OFFSHORE SUPPLY BASE

ENGI 8700 CIVIL DESIGN
PROJECT PLAN

Submitted To: Dr. Bruneau
February 4, 2013

Team:
Alana Earle
Leanne Stein
Michael Luther
Victoria Smyth

Client:
Nick Gillis
Chris Fudge

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February 4, 2013

Mr. Chris Fudge, P.Eng. & Mr. Nick Gillis, P.Eng.
SNC Lavalin BAE Newplan
1133 Topsail Road
Mount Pearl, NL, A1N 5G2

Re: Project Plan – Offshore Supply Base

Dear Mr. Fudge and Mr. Gillis,

Please find enclosed a Project Plan for the design of the Offshore Supply Base as required by the Faculty of Engineering and Applied Science Civil Engineering Project course.

This plan contains a project description and statement of project requirements as discussed on Match Night and during our subsequent meeting on January 17, 2013. In addition, this document outlines our approach and methodologies for completing project work, including communication, research, preliminary structure analysis, and final design. A project schedule is also included and represents estimated durations for critical tasks and project milestones. Finally, summaries are provided for estimated costs associated with the execution of this project course, client deliverables, and anticipated risks throughout the course of this project.

Thank you for choosing Precision Engineering Consultants to undertake your project design. Should you have any questions or concerns regarding this project plan, please contact us at any time.

Kind Regards,

Victoria Smyth
Project Manager

Cc: Dr. Steve Bruneau, Ph.D., P.Eng.

Table of Contents

Section 1: Project Description

The Offshore Supply Base will be a double berth port used for supply vessels that are critical to offshore projects in Newfoundland and Labrador. Due to client confidentiality, the exact location of the project cannot be disclosed but will be referred to as the North side of St. John’s harbour.

The project scope includes a wharf and deck structure for the safe docking and mooring of CH-type supply vessels, a 200 ton mobile crane for supply operations, and an upland storage area. Vehicular traffic will also have access to the area.

The proposed location of the marine base presents unique structural challenges with respect to the terrain slope, geotechnical features, bathymetry, and the climatic conditions in the province. In addition, constructability must also be considered so as to reduce interruptions to the harbour’s operations and vessel traffic.

Finally, due to the project’s location and intended use, special design considerations must be made for site-specific ice, snow, wind, wave, and current loading. Additionally, in maintaining a socially responsible mindset, the sustainability and environmental effects of the selected structure will be taken into consideration throughout the optimum structure selection and will include research into environmentally friendly materials and effects on marine life.

Section 2: Project Requirements

Given the geotechnical, bathymetric, environmental, and operational conditions, a variety of structural concepts will be developed and evaluated for feasibility, cost effectiveness, and constructability. From this evaluation, a preliminary report will be submitted and the optimum structure selected. The optimum structure will then include a detailed design, cost analysis, construction schedule, and final drawings.

The Project Scope of Work requires the following components be completed:

- Determination of environmental loading (wind, waves, snow, and ice)
- Calculation of vessel loading (mooring and berthing loads for 2 vessels)
- Calculation of operational loading (vehicle traffic, crane loads, storage)
- Development of design concepts including preliminary design and cost
- Evaluation of design concepts and optimum design selection
- Detailed design of final structure, deck, and fender system
- Quantity take-off and cost estimate
- Creation of a construction schedule
- Preparation of design drawings

Upon completion of project work, the client and course instructor will be provided with a final report and presentation, as well as a project binder containing hard copies of all required deliverables.

Section 3: Methodology

3.1 Project Organization

3.1.1 Team Roles & Responsibilities

Precision Engineering Consultants is a team of four members: Victoria Smyth, Michael Luther, Alana Earle, and Leanne Stein. The team has a diverse background in project management, as well as structural, hydrological, and geotechnical engineering. Our statement of qualifications for this project can be found in *Appendix I.* In order to manage tasks and ensure the project is completed in an organized and efficient manner, the following roles and responsibilities have been assigned to each team member:

1. Victoria Smyth – Project Manager
    - Delegate work amongst team members
    - Ensure deadlines are met and that project schedule is updated
    - Review and compile finished work into project deliverables
    - Correspondence with client and other industry contacts
    - Preparation of templates, meeting agendas, meeting minutes
    - Provide leadership and guidance towards project deadlines and milestones

2. Michael Luther – Software Manager & Lead Drafter
    - Structural software support and troubleshooting
    - Preparation of preliminary and final design drawings
    - Weekly updates of project schedule
    - Creation of construction schedule

