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FACULTY OF ENGINEERING

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CBCL

Department of Civil and Resource Engineering

Charlottetown Pollution Control Plant Expansion

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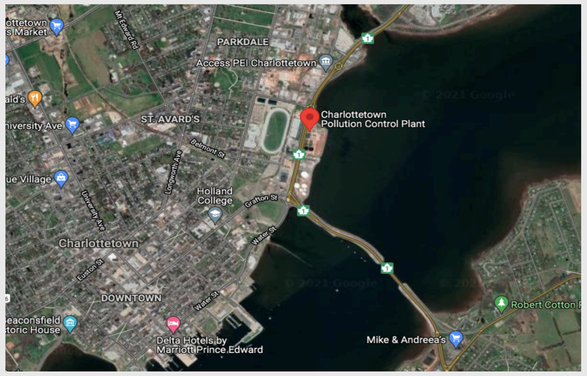
Introduction

The Charlottetown Pollution Control Plant, located in Charlottetown PEI, is a wastewater treatment plant that serves the majority of the City of Charlottetown. The plant is looking to expand to treat water from the nearby communities, and to account for the increased flow upgrades are needed in several areas of the plant. The upgrades include the need for a new primary clarifier tank and a sludge thickening building.



Design Objectives

Tank
- Perimeter Walls
- Divider Wall
- Base Slab
- Walkway
- Pump Gallery Building

Building
- Walls
- Roof
- Slab
- Footing

Design Process

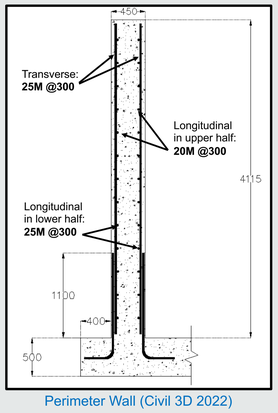
Literature Review
- Researched importance category, gravity/lateral load development, concrete environmental structures and durability considerations.

Option/Load Analysis
- Created an options analysis matrix to decide on the tank and building materials.
- Identified and developed the gravity loads and lateral loads acting on both the tank and the building.

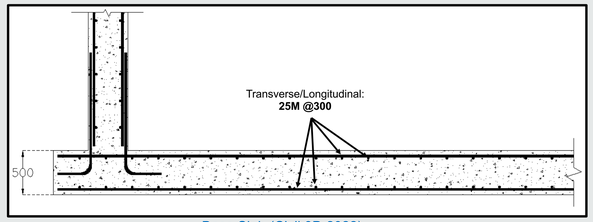
Detailed Design
- Determined the governing load case acting on both structures.
- Finalized the design of the tank and the building using detailed design calculations.
- Completed detailed design drawings and models.

Cost Analysis
- Completed a Class B cost estimate for the design and construction of both structures.

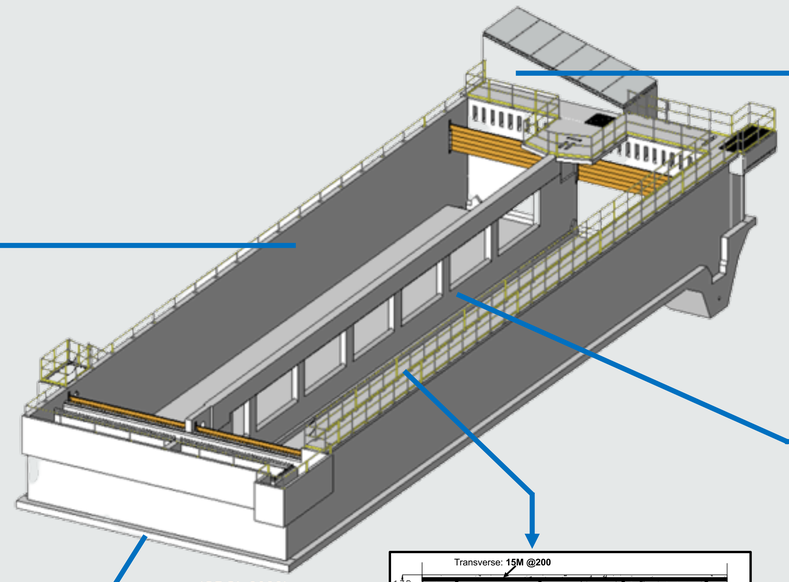
Tank Design

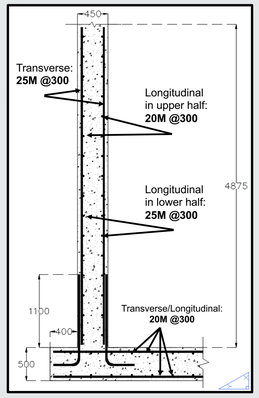


Perimeter Wall (Civil 3D 2022)



