HRSC

HARDROCK STRUCTURAL CONSULTANTS

Project Plan

MUN OSC DEEP WATER RESEARCH FACILITY

AE Consultants
ARCHITECTURE & ENGINEERING

Prepared for:	AE Consultants
and	Dr. Steve Bruneau, ENGI 8700 Memorial University of Newfoundland

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Feb. 2, 2011

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c/o Faculty of Engineering
Memorial University of
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RE: MUN OSC DEEP WATER RESEARCH FACILITY PROJECT PLAN

Krista Handcock,

Enclosed for submission is the MUN OSC Deep Water Research Facility project plan. This report has been created by HardRock Structural Consultants as requirements for ENGI 8700 – Civil Engineering Design Project course at Memorial University. The course is taught and administered by Dr. Steve Bruneau who is copied on this letter and has received a copy of this report for review.

The submitted report is a description of the MUN OSC Deep Water Research Facility project which is located in Logy Bay, NL. It also includes the scope of work to be completed by HardRock Structural Consultants for AE Cosultants and ENGI 8700 Civil Engineering Design Project. The project plan is an outline of the project methodology which includes the responsibilities of HardRock Structural Consultants, a schedule of the tasks known to date for project completion, and the perceived risks of project execution.

If there are any questions concerning the contents of this report please contact HardRock Structural Consultants by email at hardrockstructural@gmail.com or alternatively you may contact Dr. Steve Bruneau by email at sbruneau@mun.ca.

Sincerely,

Stephanie Randell
Marketing and Communications
HardRock Structural Consultants – Group 2

Paul Williams	Justin Mayo	Darrell Young
Project Manager	Design and Analysis	Cost Estimating

cc. Dr. Steve Bruneau

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1.0 Project Background

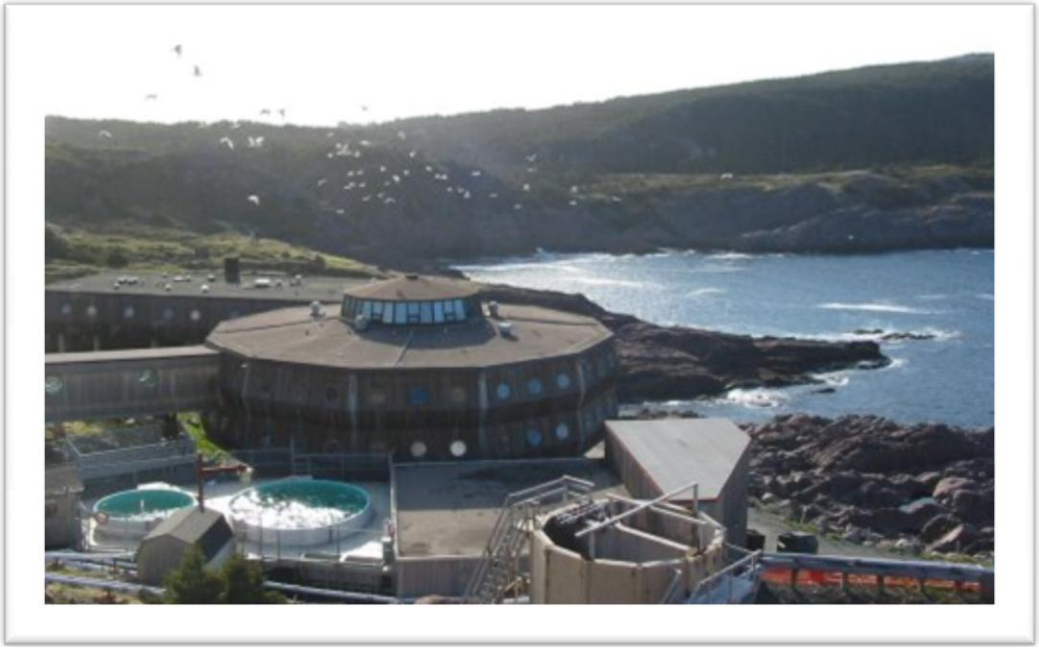


Figure 1 - MUN OSC (Summer 2010)

The Ocean Sciences Centre (OSC) is a cold ocean research facility operated in conjunction with Memorial University of Newfoundland. Located in Logy Bay, NL, the centre houses laboratories where research is conducted on the North Atlantic fishery, aquaculture, oceanography, ecology, behaviour and physiology. The facility is capable of conducting research on organisms ranging from bacteria to seals.

Memorial University of Newfoundland recently received funding of more than $6.5 million from the federal government for ocean research and infrastructure dedicated to the OSC. Through its Leading Edge Fund, the Canada Foundation for Innovation (CFI) is supporting the creation of new state-of-the-art facilities for the study of cold-water and deep-sea organisms and ecosystems at the OSC. The funding will go towards a variety of developments, including the construction of new buildings, laboratories, new and current research facilities, and updated equipment.

Memorial plans to develop a deep-seawater research source that will provide consistent, high-quality low-temperature seawater on a year-round basis. New wet and dry laboratories for cold-water research will also be constructed, allowing researchers to further study deep-ocean organisms. Additionally, the new facility will provide space for research into aquatic infectious diseases and invasive species.

1.1 Project Description

The two storey building will be constructed on the OSC grounds and house an area of approximately 950 m^2.

There are three possible site locations for the newly proposed Deep Water Research Building. The first site is located to the south-east of the current buildings on an elevated rock outcropping, the second site is located

near the visitor's parking lot on an overgrowth section of trees, and the third site is located between the current buildings in an inclined rock outcropping.