3. Alana Earle – Design Manager
    - Provide knowledge of applicable design codes and standards
    - Coordinate and lead preliminary and detailed design process
    - Liaison with the software manager in preparation of drawings

4. Leanne Stein – Costing Manager
    - Liaison with Design Manager and Lead Drafter during the detailed design process to determine quantities for take-off parallel with design work
    - Coordinate and lead cost analysis process
    - Create cost analysis report and spreadsheets

3.1.2 Organizational Tools

As this project is executed, various organizational tools will be employed to ensure that tasks are completed accurately and efficiently. Primarily, client meetings will follow a set agenda which will be forwarded to all appropriate parties one week prior to the meeting date. The minutes of the meeting will be formally recorded and a list of action items assigned when applicable. Team meetings and discussions will take place in both a formal setting with a set agenda and minutes, as well as a more informal environment where the floor will be open to creative brainstorming and dialogue. All meetings will be tracked through the use of minutes, action lists, and logbooks. To record progress and ensure individual action items are addressed, each team member will maintain a personal logbook. This logbook will also be used in conjunction with team meetings and brainstorming sessions to bring forward team ideas.

In keeping accurate records throughout the course of the project, an electronic and hard-copy filing system will be used. All electronic documents will be saved in an online database where it can be viewed by all members and the client when needed, and will also be backed up on an external hard drive. All paper copies of project work will be kept in a project binder organized according to task. Finally, all project deliverables will be stored both electronically and in this project binder for easy access when necessary.

3.1.3 Communication & Meetings

To establish effective communication amongst team members and with the client, an e-mail account has been established, as well as instant messaging. This common communication facet will allow for meetings to be organized, ideas to be exchanged, simple questions to be posed and answered, and documents sent around for review as appropriate.

Currently, it is not deemed necessary to meet with the client each week and meetings will be set up on a foreseeable need basis with ongoing progress updates via e-mail in the interim. In addition, the team meets 3-4 times a week with individual work taking place outside these meetings.

3.2 Client Interface

3.2.1 Client Role

The role of the client is to provide an accurate and specific project scope which highlights significant or critical aspects of the problem under consideration. When applicable, the client will supply site-specific data such as geotechnical information and loading conditions. In addition, once the preliminary research and design phases have been completed and a preliminary design report submitted, it is expected that the client will review and approve the report and strategy for selecting an optimum design. Furthermore, once the optimum design has been awarded, it is anticipated that the client will play a guiding role during the detailed design and cost analysis phase.

Furthermore, in cases where specific data, reference material, or software is not available to the group, the client will provide access or approve an alternative route or assumption in order for work to progress.

3.2.2 Desired Outcomes

The client requires the optimum design of an Offshore Supply Base for the supply and resupply of Offshore Projects in Newfoundland and Labrador. This option will be chosen following preliminary research, design, costing, and feasibility analyses of a number of possible design solutions. Once the optimum structural solution has been selected, a complete and detailed design, including a thorough assessment of all loads, cost estimate, drawings, and construction schedule, will be submitted as part of a final design report.

3.3 Approach

3.3.1 Research

In order to gain a better understanding of the planning and design of marine structures, research will be conducted during the initial phase of the project. This research will focus primarily on four concepts – piles, sheet pile cells, caissons, and sheet pile bulkhead walls, but will also encompass anticipated load types and combinations, wharf decks, supply cranes, fender and mooring systems, and other general wharf features to be designed.

All research will be conducted using resources such as reference texts recommended by the client and an engineering librarian, industry experts, online journals, and any other accredited online resources. For more detailed information surrounding resources, please see section *3.4 Available Resources.*

3.3.2 Design

Upon completing the research phase of the project, the design phase will be completed in two stages – preliminary design and detailed design. This approach allows the team to utilize compiled research to evaluate four possible structures and determine the optimum structure prior to detailed design. These stages are discussed in detail in *Section 4: Tasks*.

In completing both design stages, it is critical that all load types be identified and load cases properly determined. This will involve obtaining the correct environmental and operational data to be converted into forces on the structure. Applied and resisting forces will be calculated according to the partial safety factor method by applying partial safety factors on both. Hand calculations, along with excel spreadsheets, will be used to obtain member sizes and any necessary anchorage. In cases where large quantities of load combinations are to be considered, a structural model will be analyzed using computer software.

Once designs have been revised as required, they will then be conveyed through construction drawings representing plan and section views of the proposed structures;

this will take place during both the preliminary and detailed design phase with final drawings being issued only during the detailed stage.

