LANGARA SCIENCE & TECHNOLOGY BUILDING

WESBRIDGE
STEELWORKS

2017 VRCA AWARDS OF EXCELLENCE

CATEGORIES

- Trade Contractor for Structural Steel Project Nomination

LANGARA SCIENCE & TECHNOLOGY BUILDING
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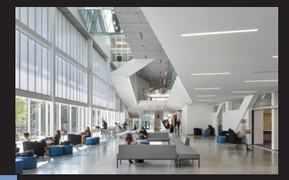

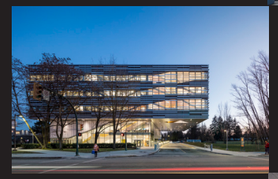

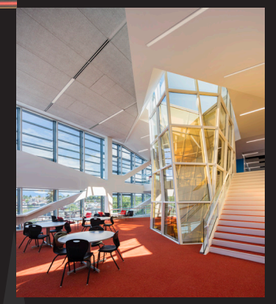

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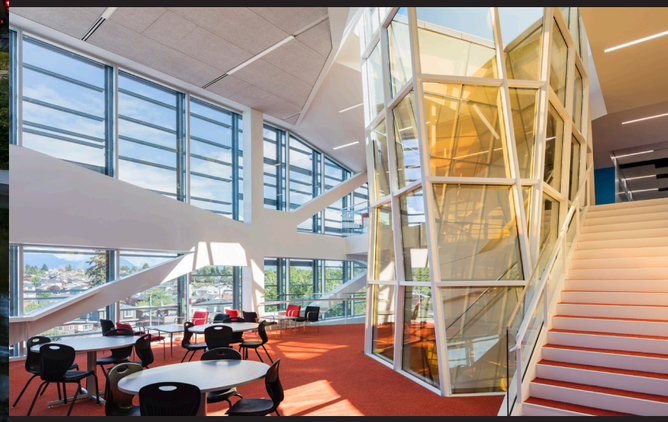
Brief Description and *Why Steel was the Natural Choice:*

A visionary gateway into the Langara campus, the new Science and Technology building is the epitome of form and function. The 12,000 square metre building used in excess of 1,600 tons of structural steel to provide over five storeys of new campus space. The structure will house specialized facilities for biology, chemistry, physics, astronomy, nursing, and more. The building, constructed without a solid concrete core, utilized steel truss systems and a concrete raft foundation. Adhering to the BC Building Code for a heavy seismic zone, the steel truss systems not only take the cantilever floor loads but also the seismic loads into the foundation. The structural steel had to be erected in a meticulous sequence due to three-sided cantilevers. Structural steel allowed the building to have maximum strength and long lasting durability while maintaining its architectural expression.

As compared to concrete, steel was the ideal choice for the three cantilevers on the east / west sides and on the north side that extend over roadways, active student pathways and an expansive campus environment. An impressive and pristine 16 metre cantilevered segment on the west, houses a skylight-like glowing oriel coined the Oculus, which seamlessly provides spiraling light from roof to ground level.



The Oculus inside the 3rd Floor of the Structure

Brief History
From Design Conception to Completion:

With a goal to secure the technology-forward 130,000 square foot Science and Technology building as the new focal point for the campus community, numerous innovative architectural and engineering highlights were designed and implemented. The key highlights of the campus life were skillfully adapted to the existing constraints of the natural and urban environments. Opening its doors in the fall of 2016, the 21,000 strong, student population at Langara has now infused new life into the $49 million futurist Science and Technology building.

Steel Truss Systems

The bi-directional steel truss systems create seismic resistance in four directions which enables the large cantilever loads to be anchored down to the foundation. At the base of the vertical five-story brace system, there are locations where the loads are up to 1,200 tons per diagonal steel brace member. The design is such that only two of the 1,200 ton loaded members could support the entire dead weight of the complete Science and Technology building. Steel, unlike other construction materials, can handle the loads with relatively compact members. On the east-west direction, a multi-floor vertical steel truss system was incorporate to control and stiffen the building, and allowed the use of a large 16-metre cantilever, seismic loads and deflections. The structure is virtually nestled together as a lattice of stacked two-way steel brace system, providing the building with the tremendous strength and rigid form required to fulfill its architectural essence, in conjunction with seismic resistance.

Steel Cantilevers

Structurally, there are three cantilevers: a substantial 16-metre cantilever on the west side, which supports all three floors above it, one of the core engineering features of the building; two smaller cantilevers are located on the north and east sides. The unity of these steel components allowed the teams to design, fabricate and erect a massive educational institute with more square footage and wide open spaces above driveways, walkways and common areas. To fulfill the architectural appearance and enhance the spatial function of the campus, the cantilever systems were utilized to create an artistic form, while maintaining existing traffic flow and elevating the educational environment for the students and the community at large.

