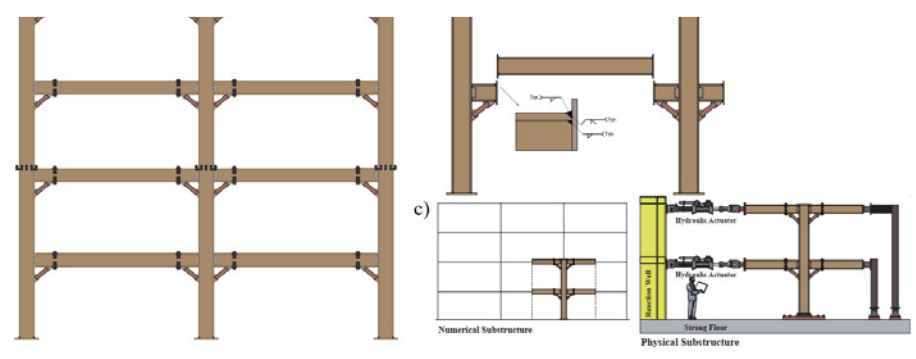
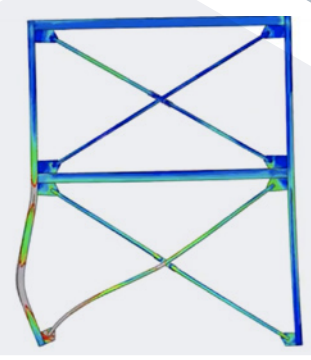
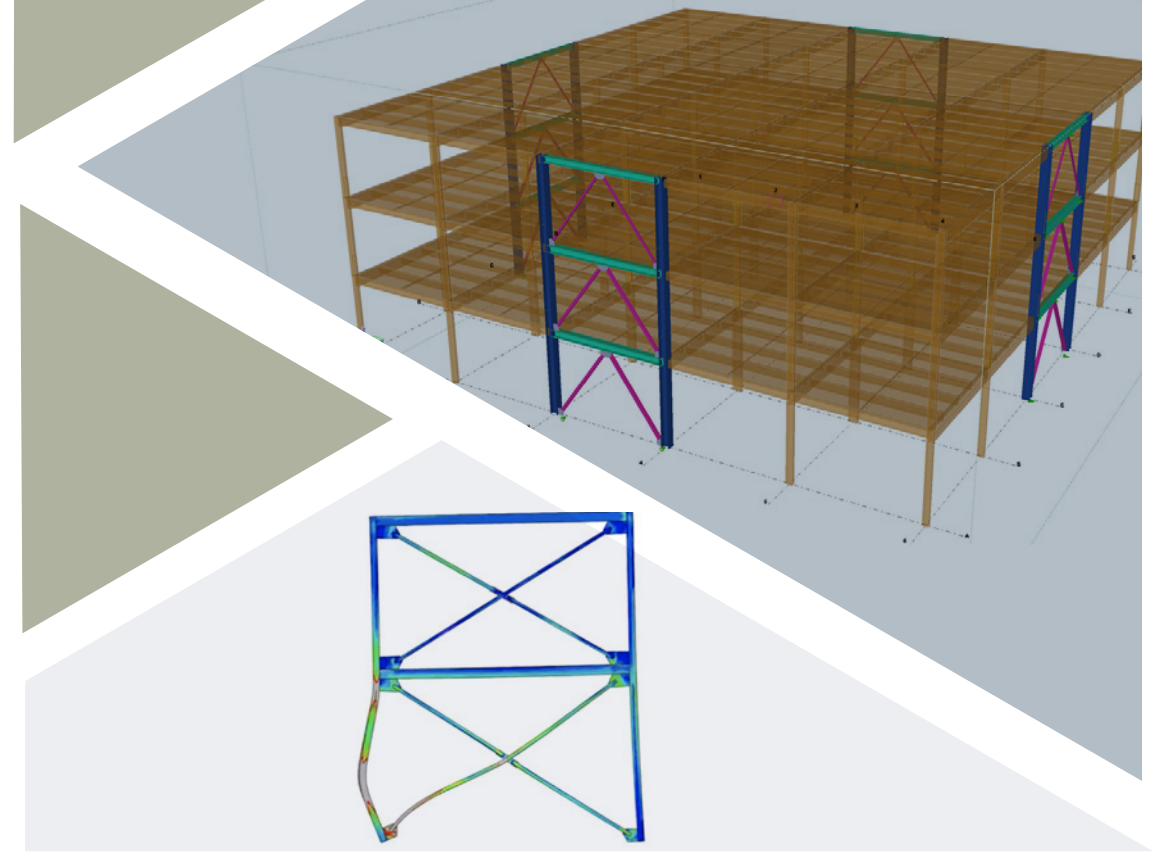
**Gerber systems**  
 Vahab Esmaili (Ph.D.) and Vincent Malazo (M.Sc.) are focused on a special case of lateral-torsional buckling: cantilevered Gerber systems, commonly found in big box retailers and other large single-storey structures.