It is also important to note that throughout the design process, the structure lifecycle will be considered in the selection of materials. Our design will aim to be environmentally responsible with sustainable materials such as those that are reusable, biodegradable, or require fewer resources to create.

3.3.3 Cost Analysis

A unit rate method will be used to complete the primary cost analysis for each of the four design concepts. Material and quantity take-offs will be completed using the primary designs and associated drawings. Unit rate data will be obtained through various suppliers and industry standards. Any rates which are inaccessible will be obtained from CostWorks software or historical data.

The cost estimates in the preliminary phase will include only the structural materials required for each design concept and will be used during the optimum structure selection process. The level of accuracy will primarily depend on the design calculation and is expected to lie within +/- 20% of the actual material costs. In the event that multiple options have comparable costs, an assessment of risk and sustainability will be used to determine the more desirable option.

A final cost estimate will be completed once the optimal structural system is selected and the final design and drawings are finished. This cost estimate will include all the materials, resources, and man-hours required for construction of the optimum supply base.

3.4 Available Resources

During the research, evaluation, and design phases of the project, applicable codes and standards will be used as recommended by the client. These include:

1. A23.3 Design of Concrete Structures
2. A23.1 Concrete materials and methods of testing (constructability)
3. S471 General requirements, design criteria, the environment, and loads
4. S474 Concrete Structures
5. S6 Canadian Highway Bridge Design
6. S16.1 Limit States Design of Steel Structures
7. A23.4 Precast Concrete – Materials and Construction
8. 20/40.21 General Requirements for Rolled or Welded Structural Quality Steel
9. W59 Welded Steel Construction
10. National Building Code of Canada
11. US Army Corps of Engineering Coastal Engineering Manual 1110-2-1100

For scheduling, planning, organizational, and structural evaluation aids, the following software will be used throughout the project:

- S-Frame: For the determination of load combinations and structure modeling
- Auto-CAD: For creation of engineering drawings
- Microsoft Project: For creation and management of the project schedule

In addition, industry experts will be retained in order to provide guidance and support to the team when required. Key personnel are listed below.

Name	**Affiliation**	**Expertise**	**Contact**
Amgad Hussein	Memorial University	Software	ahussein@mun.ca
Steve Bruneau	Memorial University	Coastal Engineering	sbruneau@engr.mun.ca
Seshu Adluri	Memorial University	Steel Design	adluri@engr.mun.ca
Chris Fudge	SNC Lavalin	Marine Engineering	Chris.Fudge@snclavalin.com
Nick Gillis	SNC Lavalin	Marine Engineering	Nick.Gillis@snclavalin.com
Dianne Taylor-Harding	Memorial University	Engineering Research	dtaylor@mun.ca

3.5 Project Deliverables

Project deliverables are an important aspect of this project as they track the team's progress and aid in presenting and communicating all relevant information to the course instructor and client. The majority of these deliverables will be detailed reports and well-organized representations of work completed through the execution of the project. In addition to the project plan submitted herein, a preliminary design and optimum structure selection report will be submitted to the client, as well as final design report and presentation, which will be submitted to the instructor and client upon project termination on April 1, 2013. All reports, presentations, and any software outputs including drawings and schedules will be available in hard and electronic copies.

Additional deliverables include a date and task organized project binder containing project correspondence, meeting agendas and minutes, weekly progress reports, brainstorming session notes, and any other relevant material compiled throughout the project.

3.6 Troubleshooting

There is a significant risk of various issues arising throughout the course of this project that have the potential to negatively impact the project schedule. These risks are discussed in detail in *Section 8: Risks.*

In having an established mitigation and troubleshooting process, we aim to eliminate or reduce any schedule impacts stemming from project concerns. Upon encountering any issues or problems during the project execution, the team will first look to overcome these issues through internal discussion and research. When this method is unable to resolve the issue, we will then seek outside help in the form of engineering resource personnel or through consultation with our client. In some cases, additional guidance may be found via the course instructor or other industry experts.

Section 4: Tasks

The team has indentified the following primary tasks required in the development and execution of this project. Each of these tasks falls under one of the three project phases: research, preliminary design, or detailed design.

