PARAMOUNT ENGINEERING

ST. LAWRENCE MARINE TERMINAL

ENGI 8700 CIVIL DESIGN PROJECT PLAN

Submitted to Dr. Bruneau
Jan. 29, 2010

Nick Gillis
Ray Bailey

Peter Collins
Steven Greeley
Robert Hunt
Andrew Small

PARAMOUNT ENGINEERING

Engineering 8700 Project Group 7
Faculty of Engineering & Applied Science
Memorial University of Newfoundland
St. John's, NL
A1B 3X5

Phone: 709-693-5086
Phone: 709-683-0425
E-mail: paramounteng2010@gmail.com

SNC·LAVALIN
BAE-Newplan

PARAMOUNT

PARAMOUNT

Paramount Engineering
Faculty of Engineering & Applied Science
Memorial University of Newfoundland
St. John's, NL
A1B 3X5
(709) 693-5086
paramounteng2010@gmail.com

January 29, 2010

Mr. Ray Bailey, P.Eng. & Mr. Nick Gillis, P.Eng.
BAE-Newplan Group Ltd.
1133 Topsail Road
Mount Pearl, NL
A1N 5G2

Subject: *Civil Engineering 8700 Project Work Plan*

Dear Mr. Bailey and Mr. Gillis,

The following document is a project work plan for the design of the St. Lawrence Marine Terminal as part of the Civil Engineering Project course at Memorial University of Newfoundland.

Contained in the plan are a project description and a statement of project requirements as discussed on match night and during our initial meeting on January 19, 2010. We have outlined a design methodology and identified primary tasks required to analyze structural alternatives and recommended a final design. Included is a work schedule with estimated durations to complete each task, and the identification of project milestones. We have also included a summary of costs associated with execution of the project course, list of client deliverables and anticipated risks.

If there are any questions or concerns regarding any aspect of the plan please inform us and we will address the issue.

Thank you for selecting Paramount Engineering to undertake the project design.

Yours Sincerely,

Robert Hunt
Communications Manager

cc: Steve Bruneau, Ph.D, P.Eng

TABLE OF CONTENTS

1 PROJECT DESCRIPTION

The St. Lawrence Marine Terminal will be a near-shore, single berth, dry bulk terminal located in the Canadian Arctic. The exact location of the project is a matter of confidentiality and for the remainder of the project a mock location for the terminal has been assigned in St. Lawrence, NL.

A future mining development is planned for the coastal Arctic region which will require a purpose-built marine terminal to export ore to market. The ore will be loaded onto a 220 000 DWT (Deadweight tonnage) design vessel by means of a typical ship-loading system. The terminal will also be used by other local users and industry.

The proposed location of the port presents unique structural design challenges with respect to bathymetry, geotechnical features, and climatic conditions. The subsea terrain adds complexity to structural design as the seafloor is sloped at 30 degrees with exposed bedrock conditions throughout.

The project's arctic location provides additional constraints on structural design as special consideration is required for loading induced by sea ice. The design must also account for site specific wind, wave and current loading.

2 STATEMENT OF PROJECT REQUIREMENTS

Given the bathymetric, environmental, and operational conditions, various structural concepts are to be developed and evaluated for a marine terminal capable of berthing the design vessel. The final recommendation will include a design of the marine structure, deck and fender system.

The project scope requires the following elements to be completed, including:

- Selection of design vessel;
- Determination of environmental loading (wind, waves, current and ice);
- Calculation of berthing and mooring forces;
- Estimation of operational loading (ship-loading equipment on deck);
- Development of design concepts (vertical face, open, floating and hybrid);
- Design of fenders and deck;
- Cost and risk comparison;
- Preparation of design drawings.

The client and course instructor will be provided with a final report and design recommendation in addition to a project binder containing all other deliverable items.

3 METHODOLOGY

3.1 ORGANIZATION

3.1.1 Roles and Responsibilities

Paramount Engineering consists of four members; Steven Greeley, Robert Hunt, Peter Collins and Andrew Small. Each member has a background in structural design, coastal engineering and project management. In order to manage tasks and ensure the project is carried out efficiently, roles and responsibilities have been assigned to each group member.