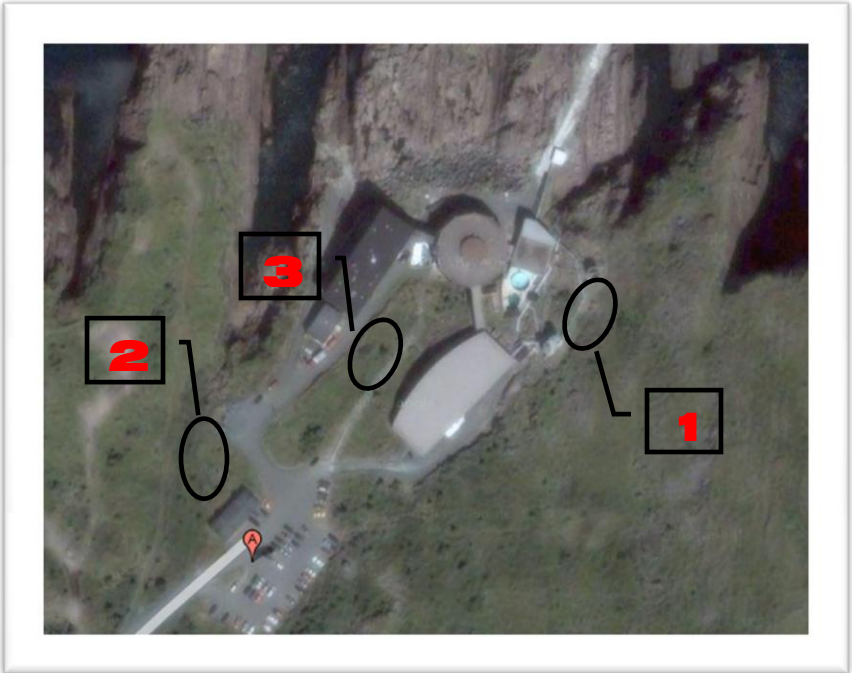


Figure 2 - Possible Sites for Deep Water Research Facility

The designed building is located at site 3 and consists of a steel superstructure with a concrete foundation. One side of the building is embedded into the rock outcropping and therefore the south-west side is ground level on the second floor. A retaining wall is required to support the building in this location. Development of the structure will require removal of the visitor's walkway into the lower buildings; this walkway will be replaced after the building is completed. Future plans exist to change the lower roof into a classroom and analysis is required for both its current function and its potential future function. The OSC will remain operational during the construction of the new building.

2.0 Statement of Project Requirements

The objectives for this project are:

- to carry out a site assessment
- to design the building including foundations and superstructure, and
- to provide a cost estimate (+/- 25%)

The Site Assessment will require a site visit where each site location will be assessed in terms of aesthetics, accessibility, excavation requirements, pipe line layout and safety. MUN OSC has requested that the structure should not overshadow or stand out from the main structure which is a showpiece building. This will also be taken into consideration when evaluating each site.

The building design is required to conform to Aquatic Containment Level 2 facility (AQC2). In an AQC2 facility, containment is achieved through facility design, operational procedures, and the use of specialized equipment. The requirements for such a facility will be provided by the employer.

The building is to be designed in accordance with the National Building Code of Canada (NBC 2010), with exception of the structural components which may follow NBC 2005, and steel design will be taken from the CISC Steel Handbook 10th edition. The structural components are exempted from the NBC 2010 requirements because the structural commentaries for NBC 2010 will not be released until after the completion of this project.

Weekly updates will be submitted to the client and a minimum bi-weekly meeting will take place at AE Consultants offices on Freshwater Road. At the end of the project timeframe a report containing all deliverables, documented correspondence, and all other valid documentation will be presented to AE Consultants and to Dr. Bruneu for evaluation. A final presentation will also be offered at that time to present the information contained in the final report.

3.0 Project Methodology

3.1 Client Responsibility and Interaction

The client for the MUN OSC Deep Water Research Facility project is AE Consultants Ltd. Lead correspondence will be with Krista Hancock, P.Eng, Senior Civil/Structural Engineer with secondary correspondence through Ivan Hynes, P.Eng, Civil/Structural Engineer. The client is responsible in specifying all project deliverables, requirements, and deadlines. They are responsible for providing HRSC with all relevant architectural drawings, geotechnical site information, Level 2 facility requirements, and design regulation requirements. To date HRSC has received all geotechnical, architectural, and Level 2 facility requirements from AE Consultants.

The client will be provided with weekly project progress reports and a schedule plan at the beginning of the project. Client meetings have been scheduled on a bi-weekly basis; option for meetings in-between schedule is available when pressing matters arise. The Client will be presented with a meeting agenda before all meetings to maximize time availability.

3.2 Design Principles

This structure is to be designed to satisfy all applicable codes including the CSA concrete and steel design codes and the National Building Code of Canada (NBC). The analysis of structural members will be done using S-Frame and/or Staad and accompanied by any required hand calculations. The main design criteria set forth for HRSC is based on cost. The final decision must be economically viable. The building must also conform to the requirements for a Level 2 facility prescribed by the Canadian Food Inspection Agency. Alternatives will be considered in all major decisions to ensure the best final design is presented.

Our goal is to present the client with a feasible design that can be used to deliver the project on budget and meet all safety requirements.