- Research:
    1. Site Investigation
    2. Site Layout
    3. Structure Alternatives
    4. Loads & Load Combinations
- Preliminary Design:
    1. Design of Alternatives
    2. Review Drawings
    3. Preliminary Cost Estimates
    4. Optimum Structure Selection & Recommendation Report
- Detailed Design:
    1. Final Design
    2. Review & Issued for Construction Drawings
    3. Cost Analysis
    4. Construction Schedule
    5. Recommendations & Final Deliverables

4.1 Research

4.1.1 Site Investigation

A site investigation will be completed to determine the conditions surrounding the proposed structure. For example, the depth of water, ice, and wind conditions, weather patterns, geotechnical features, nearby structures, and the amount of space available. Such an investigation is required to determine the loading and resistance expected during the planed lifetime of the structure. Victoria will obtain all available data from Chris Fudge, the client representative. Leanne will be responsible for the evaluation of the geotechnical report and determining the relevant conditions for design. Alana will analyze the operational conditions of the wharf structure and subsequent loadings, while Mike will evaluate the environmental conditions and associated loads. These tasks will start immediately and three days have been allocated for its completion.

4.1.2 Site Layout

As previously discussed, the proposed structure is required to accommodate a minimum of two CH-type vessels. Therefore the size, orientation, and docking arrangement of the structure must be determined. The layout of bollards, fenders, and other such docking equipment must also be established. Once the site investigation is complete and the available area is known, the team will meet and present various layout plans from which we will choose the most practical. In order to have a visual understanding of a similar site, our team will complete a site visit to the Harvey Dock in St. Johns. Within our schedule, one day has been allocated for completion of the site layout.

4.1.3 Structure Alternatives

In assessing the proposed problem, the team will evaluate multiple solution possibilities prior to recommending an optimum structure for detailed design and construction. In doing so, the team will research various possible docking structures and determine which we consider to be the optimum selection based on cost, time, material, constructability, lifespan, and safety. The different structures include concrete or steel piling systems, concrete caissons, sheet pile cells, and sheet pile bulk head walls. Each structure will be researched to obtain background knowledge, applicability, and economics as well as to outline the pros and cons. Research will start immediately following our first kick-off meeting by all members of the team. Each member will complete in-depth research on one structure in particular. A time period of eight days will be permitted for research.

4.1.4 Loads & Load Combinations

Prior to the design and sizing of the structure components, all applicable loads must be identified and calculated based upon the current and future site conditions for the intended life span of the structure. Loads will include:

1. Lateral loads from berthing forces transmitted through fenders
2. Lateral loads from mooring operations
3. Lateral loads from wave forces
4. Current drag on the structure and moored vessels
5. Lateral loads from wind forces on the berthing head, moored ships, stacked cargo
6. Compressive uplift forces induced by overturning movements due to loads 1-5
7. Compressive loads from the dead weight of structure and applicable live loads
8. Vertical and lateral loads from snow and ice
9. Seismic loads

Load combinations of short-term normal loads and long term extreme loads will then be evaluated. With the use of various offshore design text books, Alana and Victoria will be responsible to determine all of the various load types and combinations. Two days will be allocated for this task and then a meeting with the client will be scheduled for load verification and approval prior to commencing the preliminary design phase.

4.2 Preliminary Design

4.2.1 Design of Alternatives

Based on the calculated loads and load combinations, Alana will lead the primary design of each structure to determine member sizing, toe depth, and the use of anchorage. Seven days has been scheduled for the completion of the primary design for all four structures. Resources to be used for this task are sample designs, compiled research, and S-Frame structural software.

4.2.2 Review Drawings

Following the site evaluation, Mike will begin developing a set of drawings for the project. Initially, a drawing indicating the overall environment of the site will be completed to show the plan view and applicable borehole samples. As the preliminary designs progress, a drawing to show the general layout will be completed for each possible docking structure and will be used in the costing stage. These preliminary drawings are scheduled to be completed in five days and will require the use of AutoCAD 2010.

4.2.3 Preliminary Cost Estimates

Following the completion of the preliminary designs, Leanne will coordinate with Mike to complete preliminary cost estimates for each structure to be used during the optimum structure selection process. These cost estimates are scheduled for five days and will require unit cost information from the client, suppliers, cost software, or previous experience, as appropriate.

4.2.4 Optimum Structure Selection & Recommendation

Based on our findings during the preliminary assessment of each potential structure, the optimum structure will be chosen within two days by means of a selection matrix based on cost, constructability, safety, and sustainability criteria. At this time, a report will also be submitted to the client indicating our methodology and recommendation. This task represents a project milestone and the end of the preliminary phase. Once the optimum structure has been approved by the client, the detailed design phase can commence.

4.3 Detailed Design

4.3.1 Final Design

Alana will again lead the task of completing the detailed design for the entire structure. This will include detailing the structural system, wharf deck, and reinforcement, as well as the mooring, fender, and storage systems. In order to create the detailed design, loading conditions and combinations may be modeled using S-Frame and appropriate mooring and fender systems will be selected from a client-recommended list of manufacturers once the design values are determined.

