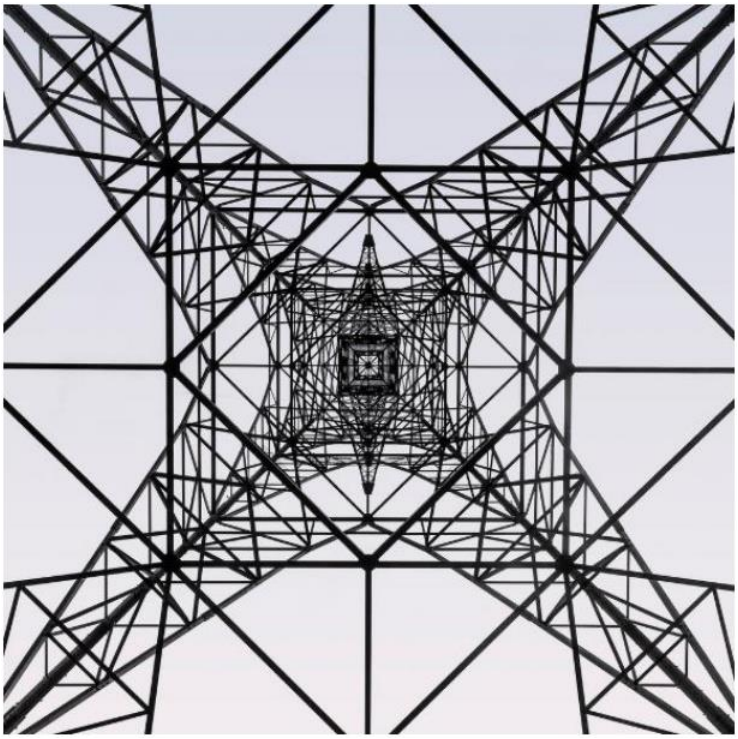

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CONTESTANTS

Colin Gilbert, MASc, E.I.T, RJC Engineers
Hercend Mpidi Bita, PhD Candidate, UBC
Brandon Sullivan, P.E., StructureCraft Builders Inc.
Siyao Ma, MASc, EIT, EQUILIBRIUM Consulting
Conner Ferster, EIT, UBC Civil Engineering student,

SEABC YMG 8TH ANNUAL PRESENTATION COMPETITION

COST: FREE FOR SEABC MEMBERS, $10 FOR NON-MEMBERS

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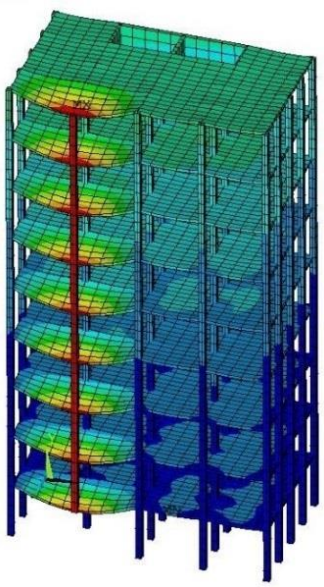
GNW Pavilion – 555 Great Northern Way, Vancouver

Colin Gilbert, MASc, E.I.T, RJC Engineers

The GNW Pavilion is a 2000 sq. ft. coffee shop and retail pavilion located on the Emily Carr university of Art + Design campus on Great Northern Way in Vancouver, BC. The building was designed to resemble a lotus flower with multiple overlapping petals that converge at circular skylight. A multi-layer assembly consisting of five curved light frame walls supporting a hybrid timber-steel dome was detailed to from the principle structure and five outer curved wood walls were used to form the upper roof and skylight. As a result, the structural assembly was detailed with pre-fabricated sections that could be efficiently connected together on site using bolted and screwed connection. This significantly reduce the requirement for on-site construction and optimize the shipment of the structural components and building materials to site. In closing, the GNW pavilion represents a complex structural system that was simplified through modular construction and typical details to create a unique retail space.

Disproportionate Collapse Prevention for Mid-rise Mass-timber Buildings

Hercend Mpidi Bita, PhD Candidate, UBC



Abnormal loads may cause initial damages which can trigger collapse propagation, leading to disproportionate collapse of buildings with insufficient structural robustness. To ensure structural safety, design approaches against this catastrophic collapse are embodied within the building regulations through structural robustness. Nevertheless, the application of existing guidelines for disproportionate collapse prevention for mid- and high-rise mass timber buildings -being an emerging construction method- becomes unpractical and uneconomic; and research studies in this topic are scarce. This presentation will illustrate how mass-timber buildings could be analysed and designed for a target performance under extreme loading events. First, descriptions of disproportionate collapse, highlighting the limitations of the existing codes, guidelines as well as design strategies, will be presented. Then, to study their responses after initial damage, the results of nonlinear dynamic analyses performed on twelve and nine storeys mass-timber buildings will be presented. Thereafter, an improved tie-force procedure which ensures structural robustness of mass-timber floor and wall systems will be introduced. Finally, this presentation will demonstrate that mass-timber buildings can be designed for structural robustness similar to that of concrete and steel buildings.