3.3 Reporting and Deliverables

AE have asked HRSC to prepare:

- Detailed site assessment
- Full structural design
- Class D cost estimate (+/- 25%)
- Final report based on our recommendations and findings

As a requirement for the ENGI 8700 course HRSC will present weekly progress reports and a final presentation. This presentation will be given to senior faculty members and clients on April 4, 2011. The final presentation will illustrate all final decisions in the design process and show how HRSC progressed through the project methodology.

3.4 Troubleshooting

Any problems faced during the design will be solved by numerous methods. Questions arising directly from principles of design or calculations will be discussed with faculty members at Memorial University specializing

in structural design. Project specific issues can be discussed with AE Consultants through Krista Hancock, Dr. Bruneau, and other members of the company.

3.5 HRSC Organization

Group members have been assigned roles based on individual experience and knowledge. Each member has been assigned to one or two principle roles and will also aid project progress by taking on alternate secondary roles. Members with primary roles will be responsible for those members in secondary roles in the same field. Full descriptions of the primary roles can be found below. [Section 4.0 Roles and Responsibilities]

Table 1 - HRSC Member Roles and Responsibilities

Member	Primary Role(s)	Secondary Role(s) [not inclusive]
Justin Mayo	Concrete Design Engineer Draftsperson	Geotechnical
Stephanie Randell	Marketing and Communications Steel Design Engineer	Geotechnical
Paul Williams	Project Manager Geotechnical Engineer	Cost Estimating Steel Analysis
Darrell Young	Cost Estimator Research and Development Manager	Drafting Concrete Analysis

4.0 Roles and Responsibilities

Each member of HRSC has been designated roles relating to the project execution. As member resources are limited, each member has been selected for a maximum of two primary roles and a number of secondary roles. These secondary roles will allow the group members to ensure that landmark tasks are fully attended with minimal disruption in project execution. Project meetings will ensure that all members are conscience of the progress of each task and the progress of the entire project.

4.1 Project Manager

The Project Manager is responsible for ensuring that all members have been allocated a task to advance the project schedule. They are responsible for developing a schedule that sees completion of the project to end date, and updating that schedule with the work complete throughout the project. They are also responsible for re-allocating member resource when tasks fall behind the projected deadline.

4.2 Marketing and Communications Manager

The Marketing and Communications Manager is responsible for document control of any works submitted. They will ensure that all documents follow the HardRock Structural Consultants branding scheme and be responsible for all master documents created for the project. They are responsible for all communications between the client and the company as well as creating any meeting agendas and progress reports. Finally they are responsible for recorded minutes of all group and client meetings.

4.3 Concrete Design Engineer

The Concrete Design Engineer is the lead design of all concrete works. They will be responsible for design and analysis of all concrete and masonry and oversee others in secondary position of this field. They are also responsible for checking all concrete drawings to be submitted or used for quantity takeoffs.

4.4 Steel Design Engineer

The Steel Design Engineer is the lead design of all steel works. They will be responsible for design and analysis of all steel columns, open web joists, roof trusses, cross-bracing, and connection details and oversee others in secondary position of this field. They are also responsible for checking all steel drawings to be submitted or used for quantity takeoffs.

4.5 Geotechnical Engineer

The Geotechnical Engineer is responsible for ensuring that the footings, concrete slab, and retaining wall comply with the geotechnical report provided by AE Consultants and administered by Stantec Inc. They are also responsible to oversee others in secondary position of this field.

4.6 Estimator

The Estimator will be responsible for quantity takeoff's and cost estimating of materials. They will be responsible to obtain correct material pricing and is responsible for any members in secondary position in this field. The Estimator will be responsible for verifying the final cost estimate report.

4.7 Draftsperson

The Draftsperson is responsible for creating all CAD drawings and ensuring that they meet the specifications of the project and ensuring all required drawings are completed. They are also responsible for any members in secondary position in this field.

4.8 Research and Development Manager

The Research and Development Manager is responsible in ensuring that the Level 2 facility requirements are met in all aspects of the project. They are also responsible for any additional research that may be required throughout the duration of the project. The R&D Manager is responsible for any secondary members in this field.

5.0 Project Scope

There are several major tasks to be completed in this project. These include:

- Site assessment/recommendations
- Structural analysis/design
- Cost estimate

To be able to complete all required project objectives in a timely and efficient manner the scope of work for this project will include all engineering analysis and design for the site assessment and all required structural elements. All work associated with the preliminary site assessment already completed will be included in the final report. To aide in all structural element design S-Frame and/or .STAAD will be used and to assist with any or all cost estimating work, RSMeans and Costs Works will be utilized.

All results obtained from design will be used in preparing a set of working drawings using AutoCAD software and will include any and all necessary information such as member sizing, connections, foundations and retaining wall details.

To simplify the project tasks, work has been divided into; site assessment, design and analysis, cost estimating and reporting.

5.1 Load Scenarios

In order to design the structural building elements, all loads must be known. Environmental loadings need to be determined as per the National Building Code of Canada. The building must be designed to resist wind and snow loads for the town of Logy Bay, or the closest available site, city of St. John's, if data for this site is unavailable. In addition to this, all interior loads will need to be known (i.e. mechanical equipment, laboratory equipment, etc...). This means that all intended uses of the structure will have to be taken into consideration. These considerations will include future plans for a school room on the second floor currently designed as the first floor roof.

Using the NBC all load scenarios will be completed for various wind directions and snow distributions. The slope of the roof must be taken into consideration as it will have a small slope. As well drifting on the roof over the first floor will need to be calculated.