This design stage will aid in the material take-offs and construction drawings, and will be performed concurrently with these tasks over a three week period.

4.3.2 Issued for Construction Drawings

The final drawings will be created by Mike using AutoCAD 2010. This activity will run parallel to the detailed design, with a delayed start. As the design progresses, Mike will be able to add the design features to the drawings already created during the preliminary phase. Once these drawings reach the 60% complete phase, they will be submitted to the client for review as per request. Once approved, the drawings will continue to the 90% stage where they will again be reviewed for any final requests by the client. Finally, the Issued for Construction Drawings will be finalized including plan and typical cross section views of the designed wharf, as well as any special views required by the client.

4.3.3 Cost Analysis

As the final design and drawings commence, more accurate quantity take-offs can be completed and a final cost analysis compiled. Similar to the drawings tasks, this activity will run simultaneously during the detailed design phase and will have a delayed start from the Issued for Construction Drawings start date.

To complete this task, unit prices will be obtained from the client, suppliers, or CostWorks databases as required. The final cost analysis will be conducted to a level of accuracy as deemed appropriate by the client and will be determined later in the project. This task will be lead by Leanne who will coordinate with Alana and Mike during the design and drafting stages to complete the cost analysis concurrently.

4.3.4 Construction Schedule

As requested by the client, prior to project completion, a construction schedule for the designed structure will be created in Microsoft Project 2010. This schedule will be a collaborative effort by the team drawing on everyone’s work experience in determining the work break down structure, assessing man-hours needed to construct the project, and ultimately scheduling the construction phase.

4.3.5 Recommendations & Final Deliverables

To complete the detailed design phase, and in due course the project, the team will submit a final report recommending the final design and construction methodology to both the client and the course instructor. This report will include the detailed design, construction drawings, costs analysis, and the construction schedule, as well as all other required deliverables as set out in this plan.

Section 5: Schedule

With only a short eleven weeks to reach project completion, the team has collaborated to create a Gantt chart using MS Project to outline the schedule and tasks that will guide the design of the Offshore Supply Base. This schedule will be ever changing, with updates expected weekly as tasks and their durations become more critical. By using this tool, we aim to eliminate any delays to the project while also facilitating greater organization within the group.

The schedule presented here summarizes the entire project from start on January 14, 2013 to completion on April 1, 2013. It currently lists tasks and durations as identified during the initial phase of the project but these tasks and durations are subject to change or further breakdown as the project progresses. However, any changes to the schedule will not affect milestone completion dates.

As presented on the schedule, the project timeline follows a phased linear relationship with overlaps between the 3 phases. Within each phase there are also parallel or concurrent activities. This schedule type was created based on the research, preliminary design, and detailed design phases, with each phase separated by a milestone event. As each phase is executed, tasks are completed concurrently amongst team members and as that phase nears completion, preparation for the completion milestone and next phase begin. The durations for each task and phase as a whole were estimated based on the team’s combined knowledge and experience. A time-frame contingency was allowed such that each phase has float time in each task’s duration estimation to reduce the risk of milestone dates being delayed. This contingency involves the use of weekends and statutory holidays as represented on the Gantt chart by days highlighted in blue.

