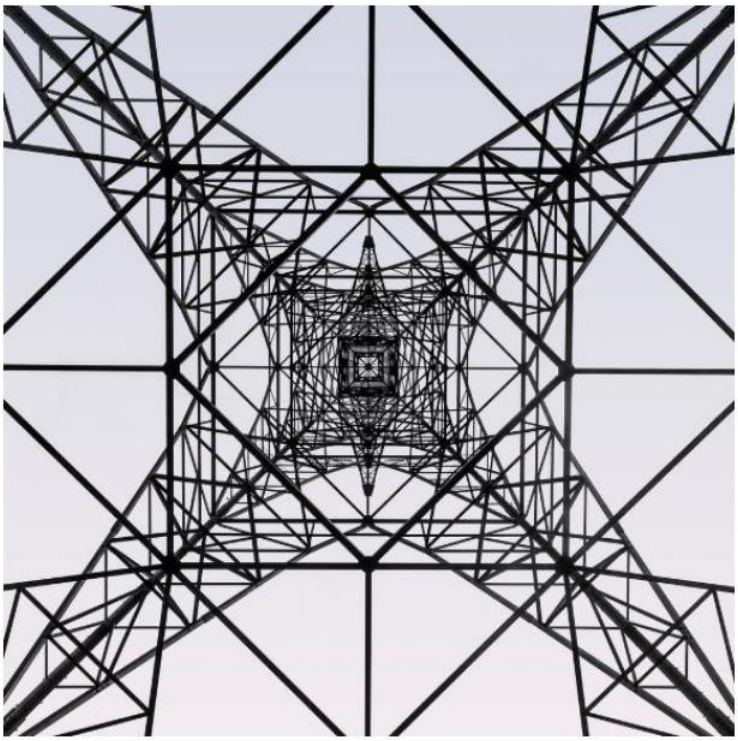

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CONTESTANTS

Amrit Pal Singh, M.Sc, E.I.T, RJC Engineers

Pia Abercromby, B.E., P.Eng, McElhanney

Edward Lau, P.Eng, Layton Consulting Ltd.

Arjun Prihar, BASc Candidate, UBC

Mohammed Moravvej, Ph.D, E.I.T, COWI

SEABC YMG 9th ANNUAL PRESENTATION COMPETITION

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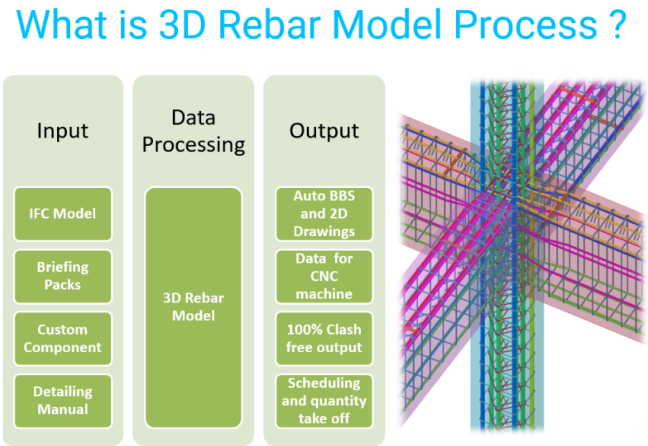
Transforming Construction Via 3D Rebar Modelling

Amrit Pal Singh, M.Sc., E.I.T, RJC Engineers

In the last decade there have been constant efforts to make Engineering and construction processes more efficient. To achieve efficiency, accurate data is required at an early stage of the design process, which can be acquired through 3D rebar modelling. It is a new tool for Structural Engineers to do potential improvements in the overall reinforcement process. These models are a kind of centralized data source that helps in building with higher productivity, enhanced sustainability, improved efficiency, better health and safety along with absolute quality. 3D rebar models can be directly transferred to Computer Numerical Control machines and fabrication can be done through automated process, hence significantly reducing rebar wastage. By using tablet-based devices, trade contractors can access the 3D models and check the exact arrangement, sequence and placement of rebar's on site, therefore mitigating all major risks associated with construction.



Bridges to Prosperity - Uganda

Pia Abercromby, B.E., P.Eng, McElhanney

In May 2019, I went on an epic adventure to the north east corner of Uganda. My company, McElhanney, sponsored me to travel to Africa to build a pedestrian suspension bridge for a small community through the Bridges to Prosperity organization. I was a part of a group of 10 women from across North America who came together, rolled up their sleeves and physically built the bridge. We set the cant in the towers, measured sag in the cables, and manually bent reinforcement into hangers for the bridge. And when the bridge was completed, after two weeks of hard work, we achieved much more than just building a bridge. We built relationships with the locals, teaching them how to use power tools and how to maintain the bridge. We learnt from the community, understanding the simple way of life they live and how this bridge will provide safe access for them to schools, medical centers and markets. We learnt how to problem solve with limited resources. I gained technical knowledge relating to pedestrian suspension bridges, but I also came away with lifelong friends and a great appreciation for the privileged life that we lead in Canada. I would encourage anyone who has the opportunity to become involved in a volunteering project such as the Bridges to Prosperity Bridge Builds and see what they can take away from the experience.