The building's intended usage will determine the live loading and special considerations need to be taken during the design for Level 2 facility requirements. The concrete slab design will be designed for five foot high tanks assumed to be completely full of water.

5.2 Design and Analysis of Building System

This task contains all elements required for the building system. The sub-tasks include: load calculations, slab design, foundation design, retaining wall design, and superstructure and roof design.

5.2.1 Load Calculations

All load calculations will confer to the NBC 2010 edition.

5.2.2 Slab

The floor of this building will be constructed with concrete. Due to the intended building use, five foot high tanks filled with water will be placed on the main floor. Extra consideration will be taken in this area of the building. Additionally, a pathogen contamination treatment pit will be installed in the building requiring close examination.

5.2.3 Foundation

Strip footings will be required around the perimeter of the structure to transfer all loads from the perimeter columns and walls to the surrounding soils. This load transfer is designed not to cause excess soil settlement. Consideration of the second story and the proposed classroom addition to the second floor will govern the use of column footings throughout the building and slab thickness. All soil information required is included in the geotechnical report.

5.2.4 Retaining Wall

The proposed building in being placed in close proximity to an existing building, therefore a retaining wall will be required to prevent the soil from collapsing and damaging the two buildings. The retaining wall will be designed to resist the soil bearing pressure from above. All soil information required is included in the geotechnical report.

5.2.5 Superstructure

All structural supports and joists will be of steel frame design. This includes all columns, floor joists, connections, etc... Standard steel members will be used as they are the most accessible and economical option. All members sizing and placements will be determined from the load calculations.

5.2.6 Roof

The roof structure will be designed based on governing calculated load cases. From these, the most cost effective design will be chosen to reduce all costs associated with purchasing and installation.

5.3 Cost Estimating

Material and construction costs will be based on the design details. A Class D estimate will be prepared for the project and will come within a ± 25% of the actual cost. This will be a preliminary estimate provided for information purposes.

5.3.1 Quantity Take-Offs

All steel members will be quantified by their respective sizes. This will include beams, columns, truss members, cross bracing, etc... The volume of concrete specified will also be quantified for the entire project.

5.3.2 Unit Pricing

Unit pricing will be provided for all elements of the structure (i.e. steel, concrete,). All construction cost will also be determined and included in the unit pricing.

5.3.3 Cost Estimate Report

All quantity take-offs and their respective unit pricing will be included in a final report which will include totals before and after taxes. The final report will show cost breakdown by category elements (i.e. roof, foundation, retaining wall.)

5.4 Reporting

Reporting will consist of weekly progress reports for the client and course purposes. In addition to this, a final report and a final presentation will be completed to show the complete site and building analysis, design and analysis of the structure and a final cost estimate.

5.4.1 Weekly Progress Reports

Project progress reports will be created to inform the Client and Dr. Bruneau of the project development to date. These will highlight the work completed in the previous week, the work in progress and any upcoming tasks. They will also allow HRSC to track any outstanding information required from outside the company.

5.4.2 Final Report and Presentation

The final report and presentation will be the handoff prepared by HRSC for AE Consultants and 8700 Project course. It will include all relevant information required for the design and construction of the proposed project. Also included will be a full cost breakdown of the project and all design drawings outlining the proposed structure plan.

6.0 Project Plan

6.1 Course Related Milestones

A project plan including the requirements of the project and possible risks to its completion is due February 2, 2011. This plan will be a reference guide throughout the project life of the project details, responsibilities of HardRock Structural Consultants, scheduled tasks, and required client communications.

Project updates are due on Monday of each week. These updates will include the work completed in the previous week, work planned for the following week, any client correspondence, and any outstanding information or materials. These updates will be presented to the class in a 2 minute presentation, submitted to Dr. Bruneau, and provided to the client.

A final report is due to Dr. Bruneau on April 4, 2011 at 1000h. A copy of this report will also be provided to AE Consultants at this time. A presentation of the project and of the results of the final report will be given on April 5, 2011 from 1400h to 1700h.

6.2 Project Milestone

The milestones identified by HRSC include; completion of the site assessment and structure methodology, design and analysis of the structure, cost estimating, and completion of the final report and presentation. Each milestone comprises of a number of sub-task needed to complete to meet the deadline of April 4, 2011.

The site assessment comprises of an initial site visit to investigate the various locations and draw initial pros and cons from each of the three sites. The deliverable will include our final judgements about the location and any other alternative sites deemed possible. Also included in this deadline will be a design methodology of the building, including the material design decisions.

Design and analysis consist of the completion of load calculations, foundation design, retaining wall design, superstructure, slab design and the roof design. This will cover the entire design of the building system.

Cost estimating will required quantity take-offs and their respective unit prices to be determined from the design drawings created by HRSC, and relevant material information for St. John's, Newfoundland. The final report will comprise of all the findings for the cost estimates.

The final report and presentation will be compiled on an ongoing basis. The final report will comprise all findings during previous milestones and any other relevant design information required for ENGI 8700 project course.

6.3 Project Schedule

A detailed project schedule has been created and can be found in Appendix A, including all project milestones.

7.0 Estimated Project Expenditures

Consult Table 2for expected project expenditures.