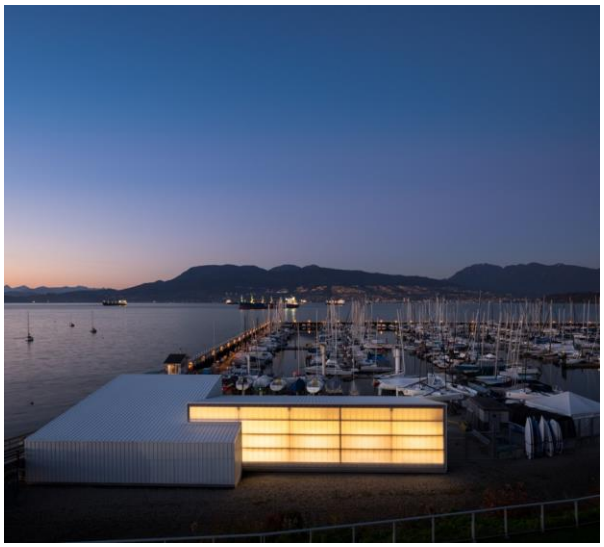
Brandon Sullivan, P.E., StructureCraft Builders Inc.

Giant Observation Wheel Design – the Vegas High Roller

The Vegas High Roller was completed in 2014, and is the world's tallest observation wheel at 550 feet tall. Designing a moving structure on this scale requires significant structural optimization and efficient use of materials. Like a bicycle wheel, the Vegas High Roller is constructed with tensioned steel spokes and a large compression rim. This design is not only structurally efficient, but it also yields superior fatigue performance to fairground-style Ferris wheels. The High Roller will operate 18 hours a day for 50 years (330,000 cycles) so every weld, penetration, and attachment is detailed with fatigue in mind. In addition to its world record height, the High Roller can accommodate a world record 1120 passengers per 30-minute rotation. This level of public exposure requires the wheel to be robust and resilient to potential damage, whether it is environmental, accidental, or deliberate in nature. A detailed Failure Modes and Effects Analysis was conducted to identify potential threats and ensure that there are redundant systems in place to prevent operational and safety failures. The final product is a giant observation wheel that is well integrated with the site, structurally optimized, and will be a world-class tourist attraction for decades to come.

New Dock Building At Royal Vancouver Yacht Club

Siyao Ma, MASc, EIT, EQUILIBRIUM Consulting

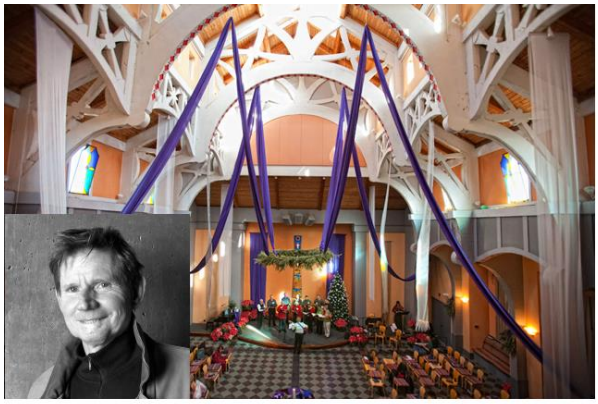


The Dock Building, located on Jericho Beach in Vancouver, BC, brought new presence to the Royal Vancouver Yacht Club. The building was completed in May 2018. With a very modest budget, this multi-space timber facility, achieved with grace and architectural dignity, was designed to serve a large marina of sailboats and to provide showers, washrooms, management offices for the yacht club. The building consists of two intersecting wedge volumes that mirror each other, creating a lantern to the sea and a lantern to the land. The structure is a mix of glulam columns and beams with light-framed timber roof and walls. Facing the land, glulam and polycarbonate are used to bring light into the workshop areas; facing the sea, garage doors provide access inside. Because of the great attention to detail, this Dock Building won an AIBC Special Jury Award for exceptional achievement at the 2018 AIBC Awards. This presentation will introduce the simple and economic timber structure of this Dock Building and will focus on the development of some challenging structural details. Taking the Dock Building as an example, the presentation will show that elegant and economic architecture is always possible to be achieved with timber structures.

The Art of Everyday Innovation: A Retrospective on R. Gary Black, P.E.

Conner Ferster, EIT, UBC Civil Engineering Student

R. Gary Black is a structural engineer practicing in Berkeley, California who is most known for his work with the architect Christopher Alexander in projects around the world. Working in both buildings and bridges, Black has developed a unique, innovation-based practice through "hands-on" experimentation with all three primary structural materials: steel, concrete, and timber. Based on my personal interview with Black and Black's published papers, this talk will highlight one of Black's built innovations in each of these materials: 1) timber connection design in one of Japan's largest traditional timber buildings, 2) lace-like roof trusses made of open-form shotcrete, and 3) steel frame seismic retrofitting in commercial buildings utilizing the forms of the Monterey Cypress tree.



The talk will describe the creative, technical, and regulatory processes that Black went through to create these solutions with the aim of giving inspiration to engineers who may feel that the creative component of their work is limited due to the conventional circumstances of building.

KEYNOTE SPEAKER

Owen Berg, P.Eng, P.E, S.E, Engineering Manager, Kiewit Infrastructure Engineers, KIE

Owen Berg is an Engineering Manager specializing in temporary structures and construction support. With numerous years on-site design experience on various high-profile projects across North America, he is well versed in leading design teams in fast-paced high-pressure environments. Owen graduated from Iowa State University with a Masters in Structural Engineering in 2010, and started his career at the Omaha office of Kiewit Infrastructure Engineers. He currently serves as the Engineering Manager for the Burnaby Office of Kiewit Infrastructure Engineers.

Title: Building Complex Concrete Shapes

Abstract:

Conical slipforming allows for the creation of complex geometric shapes. This highly specialized construction method is only performed by a few specialty firms around the world. The design and verification of these forming systems requires unique modelling techniques, advanced understanding of structural behavior, and practical application of environmental loads. Owen Berg presents on his work as the Lead Structural Engineer responsible for the verification of the Hebron Conical Slipform Structure, and the challenges with turning a concrete circle into a square.