Lessons Learned - Curtainwall PMU Testing in Malaysia

Edward Lau, P.Eng., Layton Consulting Ltd.

Layton Consulting was retained by an overseas unitized curtainwall supplier to be their specialty structural engineer for a local project being built in Richmond, BC. A structural, air, and water performance mock-up test (PMU) on the unitized curtainwall system was proposed to be conducted at a testing facility in Malaysia. I had the opportunity to witness the PMU tests as a representative of Layton Consulting. Being in a foreign country for engineering work brings its own set of challenges and unexpected circumstances. This presentation focuses on the problems and solutions that occurred during the PMU tests, such as various structural and water leakage failures, and various installation and shop drawing detail discrepancies. This presentation also summarizes the lessons learned from this foreign experience, such as allowing more time for testing, and communicating between all parties regarding test parameters beforehand. The lessoned learned from this recent foreign experience should help engineering firms from repeating the same mistakes in another foreign country opportunity.

2020 ICD/ITKE Research Pavillion, University of Stuttgart, Germany

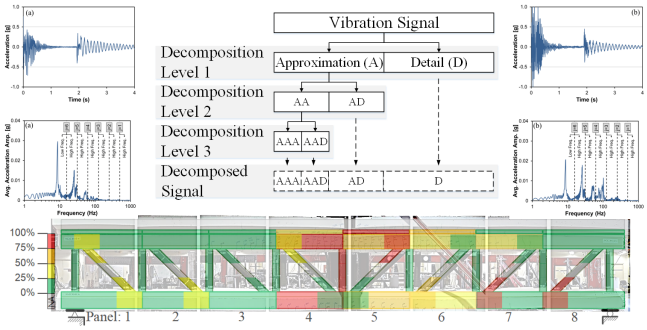
Arjun Prihar, BASc Candidate, UBC

This presentation is a case study into the application of parametric modeling software and "form-finding" techniques in the structural optimization of the annual research pavilion constructed by the Institute of Building Structures and Structural Design (ITKE) at the University of Stuttgart, Germany. The goal of the pavilion is to explore both a novel building material and an emerging computational design process in the development and manufacturing of a single-story, fiber-reinforced composite structure. With virtually zero precedent, this unique project requires the structural engineer to be involved in all stages of the design process: beginning with the building's architectural expression, carrying through the identification of material capacities from physical testing, and ending with the building's construction using automated robotic winding.

Development of a Reference-Free Vibration-Based Damage Identification Technique for In-Service Bridges

Mohammed Moravvej, Ph.D, EIT, COWI

Throughout my Ph.D. studies, I developed a vibration-based damage identification technique (DIT) that can detect structural damage, determine its location, and estimate its severity. The technique combines discrete wavelet transform (DWT) – a powerful signal processing tool for decomposition of signals – and spectral entropy in a relative procedure to detect and quantify the damage-induced disturbances in the measured dynamic response of bridges under ambient vibration. This relative wavelet entropy (RWE)-based DIT is a practical means for damage identification in in-situ cases, where the normal operation of bridges cannot be interrupted to perform dynamic excitation tests, and the data obtained from a reference (undamaged) state of the bridges are not available for comparison with the data measured from their current (damaged) state. The theoretical bases of the technique are presented, and its efficacy has been experimentally validated against false damage indications under varying operational and environmental conditions, such as the location of input dynamic excitation, location and extent of damage, support conditions, and temperature levels. The RWE-based DIT showed successful performance in identifying a wide variety of test-induced damage, including fracture in shear reinforcement, concrete cracking/crushing, debonding of strengthening sheets, rupture of truss elements' confining tubes, and failure in truss connections. The technique has also been used to investigate the effects of prestressing on the dynamic behavior of post-tensioned concrete girders to address the disagreement in the research community about the effectiveness of vibration based DITs in prestress force identification.



KEYNOTE SPEAKER

Title: Building a Career - A 40-year Retrospective of Structural Engineering

Adrian Gygax, P.Eng, Struct.Eng,

Principal, Gygax Engineering Associates Ltd.

Adrian is a 1981 graduate in Civil Engineering from the University of British Columbia, where he majored in structural engineering and minored in geotechnical and hydrotechnical engineering. After two year's working in Vancouver for a small structural consultancy, Adrian joined Electrowatt Engineering, a large international engineering firm based in Switzerland. He spent 13 years working on fun engineering projects in Europe, West Africa and Southeast Asia. Adrian returned to Vancouver in 1996 and founded Gygax Engineering Associates. GEA currently employs 9 staff and continues to do fun and challenging engineering projects that always have a significant structural component. GEA's projects have won two Association of Consulting Engineers of BC Awards of Merit and one Award for Engineering Excellence.