Table 2 - Project Expenditures

Item	Date for Expense	Expected Cost	Actual Costs to date
Travel Expenses			
Fuel			
Site Visits	Various	$20.00	
Client Meetings	Various	$10.00	
Office Expenses			
SOQ (x5)			
Binding (x5)	Jan. 14, 2011	$1.50/each	$1.50 x 5 = $7.50
Gloss Paper	Jan. 14, 2011	$35.00	$19.98
Color Printing		$25.00	-
Purchased Color Ink Cartridge		-	$61.71
Meeting Agendas (min. 6)	Various	$1.00/each	
Project Progress Reports (min. 12)	Weekly	$1.00/each	
Project Journals (x4)	Jan. 15, 2011	$10.00/each	$10.16 x 4 = $40.64
Final Project (x2 copies)	April		
Paper		$20.00	
Binding (x2)		$1.50/each	
Final Presentation	April		
Presentation Materials		$40.00	
Software and Hardware			
RS Means	February	$60.00	
Steel handbook 10th Edition	February	$130.00	
	Total Costs	$408.50	$129.83

8.0 Deliverables

All deliverables associated with the project are detailed in Table 3.

Table 3 - Project Deliverables

Deliverable	Date	Decription
Project Plan	2011/02/02	Detailed documentation of project requirements and risks. Delivered to Dr. Bruneau. Copy submitted to AE Consultants for review.
Meeting Agendas	As required	To be presented to AE Consultants by email before every client meeting. These are to be cc'ed to Dr. Bruneau before every client meeting and are to be attached as Appendix in final report.
Project Progress Reports	Weekly	Hard copy to be submitted every Monday (unless otherwise rescheduled) at the beginning of every business meeting. Progress Reports are to detail work that has been completed, work that is planned for following week, and client correspondence. These are to be submitted as part of Appendices in final report.
Site Assessment and Building Design Study	2011/04/04	Detailed report on site alternatives and economics of building design and construction. Presented to client as part of final report. Hard copy and PDF.
Cost Estimate	2011/04/04	To be submitted as hard copy and as PDF as part of final report. Client requires Class D assessment (+/- 25%)
Journals	As required	Report of daily work tasks concerning the project. Each member is to be completing their own journal and all journals are to be submitted along with the final report.
Final Report	2011/04/04	To be submitted in hard copy and PDF to Dr. Bruneau and to AE Consultants. Final report is to include all materials required for project completion.
Final Presentation	2011/04/05	Presentation of project completion to be given for Dr. Bruneau and AE Consultants. May include other audience.

9.0 Risks and Vulnerability

Some of the risks currently present with this project are the availability of hardware and software. Currently, HardRock Structural Consultants have no access to cost estimating software. It is assumed at this time that each group will be able to obtain an education licence to RS Means at a cost of $60.00. Some hardware requirements may also pose a risk. The Client has asked that the 10th edition of the Steel Handbook be utilized during analysis; currently HardRock Structural Consultants are operating with the 9th edition of the text and will have to obtain to 10th edition before analysis can be completed. Difficulties in obtaining the required analysis material could delay the project schedule past the point of recovery.

There pose some risks in the Client availability throughout the project. As HardRock Structural Consultants will not be working during the normal working hours it may become difficult to contact the Client during off hours and awaiting milestone information may cause delays in the project execution. To help reduce these risks it is important to maintain contact with the Client and provide them with a weekly update of the progress of the project. Any outstanding information should then be caught the week prior and thereby provide the Client with time to deliver the information.

HardRock Structural Consultants are vulnerable to minor changes in scheduling. As each member of the team are registered in a minimum of 4 courses besides ENGI 8700, there exists the risk that members could become over-worked, especially during examination periods. To reduce the risks of burnout, it is important that the team has contingency time allocated in the schedule. It is important that work be completed in the time allocated and also that the team take time to have a beer or two.

Some risks are involved in implementation of Level 2 facility requirement. At this time the limitations of this requirement are unknown to HardRock Structural Consultants and therefore assumed timeframe for research and execution have been estimated. Changes to these estimates could significantly affect the project schedule.

HardRock Structural Consultants are aware of the risks involved in the execution of this project and have provided contingency plans to offset some of the risks. The company is confident that with close monitoring of the schedule progress we will be able to complete this project in the allocated time period.

10.0 References

Bruneau, Dr. Stephen. 8700 - Civil Engineering Project. 2011. 31 01 2011 <http://www.engr.mun.ca/~sbruneau/teaching/8700project/index.htm>.

Canadian Food Inspection Agency. Containment Standards for Facilities Handling Aquaduct Animals Pathogens. 19 March 2010. 21 January 2011 <http://www.inspection.gc.ca/english/sci/bio/anima/aqu/csfncich2e.shtml#a2.3.2>.

Canadian Institute for Steel Construction. Handbook of Steel Construction 9th Edition. Ontario: CISC, 2007.