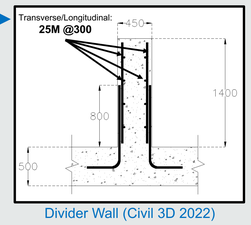
Base Slab (Civil 3D 2022)


(CBCL 2022)



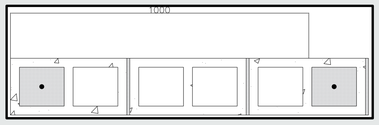
Pump Building Wall/Slab (Civil 3D 2022)

Walkway (Civil 3D 2022)

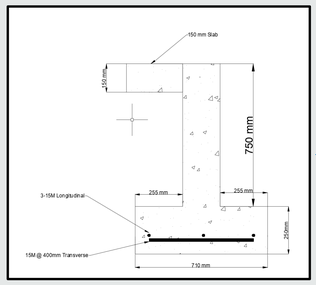


Divider Wall (Civil 3D 2022)

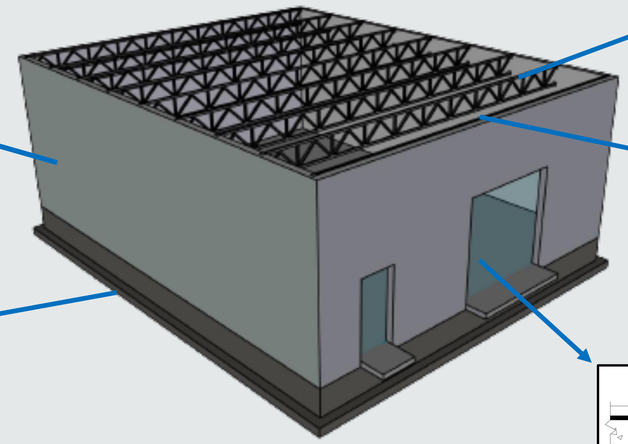
Building Design

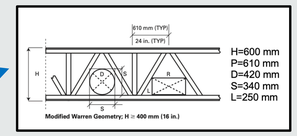


Masonry Wall (Auto CAD 2022)

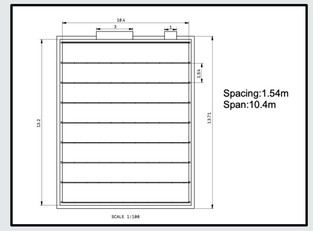


Foundation (Auto CAD 2022)

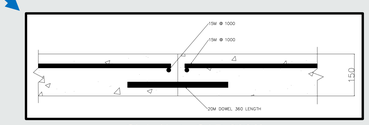

(Sharp 3D 2022)



Roof Joist (Canam 2022)



Roof (Sharp 3D 2022)



Slab (Auto CAD 2022)

Conclusion and Recommendations

The materials were selected using a option analysis matrix that considered a variety of features including durability, cost and environmental considerations. The tank is to be constructed using reinforced concrete. The building is to be constructed using steel joists, masonry block walls and a reinforced concrete foundation. All load cases were considered for both the tank and the building. The tank walls and slabs were designed based on the soil loads which was the governing load case. The tank was also designed for durability against the harsh chemicals in the wastewater by using an epoxy coating. The building was design based on the applied dead, live, wind and snow loads.

Cost Estimate

Tank	$1,043,790
Building	$124,600
Total	$1,168,390

References

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- Munshi, J.A. (1998). PCA Rectangular Concrete Tanks. Fifth Edition. Portland Cement Association.
- NBCC. 2015. National Building Code of Canada. Canadian Commission on Building and Fire.
- Tarr, S. C., & Farney J. A. 2008. Concrete Floors on Ground. Portland Cement Association.