Street View of Langara Steel Cantilever System

The Oculus

The Oculus is a radiant, twisted, vertical light tube, which travels from roof to ground with the core function of projecting natural daylight into the educational edifice. The complex, multi-faceted and geometrically-challenging steel framed cylinder was constructed and installed as five multi-length panels. The largest panel is six metres wide by fifteen metres long. Each meticulously fabricated panel needed to be a precision fit on site to maintain the mounting points for glazing in multiple fifteen-metre vertical sections.
The Oculus required top-level steel fabrication skills to incorporate the geometry yet maintain the vision and quality requirements of the architect. A wide range of angles and lengths has created a stunning refraction and pathways for light, made possible by the use of structural steel. Thus the Oculus has become a perfect synergy of interior and exterior atmospheres.

Before and After Peering Upwards through the Oculus

Additional Challenges and Obstacles

To provide the floor components to the correct elevation, the three-sided cantilevers posed extreme challenges in maintaining the dimensional tolerance at the perimeter during construction. This required meticulous sequencing of construction work and shoring requirements.

Bolted connections were selected for constructability and speed of installation yet posed additional challenges due to the heavy loads and connection sizes and in-turn required a higher accuracy of fabrication.

Heavy seismic and cantilever loads needed to be transferred to a compact foundation footprint. This foundation has built-in embedded structural steel columns and beams to be connected to the subsequent steel structure above. The heavy column and beam bolted connections needed to match precisely even though the foundation and the subsequent structure were constructed in two separate phases.

Steel Cantilever System Supports Floors Above

Economics and Budget:

The $49 million Science and Technology building, reaching five storeys above ground and one below, with a total floor area of 130,000 square feet, met the finalized budget outlined by the Langara College Board.

Schedule and Timeline:

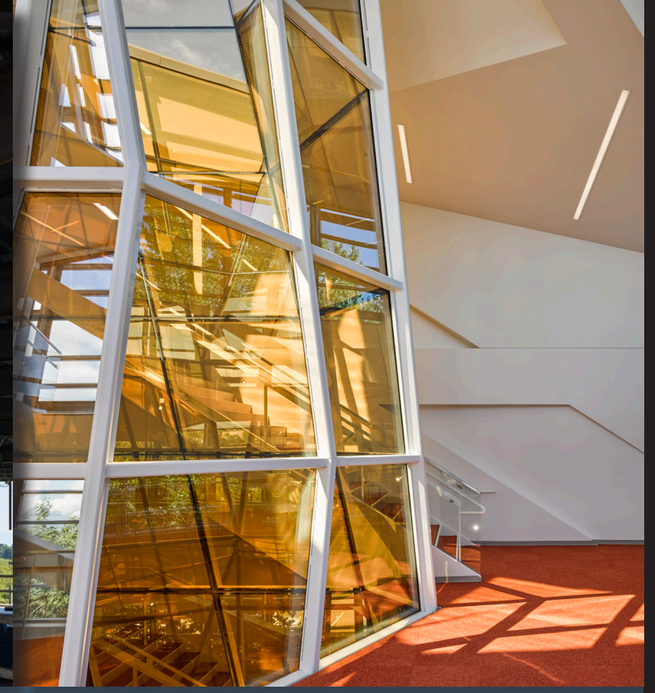
The commencement for the Langara College Science and Technology building was late 2013. Wesbridge Steelworks met the steel construction schedule timeline in accordance with the completion date, and the opening of the new building was set for the Fall of 2016.

Steel Trusses - Building used 1,600 Tons of Structural Steel

How Does the Structure Fit into the Surrounding Community and / or Environment?:

Elevated impressively above ground and the surrounding community, and expanding horizontally east to west, the Science and Technology building allows for uninterrupted traffic and student flow on adjacent roadways and pathways. A stunning signature structure at midday or midnight, the LEED Gold educational institute provides more planned and designed wide-open spaces for community participation and engagement. Crystal clear windows on all sides and awe-inspiring 360-degree views from inside the edifice, allows for more openness and greater transparency between the local south Vancouver neighbourhoods and student population.

Elevated Impressively Above Ground in the Local Community



Architectural Innovations:

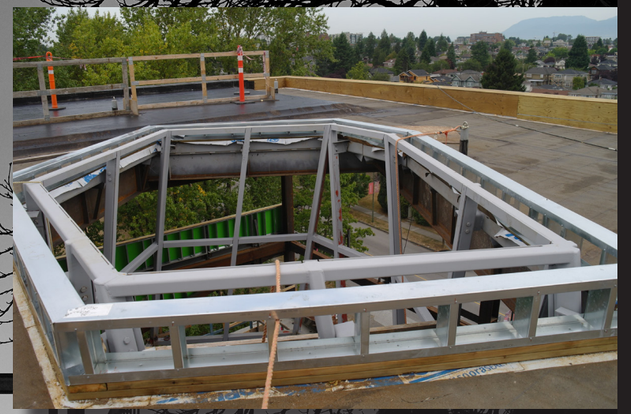
The Langara Science and Technology building has become the recognized industry benchmark for a student agora. With an awe-inspiring vertical Oculus light tunnel, which embeds itself straight through the entire structure, the multi-faceted tube was designed to continuously reflect the highlights, shadows and tones of daily weather patterns to the students and faculty. Hence, the path to finding the balance of between “student-life” and “work-life” has been identified and celebrated. With expansive, open spaces underneath the flowing educational centre, the new building is at the heart of innovation and sustainability.