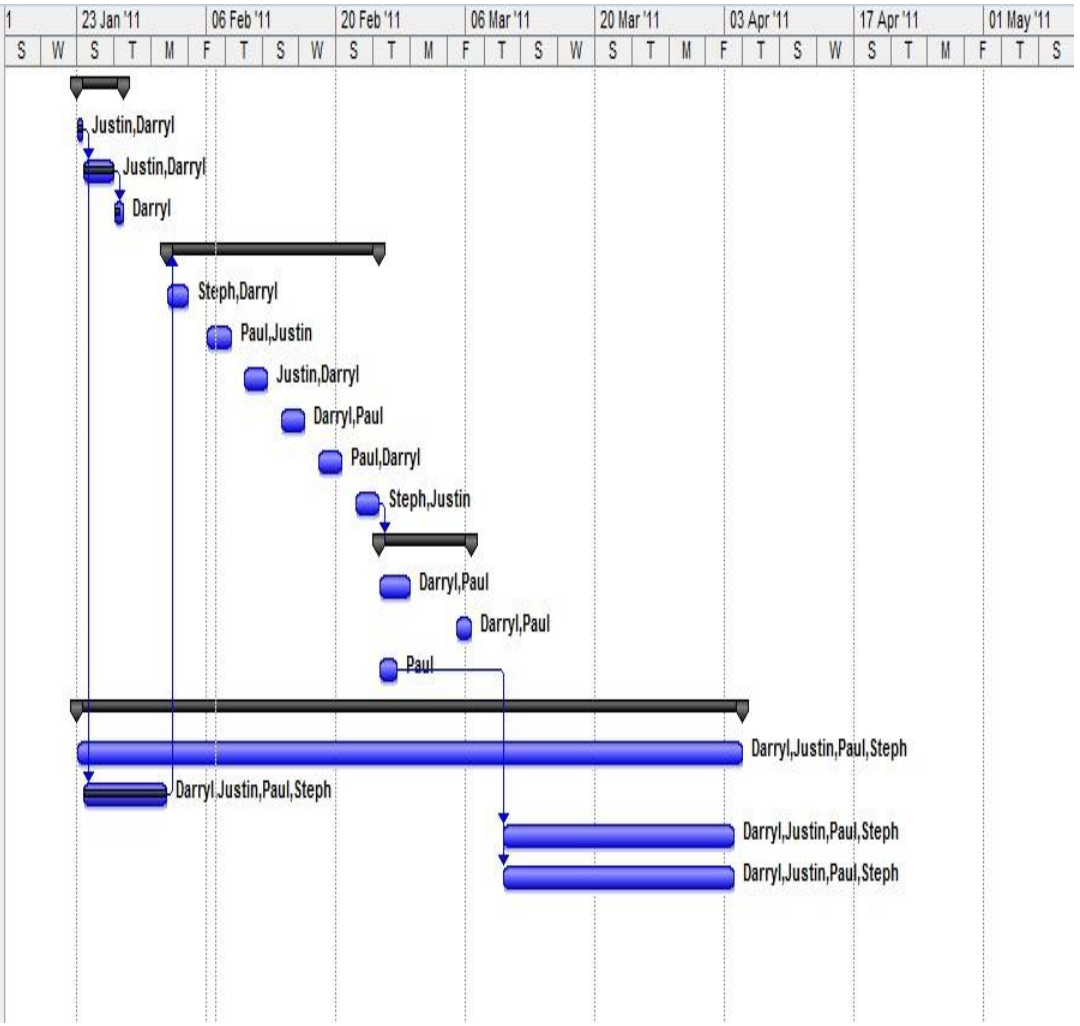
Cement Association of Canada. Concrete Design Handbook 3rd Edition. Ottawa: CAC, 2006.

Memorial University of Newfoundland. Ocean Science Center. 13 January 2011. 20 January 2011 <http://www.mun.ca/osc/Home/>.

Appendix A

Detailed Schedule

	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	**Site Assessment**	**5 days?**	**Sun 23/01/11**	**Thu 27/01/11**		
2	Site Visit	0.5 days?	Sun 23/01/11	Sun 23/01/11		Justin,Darryl
3	Analysis of Site Options	3.5 days	Sun 23/01/11	Wed 26/01/11	2	Justin,Darryl
4	Prepare Recommendatio	1 day?	Thu 27/01/11	Thu 27/01/11	3	Darryl
5	**Design and Analysis**	**23 days**	**Tue 01/02/11**	**Thu 24/02/11**	**18**	
6	Load Calculations	2.5 days	Tue 01/02/11	Thu 03/02/11		Steph,Darryl
7	Foundation Design	2.5 days	Sun 06/02/11	Tue 08/02/11		Paul,Justin
8	Retaining Wall Design	2.5 days	Thu 10/02/11	Sat 12/02/11		Justin,Darryl
9	Superstructure	2.5 days	Mon 14/02/11	Wed 16/02/11		Darryl,Paul
10	Slab Design	2.5 days	Fri 18/02/11	Sun 20/02/11		Paul,Darryl
11	Roof Design	2.5 days	Tue 22/02/11	Thu 24/02/11		Steph,Justin
12	**Cost Estimating**	**10 days**	**Thu 24/02/11**	**Sun 06/03/11**	**11**	
13	Quantity Take-offs	3.5 days	Thu 24/02/11	Sun 27/02/11		Darryl,Paul
14	Unit Pricing	1.5 days	Sat 05/03/11	Sun 06/03/11		Darryl,Paul
15	Prepare Final Estimate	2 days	Thu 24/02/11	Sat 26/02/11		Paul
16	**Reporting**	**72 days?**	**Sun 23/01/11**	**Mon 04/04/11**		
17	Weekly Reports	72 days?	Sun 23/01/11	Mon 04/04/11		Darryl,Justin,Paul,Steph
18	Work Plan	9 days	Sun 23/01/11	Tue 01/02/11	2	Darryl,Justin,Paul,Steph
19	Final Report	25 days?	Thu 10/03/11	Sun 03/04/11	15	Darryl,Justin,Paul,Steph
20	Final Presentation	25 days?	Thu 10/03/11	Sun 03/04/11	15	Darryl,Justin,Paul,Steph