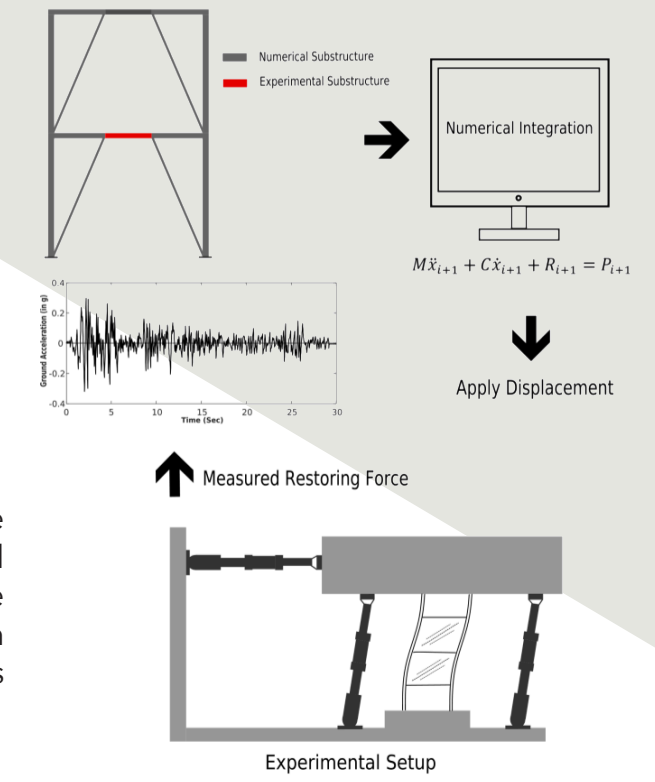


**Design guidelines for structures in seismic zones**  
 A number of Steel Centre students are advancing our understanding of seismic responses in different types of braced frames and proposing design or code changes to ensure safety and performance while reducing complexity and cost.

**Proposed Hybrid Steel-timber structure**



**Hybrid Simulation Procedure**



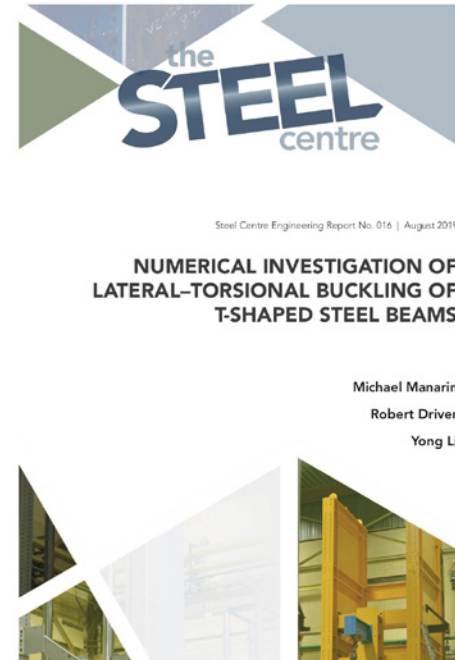
**Advanced and emerging technologies**  
 Research projects are using machine learning, hybrid simulation, augmented reality, and generative design to change the ways we teach and do research in Structural Engineering, and explore tools for future use in professional practice.

