Goldring Centre for High Performance Sport

DALHOUSIE UNIVERSITY
Department of Civil and Resource Engineering

Meghan Hanington, Ethan Reashore, Jacob Cosman, Megan Foran

Project Advisor: Dr. Kyle Tousignant

Blackwell

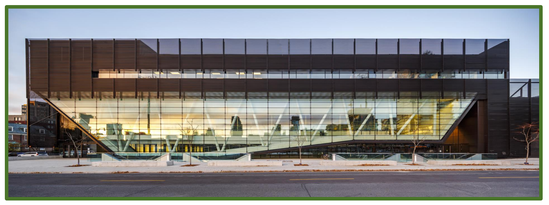
Project Scope

Overview

The Goldring Centre for High Performance Sport Project consisted of the complete structural design of the building. The building contains a 2,000-seat arena, fitness center, and supporting space.

Key Architectural/Structural Elements

Large floor-to-floor heights in the atrium and the gymnasium; large structural spans to accommodate column-free space over gymnasium; floor-to-ceiling glazing on the exterior and high design loads.



Location: University of Toronto[1]

Design Process

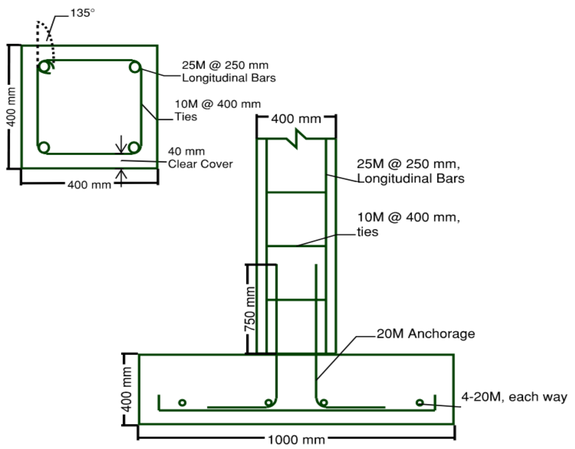
Options Analysis

All materials pertaining to the structural design of the building were considered. For the basement level, concrete was chosen. For the above grade levels, steel was chosen.

Top-down Approach

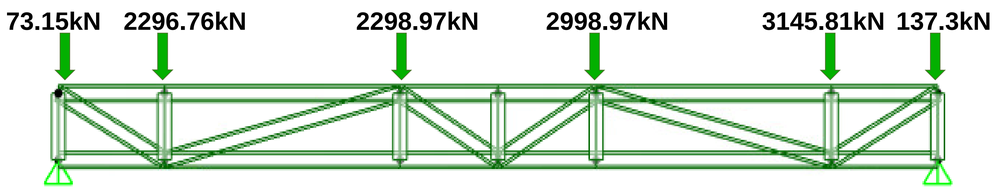
As done in practice, the building and member locations were designed from the roof down to the basement.

Concrete Column & Spread Footing



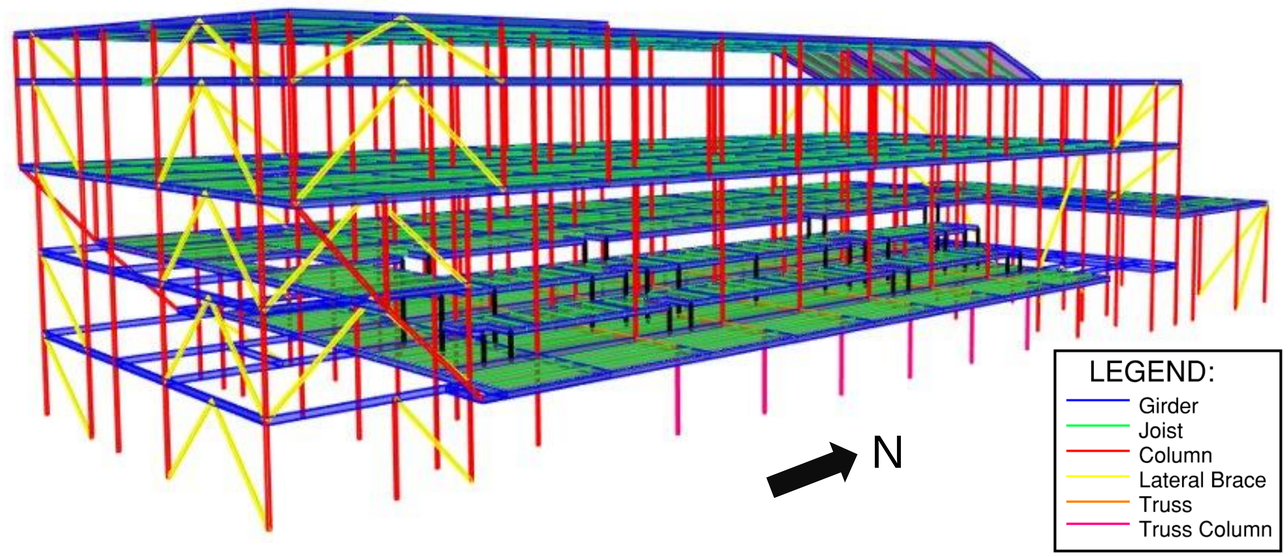
Truss Design

A truss was designed to transfer all the column loads over th e gymnasium.