Engineering Innovations:

Further innovations included building the cantilevers with minimum shoring. Meticulous sequencing of steel installation was required. The structural system of the building was all intertwined, therefore finding the logistical solution of assembling and erecting this complicated structure was critical. Until all floors were completed, the entire structure remained dimensionally unstable lacking proper shoring and installation procedures.

Once completed, another innovation was the removal of shores. Jacking work was engineered with the entire three upper floors of the steel and concrete slab weight. The logistics and sequencing of the building installation was extremely sensitive to safety while ensuring the building was both structurally sound, and dimensionally stable.

Embedded structural steel was required to bring the heavy seismic loads to the foundation / soils anchor concrete work before the installation of the main steel frame. Consequently, precision fabrication and installation were required to maintain continuity of heavy columns and brace connections.



Engineering Complexity:

Highly complex in nature, the system of implementing an extremely long cantilever was critical in ensuring the overall size of the building, which added more than 1,000 square metres of student space, as well as 35 new laboratories and classrooms. The cantilever floor structure is an integral part of the east west multi-floor vertical steel truss systems.

The steel backbone of the Oculus is a detailed fabrication and installation case study with multi-faceted sides, lengths and angles. To achieve the fine balance between architectural vision and structural competency, the teams meticulously drafted models, consulted with architects and engineers and constructed prototypes to ensure the building became a signature structure of Langara.

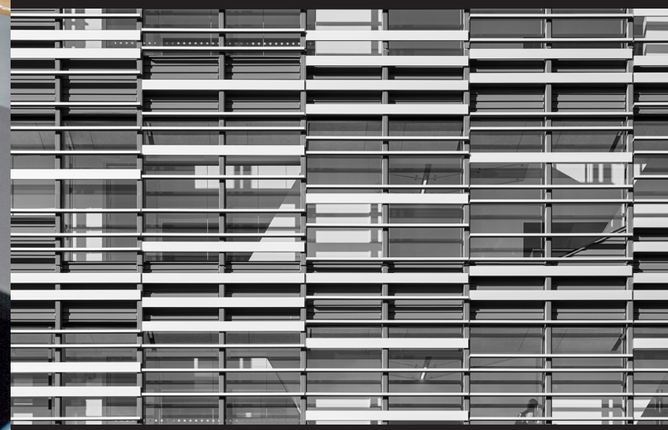
Was it a Leed Project?

The new eco-friendly Science and Technology building adhered to LEED Gold standards: the edifice incorporates many green building features including: green and reflective roofs, an energy-efficient building envelope, and low-flow fume hoods with adjustable sashes and an energy-efficient cladding system. During the creation of the community-based building, the new Langara building adhered to an energy-smart policy and the highest levels of sustainable building design, to become one of the highest rated LEED green buildings in North America.

Innovative Design, Technologies and Standards to Minimize its Impact on the Environment and the use of Energy:

The New Science and Technology building was targeted for a leadership in energy and environmental design Gold designation, applying exceptional economical building techniques and incorporating healthy living components. The intended sustainable plan includes green building features such as reflective and green roofs, an energy-efficient building envelope, low-flow fume hoods with adjustable sashes and energy-efficient mechanical and electrical systems. According to Construction Business Magazine: The employed energy efficient strategies and systems have resulted in an overall annual energy cost savings of 45 per cent (over $74,000 in utility cost savings) compared to a conventionally constructed building.

Steel is highly recyclable and was the ideal choice due to its low environmental impact and low carbon footprint. Steel also added to the overall sustainability of the building and reinforce athe brand: Langara - The College of Higher Learning.



Exterior Windows - An Energy-efficient Building Envelope

WESBRIDGE
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Teams Involved:

Architects: Teeple Architects / Proscenium Architecture + Interiors Inc.

Structural Consultant: Weiler Smith Bowers Consulting Structural Engineers

Owner: Langara College

General Contractor: Bird Construction Company

Steel Fabricator: Wesbridge Steelworks

Steel Detailer: Wesbridge Steelworks

Steel Erector: Wesbridge Steelworks

Photos: Andrew Latreille and Wesbridge Steelworks

Brand Design + Copy: ISIbranding.ca

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