# current projects

# Steel Centre Engineering Reports (SCERs)

The Steel Centre keeps industry in the loop with new research

Research is an important part of what we do, but its value is only truly realized when that knowledge can make its way out into the world of practicing engineers. To aid this effort, we launched the Steel Centre Engineering Report (SCER) series. As students complete their investigations, their work is compiled and published as an SCER available to the public at [steelcentre.ca/reports](http://steelcentre.ca/reports).



## access the reports

[Click here to download any published SCER.](http://steelcentre.ca/reports) The full archive also includes Structural Engineering Reports published by the Steel Centre researchers prior to the Steel Centre's official formation.

# New Steel Centre publications in 2020

Steel Centre students underlined.

- Agbo, S., Imanpour, A., Li, Y., Kainat, M., Yoosef-Ghodsi, N., Cheng, R., and Adeeb, S. (2020). Development of a Tensile Strain Capacity Predictive Model for API 5L X42 Vintage Pipelines. *Journal of Pressure Vessels and Piping*. 142(6): 061506
- Ashrafi, A. and Imanpour, A. (2020). Seismic Response of Steel Multi-Tiered Eccentrically Braced Frames. *Journal of Constructional Steel Research* (under review).
- Cano P. and Imanpour A. (2020). Evaluation of AISC Seismic Design Methods for Steel Multi-Tiered Special Concentrically Braced Frames. *AISC Engineering Journal*. 57(3): 193-214
- Derakhshan-Houreh, E. and Imanpour, A. (2020). A Simplified Seismic Design Method for Limited-Ductility Steel Multi-Tiered Concentrically Braced Frames in Moderate Seismic Regions. *Canadian Journal of Civil Engineering* (Under review).
- Derakhshan-Houreh E. and Imanpour, A. (2020). Seismic Response and Design of Steel Multi-Tiered Concentrically Braced Frames of the Conventional Construction Category. *Canadian Journal of Civil Engineering* (Under review).
- Daneshvar, H., Oosterhof, S.A., and Driver, R.G. (2020) "Arching Followed by Catenary Response of Steel Shear Connections in Disproportionate Collapse." *Canadian Journal of Civil Engineering*, vol. 47(August), no. 8, pp. 908-920. DOI: 10.1139/cjce-2018-0645, online publication date: September 24, 2019.
- Islam, A. and Imanpour, A. (2020). Evaluation of the Canadian Seismic Design Provisions for Wide-Flange Columns of Steel Moment-Resisting Frames. Proc., *Annual General Conference*, Canadian Society for Civil Engineering, May 27-30, Saskatoon, SK, Canada.
- Lopushinsky, B., Tomlinson, D., and Driver, R.G. (2020) "Effect of Confinement on Lap Splices in Retrofitted Concrete Columns." Paper STR-357. Proc., *Annual General Conference*, Canadian Society for Civil Engineering, May 27-30, Saskatoon, SK, Canada.
- Mohebbi, S., Laschuk, D., Bhatti, R., Bastura, M., Bilodeau, D., and Imanpour, A. (2020). Numerical Evaluation of Innovative Modular Steel Structures for Single-Storey Buildings. Proc., *Annual General Conference*, Canadian Society for Civil Engineering, May 27-30, Saskatoon, SK, Canada.
- Unsworth, D., Driver, R.G., and Li, L. (2020) "Measurement and Prediction of Residual Stresses in Welded Girders." *Journal of Constructional Steel Research*, Elsevier, vol. 169(June), 10 pp. DOI: 10.1016/j.jcsr.2020.106007; online publication date: March 13, 2020.
- Yaghoubshahi, M. and Imanpour, A. (2021). An overview of hollow structural section brace fracture in steel concentrically braced frames under seismic loading. *Engineering Structures* (under review).
- Zain, A., Imanpour, A., Driver, R.G. (2020) "Development of a Modular Steel Structure for Multi-storey Buildings." *Steel Centre Engineering Report No. 018*, September, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Canada, 104 pp.
- Zain, A., Imanpour, A., and Driver, R.G. (2020) "An Innovative Modular Steel Structure for Multi-storey Buildings." Paper STR-153. Proc., *Annual General Conference*, Canadian Society for Civil Engineering, May 27-30, Saskatoon, SK, Canada.