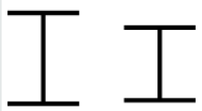
Truss is made of W360x592 steel sections

3D Building Model



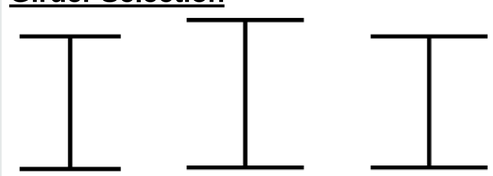
Steel Elements

Joist Selection

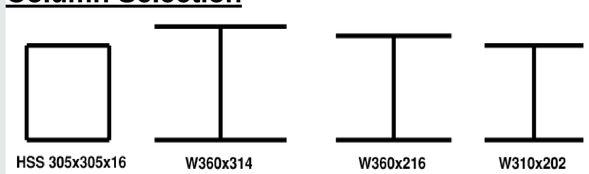


The gravity load resisting Members for this structure were designed in accordance with CSA S16 and verified using SAP2000 modeling software.

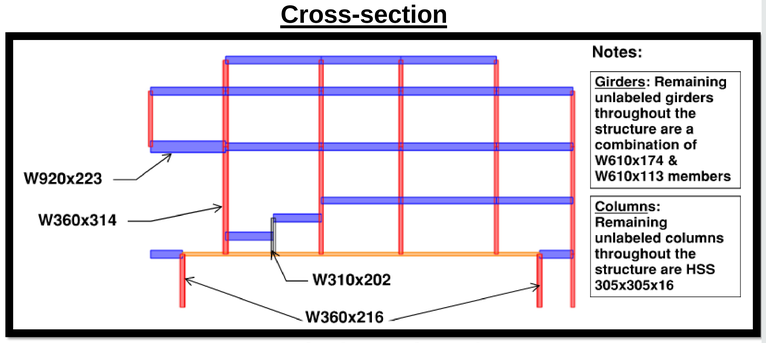
Girder Selection



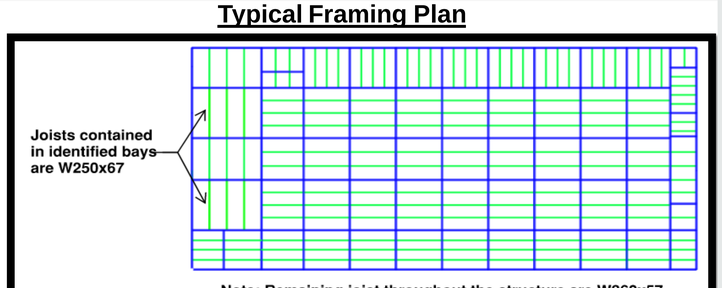
Column Selection



Cross-section

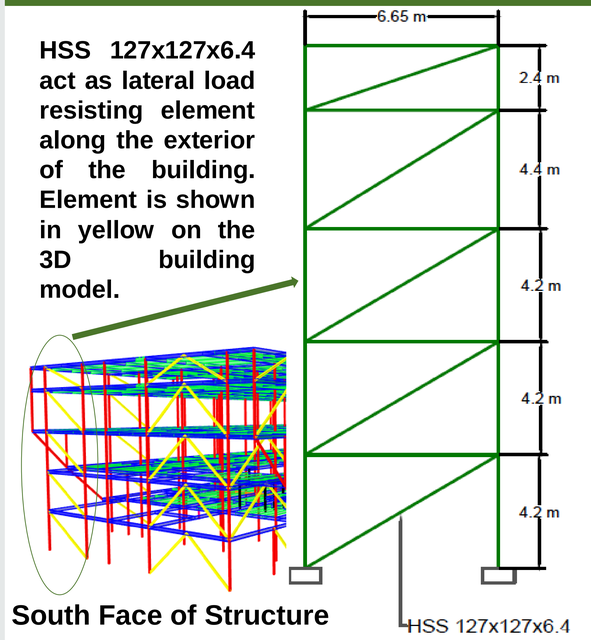


Typical Framing Plan

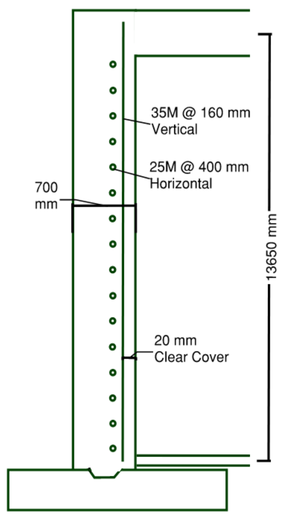


Lateral Bay Bracing

HSS 127x127x6.4 act as lateral load resisting element along the exterior of the building. Element is shown in yellow on the 3D building model.



Basement Wall Design



Due to the gymnasium and other associated areas in the basement, the max depth is 16 m. The large amount of soil that pushes on the basement wall results in large lateral loads on the basement wall. A basement wall with proper reinforcement was designed to sustain all lateral and shear loads, it was designed to be 700m.

Cost Estimate

Using RSMeans[2] historical square footage data, a "Class A cost" estimate for the Goldring Centre at the University of Toronto, was completed.

The "Class A" cost estimate for this project is $23,600,000.

References

1 Ellis Don. (2014). Goldring Centre for High Performance Sport
2 Gordian. (2018). Square Foot Costs with RSMeans Data