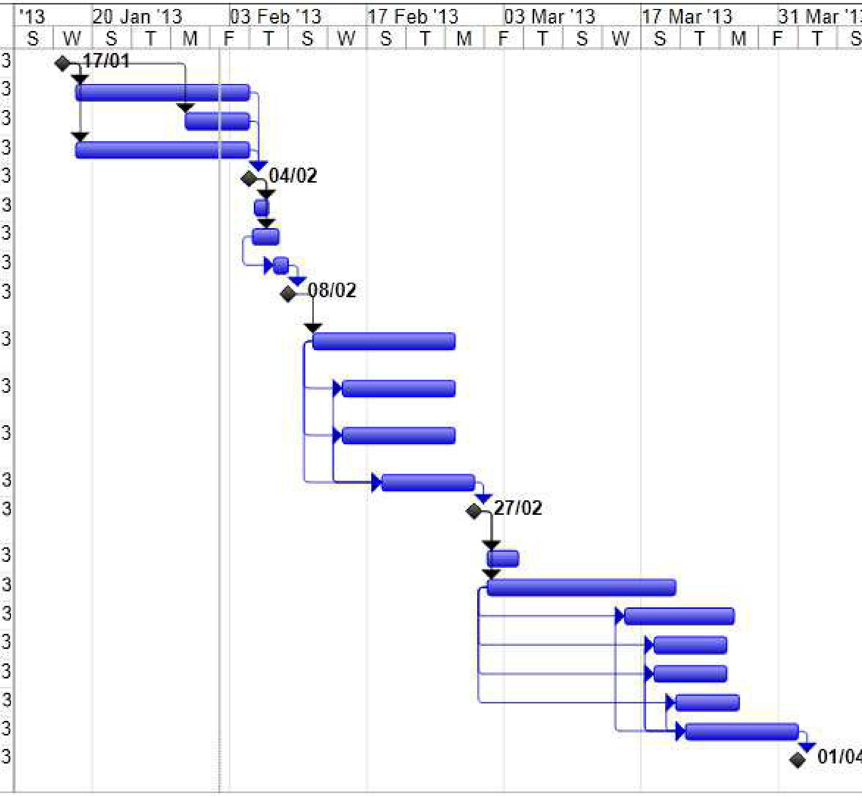
The first steps within the design of the Offshore Supply Base will be the gathering of information. This will start with obtaining design information from the client, completing a site investigation, and researching possible solutions for the problem criteria. In the interest of time, these three tasks will be completed simultaneously. The end of this phase will be marked by an approval meeting milestone with the client prior to continuing on to the preliminary design phase.

The preliminary design phase will follow with four structure alternatives being assessed simultaneously through feasibility, design, and costing. Once this task is complete, the optimum structure selection process will begin and a selection matrix will be employed. The completion of this task will be highlighted by the submission of an Optimum Structure Recommendation Report to the client outlining the selected design and our team`s justification.

Upon approval of the optimum structure, we will then begin the detailed design of the project. As this progresses, individuals will work closely with other roles within the team to coordinate the completion of the detailed design drawings and material takes-offs simultaneously. As this process is ongoing, a detailed cost analysis and the creation of a construction schedule can commence using the already completed sections of design and take-offs. In addition to this process, the final report and presentation preparation will also begin and will run parallel to these tasks to allow for some float time at the end of the project prior to our submission deadline. Final submission will take place on April 1, 2013, as highlighted by the final milestone included within the Gantt chart.

A copy of the schedule and work break down can be found on the following page.

ID		Task Name	Duration	Start	Finish
1		Project Start	0 days	Thu 17/01/13	Thu 17/01/13
2		Create Project Plan	8 days	Fri 18/01/13	Mon 04/02/13
3		Site Investigation	3 days	Tue 29/01/13	Mon 04/02/13
4		Structure Type Research	8 days	Fri 18/01/13	Mon 04/02/13
5		Project Plan Due date	0 days	Mon 04/02/13	Mon 04/02/13
6		Site Layout	1 day	Tue 05/02/13	Wed 06/02/13
7		Load Determination	2 days	Tue 05/02/13	Thu 07/02/13
8		Load Review Meeting SNC	1 day	Thu 07/02/13	Fri 08/02/13
9		Approval to proceed with Prelim. Designs	0 days	Fri 08/02/13	Fri 08/02/13
10		Preliminary Design (Options 1 to 4)	7 days	Mon 11/02/13	Mon 25/02/13
11		Preliminary Drawings (Options 1 to 4)	5 days	Thu 14/02/13	Mon 25/02/13
12		Preliminary Cost Estimates (Options 1 to 4)	5 days	Thu 14/02/13	Mon 25/02/13
13		Option Selection Matrix & Report	5 days	Mon 18/02/13	Wed 27/02/13
14		Option Selection Report Submission to SNC	0 days	Wed 27/02/13	Wed 27/02/13
15		60% IFC Drawings	1 day	Fri 01/03/13	Mon 04/03/13
16		Detailed Design	9 days	Fri 01/03/13	Wed 20/03/13
17		Material Take off	5 days	Fri 15/03/13	Tue 26/03/13
18		Cost Analysis	4 days	Mon 18/03/13	Mon 25/03/13
19		IFC Drawings	4 days	Mon 18/03/13	Mon 25/03/13
20		Construction Schedule	3 days	Wed 20/03/13	Tue 26/03/13
21		Final Report Preparation	5 days	Thu 21/03/13	Mon 01/04/13
22		Presentation and Final Report Submission	0 days	Mon 01/04/13	Mon 01/04/13



Project: Offshore Supply Base
Date: Feb. 4 2013

Task	External Milestone	Manual Summary Rollup
Split	Inactive Task	Manual Summary
Milestone	Inactive Milestone	Start-only
Summary	Inactive Summary	Finish-only
Project Summary	Manual Task	Progress
External Tasks	Duration-only	Deadline

Section 6: Costs

The bulk of the costs associated with project completion will arise from the printing and binding requirements for deliverables submission. In total, two copies of both the final report and project work plan, as well as a copy of the Option Selection Report will need to be printed and bound for submission. Log books, a project binder, and paper will also need to be purchased. The total cost for the project is estimated at $200.00. A breakdown of the costs is shown below.