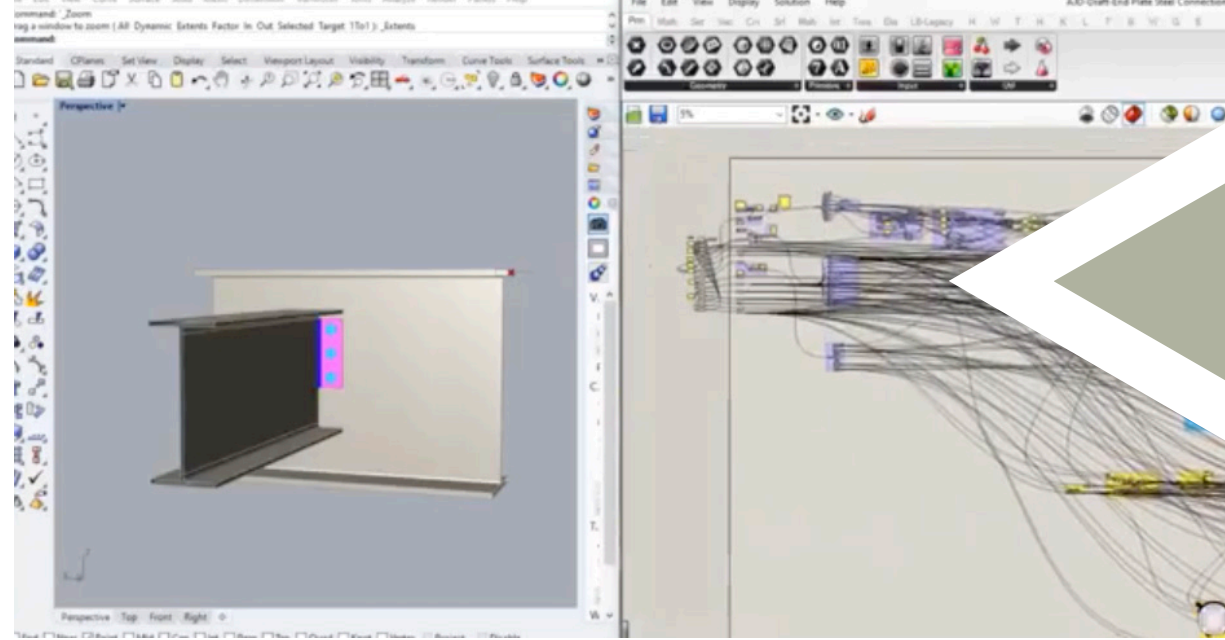
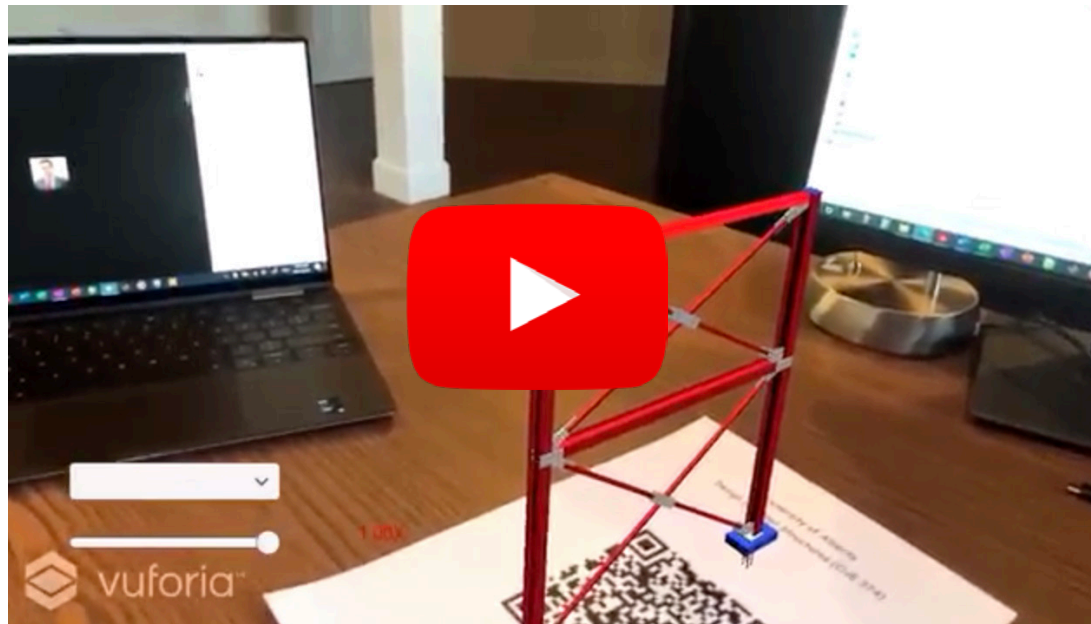
# spotlight on emerging technologies