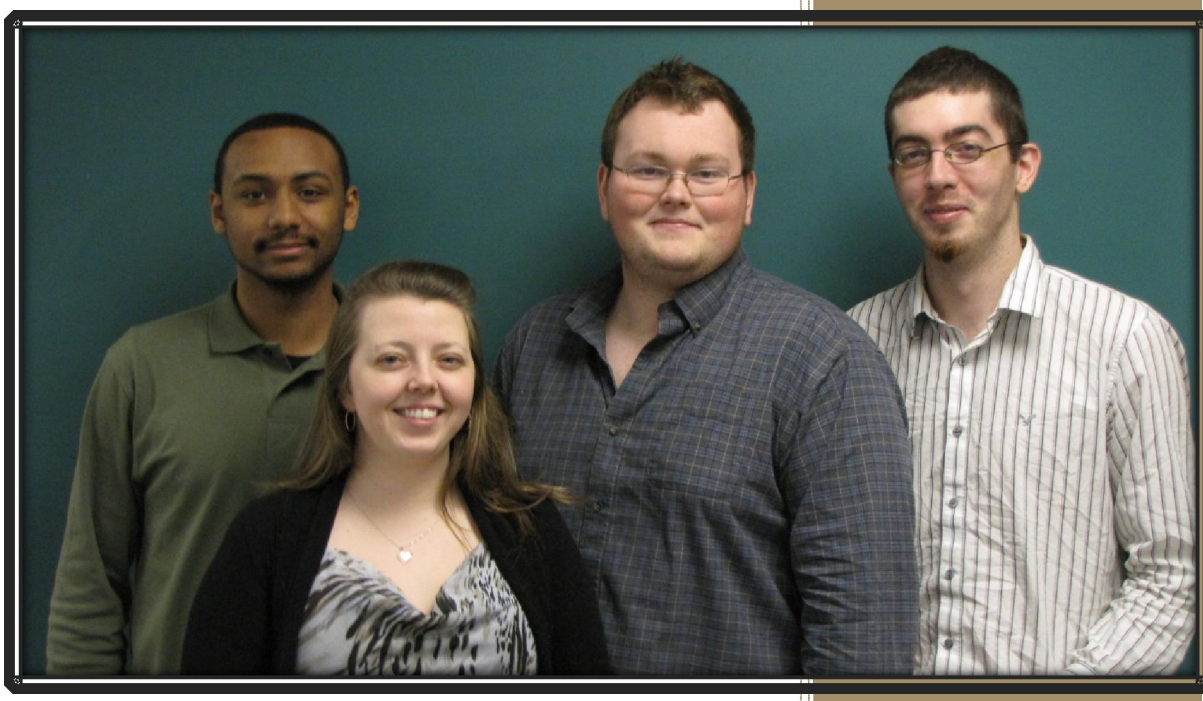
Appendix B

Statement of Qualifications

(Originally Submitted January 17, 2011)

HRSC

HARDROCK STRUCTURAL CONSULTANTS



Statement of Qualifications

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About HardRock Structural Consultants

HardRock Structural Consultants was formed from a history of group cooperation since 2007. The company was formed to satisfy a demand for structural consultants for project activities in senior engineering courses.

Our group experience includes works from a variety of civil fields. Included in this list is:

- Finite Element Analysis – design and analysis of steel frames
- Construction Management and Estimating – cost estimating and project scheduling for grade school expansion
- Geotechnical – design of concrete reinforced footing and mechanically stabilized earth (MSE) walls
- Structural Design – design and analysis of reinforced concrete

HardRock's diverse and varied work experiences, paired with well developed communication and problem solving skills allows the company to successfully compete in the structural field.

Mission Statement and Core Values

HardRock Structural Consultants strives in building its client relationship by providing dependable, timely service and exceeding client expectations.

We value providing:

- Support for members by following a team approach
- A quality product produced from committed members
- Inventive solutions from creative problem solvers

Services

HardRock Structural Consultants can provide their clients with a wide variety of services ranging from preliminary design to cost estimates. Services include:

- Structural Design and Analysis
- Finite Element Analysis
- Project Research and Development
- Cost Estimates
- Materials Engineering

Our wide range of services allows HRSC to meet any project in the structural field.

Organization

HardRock Structural Consultant's members have a wide range of skills and 3 years history of working together on a variety of projects. We believe that by applying the experience and knowledge we have obtained from working together we will be able to exceed our client's expectations and stay true to our core values.

Justin Mayo	Stephanie Randell	Paul Williams	Darrell Young
•Analysis and Design •Drafting	•Analysis and Design •Marketing and Communications	•Materials Engineering •Project Management	•Cost Estimating •Research and Development

Justin Mayo

Justin is currently fast-tracking his way through the Engineering Masters Program at Memorial University of Newfoundland. His grad studies focus on corrosion control of embedded reinforcement in concrete structures and he has acquired knowledge in design of concrete structures, concrete quality, and materials testing. He is also well skilled in drafting, project management, and structural analysis. Justin gained his experience from both private and public industries. While he has worked extensively in an office setting, analyzing, drafting, and managing a wide assortment of projects, his field experience involves inspections on upgrades of Her Majesty's penitentiary, site investigations, and cost estimates. Justin has also volunteered his time and experience in designing and testing Memorial University's entry to the Great Northern Concrete Toboggan Race (GNCTR) for the last two years.