Item	Qty	Unit Price	Cost
Paper	500 sheets	$0.01	$5.00
Binding + Colour Printing	5 reports	$30.00	$150.00
Project Binder	1	$5.00	$5.00
Log Books	4	$10.00	$40.00
Total			$200.00

Section 7: Deliverables

Throughout the course of the project, there will be client and course specific deliverables with some anticipated overlap between the two.

7.1 Course Requirements

The following lists course deliverables and applicable submission dates:

- Statement of Qualifications (Jan 10, 2013)
- Project Work Plan (Feb 4, 2013)
- Weekly Progress Reports (Weekly)
- Final Report and Presentation (April 1, 2013)
- Project Binder (April 1, 2013)
  - Personal resumes
  - Group Statement of Qualifications
  - Project Description as provided by client
  - All meeting agendas (one page per meeting)
  - All meeting minutes (one page per meeting)
  - Project Plan as submitted
  - Progress reports as submitted
  - The Final Report
  - And, the Final Report presentation (small slides)
- PDF copy of All files (April 1, 2013)

7.2 Client Requirements

The following lists client deliverables and applicable submission dates:

- Statement of Qualifications (Jan 10, 2013)
- Project Work Plan (Feb 5, 2013)
- Optimum Structure Recommendation Report (Feb 27, 2013)
  - Preliminary designs and software outputs
  - Preliminary drawings
  - Preliminary cost Estimates
  - Optimum structure selection strategy and recommendation
- 60% review drawings (First week of March)
- Design calculations, software outputs and crawings (April 1, 2013)
- Cost analysis and construction schedule (April 1, 2013)
- Final Report (April 1, 2013)
- Electronic copies of all files

Section 8: Risks

Risks are an inherent part of every project and when encountered can have negative impacts on a project's schedule. Identification is a crucial step in risk management and is used to determine mitigation measures. As discussed previously, we aim to eliminate or reduce the impact of these risks through our troubleshooting process. The most significant risks we identified include:

- Inadequate Access to Software – Project software is only accessible on campus computers. With a rather large class size and limited computers equipped with the needed software there may be delays in productivity.
- Weather Delays – With Newfoundland's hard to predict weather, some delays may arise from power outages or closures due to storms.
- Geotechnical Report Delay – With a slight delay in the Geotechnical report, possible brainstorming of design solutions may have to be put on hold until further information about the site becomes available or appropriate assumptions can be made.
- Unfamiliarity with Marine Design – With very little experience within this field of civil engineering, a large amount of research has to be completed on the structure types and loads encountered with marine design. Given the team's inexperience, delays could be encountered during the research and learning phase of the project.

Section 9: References

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Appendix I: *Statement of Qualifications*

PEC

PRECISION ENGINEERING CONSULTANTS

Targeting Exceptional Project Delivery - Safely & Efficiently

Contact Information

Memorial University of Newfoundland
S.J. Carew Building
St. John's, NL, A1B 3X5
Email: PrecisionEngConsultants@gmail.com

Consulting | Design | Project Management | Field Services

Our team is committed to finding you the best solution – one that aims to solve your problem in the safest and most efficient way possible. Let our innovation and diverse experience plan & deliver your project on target.

Companies don't solve problems, people do.

LET OUR EXPERIENCED TEAM DEVELOP THE BEST SOLUTION FOR YOU.

OUR VISION

We strive to build strong and lasting relationships with our clients and provide customer satisfaction every time. In doing so, we aim to put our team's diverse experience and talents to use, while also continuously expanding our own knowledge and skills through new technology and innovative ideas.

OUR VALUES

SAFETY: We are committed to a safe work place and strive to go above and beyond industry regulations to ensure the safety of everyone.

INTEGRITY: We maintain the highest ethical standards and ascertain honesty and equality in all aspects of our company and work.

ADAPTIBILITY: We aim to adapt to changes and challenges professionally and competently.

DELIVERY EXCELLENCE: We endeavor to deliver outstanding projects safely and efficiently.