The Steel Centre is exploring new ways to teach, build, and collaborate

There's no doubt that the world is changing, and that it will continue to change. What will we do about it? The new Emerging Technologies research stream at the Steel Centre is set on asking this type of question and exploring some of the potential answers. As new design tools become available, there is a need to understand their place in the workflow and their potential for future improvement and integration into construction processes.

Augmented reality (AR) has been around for some time, but its usage is only just becoming more common. Steel Centre

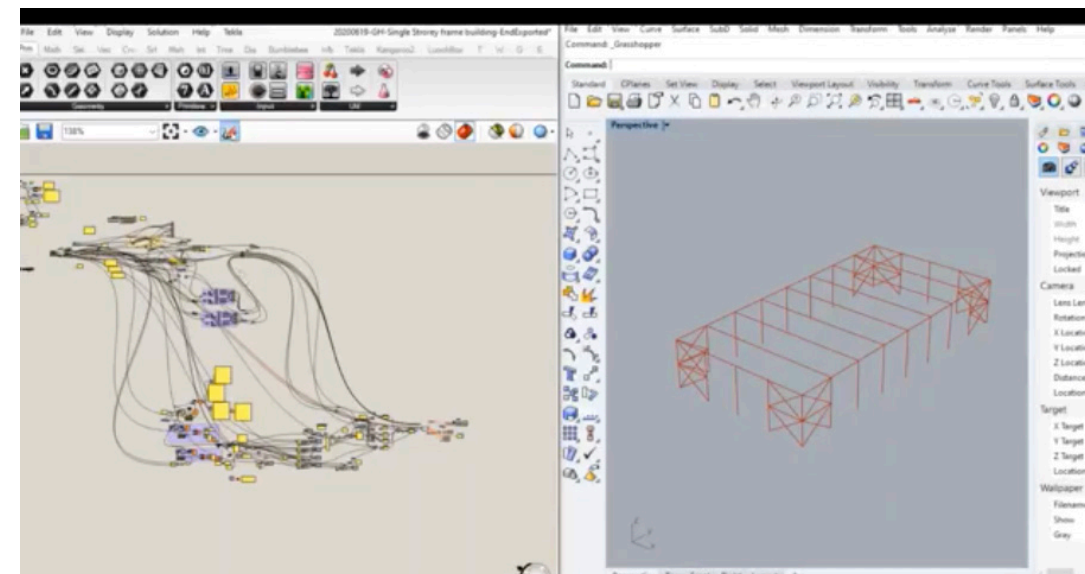
professor Dr. Ali Imanpour has taken an innovative step with his students and has developed an app specifically for engineering education, where a sample structural frame can be conjured onto any surface, then explored piece by piece using a set of controls to highlight certain aspects of the frame, hide members for a better view of connections, or 'explode' connections to see how they're put together. Especially in a virtual learning environment, this sense of physicality is a major improvement for students to see and experience what they're studying.



Order from chaos: The web of interdependent variables functions together to create a steel connection.

Another area of current interest is parametric and generative design, methods by which a computer creates a design based on inputs and goals set by the designer. After the initial relationships are established, designers can adjust sliders to change depth, number of bolts, and placement (shown in the screenshot above). The same principle can be applied to entire building systems, finding an optimized structural system based on the dimensions of the building and the expected loads.

These technologies already exist, and are breaking into professional practice. At the Steel Centre, we're beginning the process of enhancing present tools and imagining how to respond to future needs and technological opportunities. We're excited for upcoming projects as this new research area develops.



Parametric code produces a single-storey building structure that can be resized and redesigned in seconds.

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