Stephanie Randell

Stephanie is comfortable in both the office and on site and is well experienced in both. She has developed her career path around her love for structural architecture, focusing on design and analysis of steel structures, as well as, steel and concrete development and remediation inspections. She has working knowledge of an extensive number of design software programs including: S-Frame, S-Steel, Ansys, STAAD.PRO, MBS, and AutoCAD. Her work experience is mostly in analysis and design, structural inspections, and testing; further experience includes project management and cost estimating.

In addition, she is highly involved in both industry and community groups; she is the past Executive Director for the Consulting Engineers of Newfoundland and Labrador (CENL), and is an active member of Canada Green Building Council (CGBC) – Atlantic chapter, Engineers Without Borders (EWB) and St. John Ambulance (SJA) – Division 321.

Paul Williams

Paul is a highly motivated senior student in the civil engineering program. He has a strong background in the areas of project management and materials engineering. Through a variety of work experiences, he has been exposed to testing and analysis of materials in both laboratory and field settings. This experience includes acting as senior materials technician on the Trans Labrador Highway (TLH) widening project with AMEC E&E and materials technician at DOTW – Materials Engineering Department. Other experience includes project scheduling, resource/personnel management, project research, and site/safety inspections. Some examples of these involve feasibility research with C-Core, managing personnel and schedules for completing work on TLH paving, and inspecting completed work to determine job bonuses/penalties. In addition, he has developed extensive skills in numerous software including S-Frame, AutoCAD, ArcGIS, Microsoft applications, and MATLab.

Darrell Young

Darrell is an international engineering student from Belize. He has focused his studies towards structural engineering by working in the fields of construction and structural design and analysis. Through work terms in both Belize and Canada, Darrell has been exposed to various structural projects including the construction of Outer Cove Bridge and the preliminary surveys and subgrade design of the Conception Bay South bypass. He is proficient in the use of structural analysis programs such as STAAD.Pro and S-Frame, as well as drafting applications such as AutoCAD and Rhino 3D modeling. Other experience includes project management, progress reporting, site inspections for residential infrastructure, and drafting. Darrell has had work terms with Technip Canada, Belize Electric Company Ltd., Fortis Properties, Kavanagh and Associates, and the Department of Transportation and Works.

Selected Project Involvement

Northern Mill Building and 25T and 5T Crane Loading (Lead Structural Design and Analysis)

Concrete Toboggan for Great Northern Toboggan Race (Development, Testing, Drafting, Finite Element Analysis)

Industrial Metal Building (Connection Detailer, Design and Analysis)

Industrial Transport Repair and Storage Facility with 2x50T Crane and 20T Crane (Structural Design and Analysis)

Vaca Hydroelectric Dam Construction (Project Manager, Inspector)

Irving Refinery – Asphalt Side with Bridge Crossing (Design, Cost Estimating)

Outer Cove Bridge Replacement (Manager, Inspector)

CBS Bypass – Preliminary Survey and Subgrade (Project Manager, Inspector)

Trans Labrador Highway (THL) – Road Widening (Materials Testing, Project Management)

Pynn's Brook Veterinary Clinic Demolition (Lead Project Management)

Concrete Rehabilitation of the Gananoque Dam (Research and Development)

Road Network Management System Implementation (Design and Analysis, Testing)

Department of Transportation and Works (Materials Technician, Road Roughness Analysis)

Trans Labrador Highway (TLH) – Paving (Asphalt Testing)

Paint Shed Expansion (Lead Design and Analysis, Project Coordinator)

Corner Brook Long-Term Care Center (Assistance Project Manager, LEED research)

Hibernia South – Subsea Lifting (Hydrodynamic Analysis)

Hibernia Oil Riser – Hydrodynamic Loading (Design and Analysis)

C-Core – Subsea Bathymetric Mapping (Design, Development)

Fort Williams Building Renovations (Health and Safety)

Kenmount Terrace Site Inspection (Site Inspections)

C-Core – Iceberg in Subarctic (Analysis, Researcher)

RNC Annex – Fire Alarm System Upgrade (Project Manager)

C-Core Project Suite – Mining Projects (Researcher)

Provincial Government Transportation Warehouse – Strom Water Drainage (Investigator, Project Manager)

Churchill Falls (Labrador) Hydro – Concrete Controls and Spillway Dam (Structural Inspection)

East Saint John Pumphouse – Firewall Design (Design, Drafting)

HMP Upgrades and Repairs (Inspector)

Kenmount Road Tower (Site Inspector, Project Coordinator)

East Saint John Pier (Design and Drafting)

Contact

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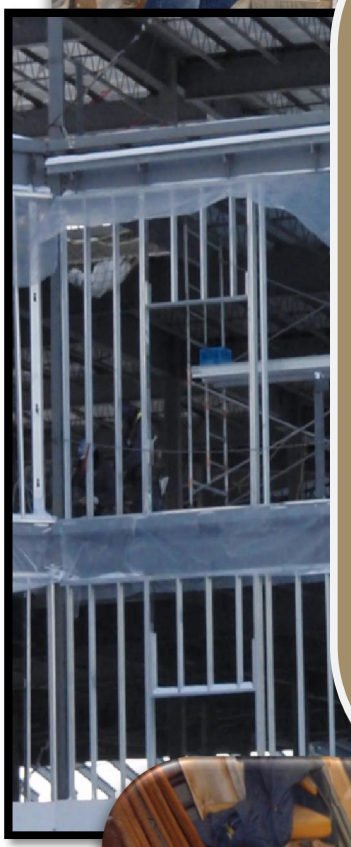

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