ABOUT US

PRECISION ENGINEERING CONSULTANTS is comprised of four civil engineering students with diverse backgrounds and experience allowing us to deliver innovative solutions and exceptional projects.

Collectively, we have been involved in many major projects nationwide and use this experience to meet our client's needs and objectives in a multitude of business sectors and industries.

We provide engineering consulting services in these fields:

- Design & Construction
- Mining & Processing
- Oil & Gas
- Heavy Civil & Earthworks
- Environmental
- Municipal

BUILDING RELATIONSHIPS

Our goal is to develop and maintain strong relationships amongst our clients by providing outstanding service in a timely manner.

INNOVATIVE SOLUTIONS

With our wide range of experience and services, we offer extensive strength in developing, planning, and executing innovative solutions that are adaptable to your changing needs.

SOFTWARE & TECHNOLOGY

Our team has developed skills utilizing several forms of software in various fields. We offer a strong ability to adopt new technological skills as required.

We Have Diverse Experience and Innovative Ideas. How Can We Help You?

Consulting | Design | Project Management | Field Services

VICTORIA SMYTH

Victoria Smyth is a senior civil engineering student with a diverse background in fields such as mining, oil and gas, transportation, geotechnical, heavy civil construction, and aviation. She has extensive experience in construction management, earthworks, structural remediation, and mining - highlighted by her undertaking of the Earthworks Supervisor and Project Coordinator role at the Calgary International Airport Runway Development Project. In addition to her enthusiasm for project and construction management, Victoria brings well-developed communication skills, leadership abilities, and a strong work ethic to the PEC team.

MICHAEL LUTHER

Michael Luther is a senior civil engineering student at Memorial University of Newfoundland. Michael has valuable experience in a wide variety of engineering disciplines and roles, including project management, hydrology, geotechnical, construction, and municipal engineering. His experiences include supervision of Dam and Spillway Rehabilitation, construction project management, soil and concrete testing, and hydrology analysis. His main areas of interest include hydrological engineering, as well as construction and design. Michael contributes to the PEC team through his outstanding work ethic and his positive attitude and enthusiasm.

LEANNE STEIN

Leanne Stein is a senior civil engineering student with extensive experience in the geotechnical, heavy civil construction, and mining fields. Leanne has worked in various roles including geotechnical field investigations, geotechnical reporting, as well as compiling and reviewing mine plans for development, rehabilitation, and closure. Leanne has excelled as a member of teams involved with several large construction and mining projects across the country, and as a result provides an acute level of communication, organization, and professionalism to the team.

ALANA EARLE

Alana Earle is currently enrolled in Term 8 of Civil Engineering at Memorial University. Through the successful completion of 5 work terms, she was able to gain a variety of valuable experience in project management, geostructural design, quality assurance, and construction management. With a passion for and expertise of heavy civil construction, Alana has proven herself to be a key player in our team, bringing to the table her hardworking attitude, excellent time-management skills, and strong work ethic.

Services that Deliver. Projects that Inspire.

OUR TEAM HAS EXPERIENCE IN DIVERSE PROJECTS NATIONWIDE

OUR PROJECTS

- Exterior Redesign of Amalgamated Academy
- Calgary International Airport Runway Development Project & Airport Trail Tunnel
- Canadian Natural Resources Ltd. Oil Sands Mining
- Syncrude Canada Ltd. Mine Structure, Tailings & Haul Road Construction
- Greater Toronto Area Shoring System Design
- Long Harbour Processing Facility
- Rio Tinto - Iron Ore Company of Canada Carol Lake Project Structural Remediation
- Rio Tinto - Iron Ore Fire Truck Customization & Procurement
- Rio Tinto - Iron Ore Company of Canada Plateau Dolomite Quarry
- Alderon Project
- Sandy Pond Access Road Construction
- Highway 63 Twinning and Overpass Construction
- Rattling Brook Big Pond Pump House Construction
- Newfoundland Transshipment Ltd. Crude Oil Pipeline Remediation & Protection Project
- Heart's Content Hydroelectric Dam & Spillway Rehabilitaion
- Kearl Expansion Project
- Water Main Expansion Modeling & Floodplain Analysis

Adaptable to your Project Needs

OUR ROLES

- Design (Structural, Geotechnical)
- Project Management
- Project Coordination
- Construction Management
- Materials Testing
- Geotechnical
- Hydrological
- Quality Control/Assurance
- Field Engineering & Services
- Estimating
- Scheduling
- Procurement
- Document Control
- HSE Planning

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