

Introduction

The owner of an existing wharf in the Halifax Harbour is seeking a 30-meter-long extension to accommodate a larger vessel. The project requires a complete geotechnical study, a mooring analysis to size new mooring bollards, detailed design of major structural components and fulfilled with a 50-year design life.

Project Scope

The owner is requesting a set of final detailed drawings, a Class 'B' cost estimate and a construction schedule submitted by the engineering design team.

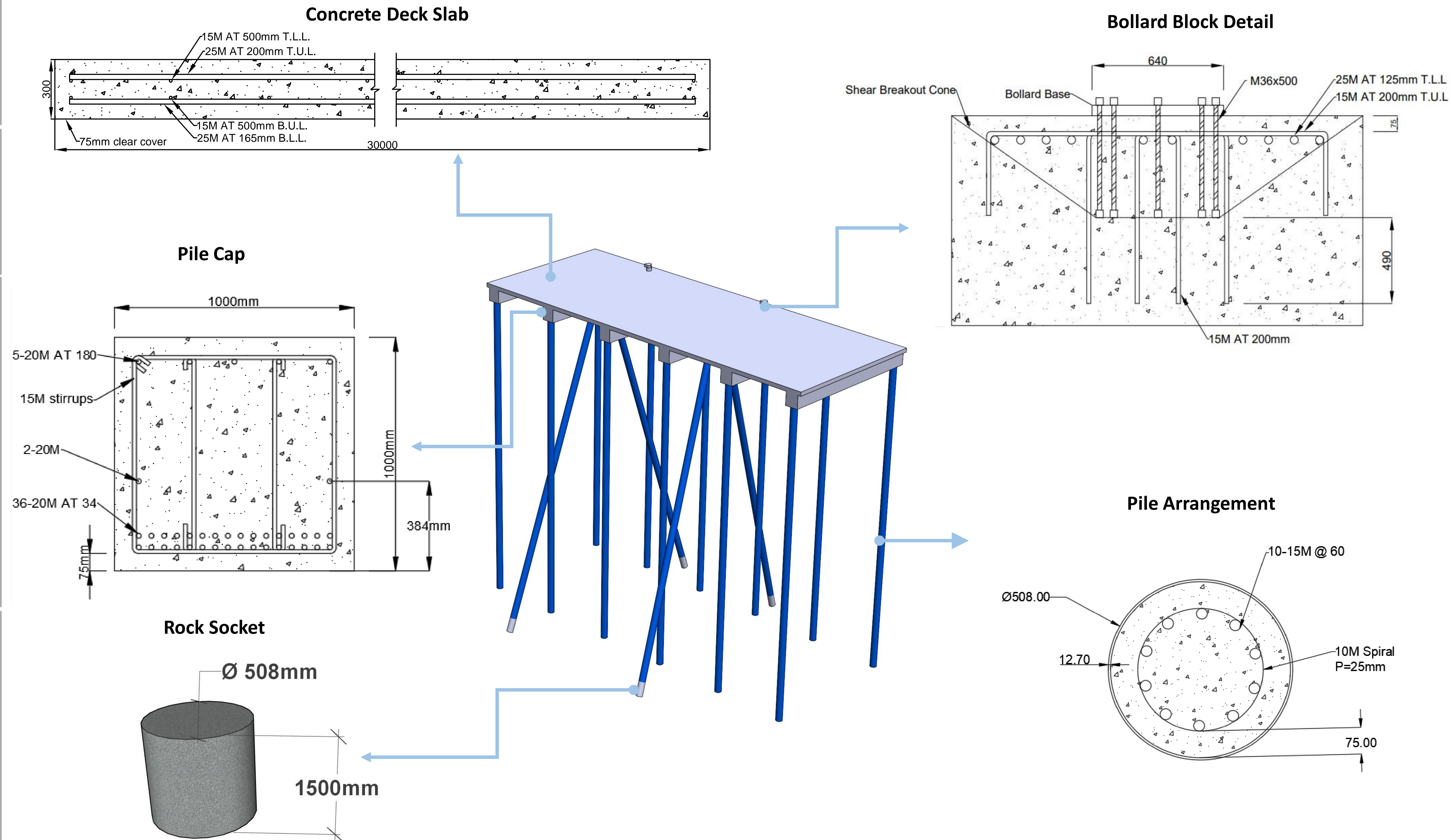
Project Location



Design Process

- Load Analysis**
 - Determine gravity loads
 - Determine lateral loads
- Geotechnical Analysis**
 - Determine load bearing capacity
 - Determine uplift resistance
- Structure Type Investigation**
 - Research wharf types
 - Create preliminary wharf design using
 - Piled structure
 - Structural sheet pile
 - Concrete caisson
- Design**
 - Determine lateral load resisting system
 - Execute detailed component design
- Present Results**
 - Model with detailed cross sections
 - Class B cost estimate

Final Design



Class 'B' Cost Estimate

Category	Items	Unit Rate
Wharf Construction	Wharf Structure	\$ 990,497
	Earth Works	\$ 50,000
	Concrete	\$ 439,081
Miscellaneous	Mobilization/Demobilization	\$ 200,000
	Engineering Fees	\$ 100,000
	Est. Contract Price (Excl. HST)	\$ 1,779,578
	Contingency (15%)	\$ 266,937
	HST (15%)	\$ 306,977
Total Price		\$ 2,353,492

Conclusions and Recommendations

Group 9 has designed a 30m x 11.5m battered pile wharf extension structure. The geotechnical analysis found an allowable bearing capacity of 250 kPa and recommended the use of 1.5m long rock sockets. The reinforced concrete filled steel tube (RCFST) piles span 24m. The concrete deck is doubly reinforced and 0.3m thick. The mooring analysis found a max. mooring force of 370kN which requires two 50-ton tee-head mooring bollards. Corrosion protection includes a fiberglass wrap hybrid with anodes at a cost of \$75K. A detailed cost estimate was complete with an approx. \$2.3 million construction cost.

References

- British Standard (2000). Maritime works. Code of practice for general criteria. British Standards Document - BS 6349-1.
- Department of Defense [DoD]. (2009). Design: piers and wharves. United facilities criteria UFC 4-152-01.
- Department of Fisheries [DFO] 2015. Harbour accommodation guidelines for small craft harbours branch. Version 1.2.