- President – Steven Greeley
  - Ensure deadlines are met
  - Prepare and assemble completed work into project deliverables
  - Provide leadership and guide group toward project milestones

- Communications Manager – Robert Hunt
  - Prepare templates (meeting agenda, minutes, weekly report, e-mail)
  - Correspondence with client and other industry contacts
  - Record meeting minutes
  - Weekly progress report preparation

- Software Manager – Peter Collins
  - Primary structural software support
  - Preparation of design drawings
  - Formatting of written reports and presentations

- Design / Cost Analysis Manager – Andrew Small
  - Provide design codes and applicable standards
  - Co-ordinate design process
  - Co-ordinate cost analysis process

3.1.2 Organizational Tools

In order to apply a systematic approach to project execution, group members will employ the use of various organizational tools. Each member will maintain a project journal to summarize action items from group meetings and record individual work completed. In order to facilitate brain storming and discussion during group meetings, a project white board will be used. Client meetings will follow a standardized agenda and a designated note keeper will record minutes. Electronic and hardcopy filing systems will be established to keep files organized. All electronic files will be uploaded to a common file transfer server and backed up on an external hard-drive. Hard copy files and project deliverables will be stored in a project binder.

3.1.3 Communication and Meetings

In order to communicate to the client and within the group, a common e-mail account will be established. This will be used to co-ordinate client and group meetings and to exchange ideas within the group. Other communication mediums will be employed as necessary including cell phones and instant messaging. Group meetings will occur daily on weekday afternoons. A weekly client meeting time has been established in order to obtain necessary project information and provide updates on group progress.

3.2 CLIENT

3.2.1 Desired Outcomes

The client requires the optimal design for a marine terminal through systematic evaluation of a number of feasible design options. The options to be considered are to be researched for practicality and designed to a preliminary level. The preliminary design should include design calculations, structural analysis output, and drawings showing a plan view and cross section. Given the proposed alternatives, a cost analysis and risk assessment is to be carried out in order to select the most desirable option.

3.2.2 Client Role

The client is to provide a specific project scope that highlights the critical components under consideration. Site specific environmental and operational load data are also to be provided by the client. Upon completion of research and selection of design alternatives, it is anticipated that the client will play a guiding role in the conceptual design process. In order to determine the most optimal design, the group will create a cost and risk assessment strategy. To maintain confidence in the final design selection, the client should approve this strategy before implementation by the group. The cost analysis will require the provision of unit rate data by the client.

3.3 APPROACH

3.3.1 Design Approach

All design concepts to be developed will be subjected to the same loading conditions. It is imperative that appropriate data is obtained for environmental loads. This load data must then be converted into applied forces for use in the design stage. Hand calculations can be used to obtain member sizes. If a large number of load cases are to be considered, a model of the structure may be created and analyzed using software. Given the result of the analysis, the design may be revised as required. Once acceptable results are achieved, the design will then be conveyed by drawings illustrating a typical plan and cross section.

3.3.2 Cost Analysis Approach

In order to complete a cost analysis of each design concept, a unit rate strategy will be used. Material and quantity take-offs will be completed using the drawings produced during the design phase. Unit rate data will be supplied by the client. Any cost data that is not provided will be obtained from CostWorks software or historical data. All costs will be determined to a level of accuracy required for comparison of concepts. In the event that multiple options have comparable costs, an assessment of risk will be used to determine the more desirable option.

3.4 RESOURCES

Research will be performed in order to gain a better understanding of marine terminals. This information will be gathered from online sources (papers, articles, project reports) and from text books and relevant course notes.

During the design and evaluation phase of the project, applicable codes and standards will be used. These include:

- CAN/CSA S16-01 Limit States Design of Steel Structures
- CAN/CSA A23.3-04 Design of Concrete Structures
- US Army Corps of Engineers Coastal Engineering Manual 1110-2-1100
- OCIMF Guidelines

In addition, industry experts will be retained in order to provide guidance and support to the group. Key personnel are listed in Table 1.

Name	Affiliation	Area of Expertise	Contact
Amgad Hussein	Memorial University	Software licensing	ahussein@mun.ca
Eugene Manning	Memorial University	Marine Construction	manning_eugene@ hotmail.com
Steve Bruneau	Memorial University	Coastal Engineering	sbruneau@engr.mun.ca
Seshu Adluri	Memorial University	Steel Design	adluri@engr.mun.ca
Ray Bailey	BAE-Newplan	Marine Design	Ray.Bailey@snclavalin.com
Nick Gillis	BAE-Newplan	Marine Design	Nick.Gillis@snclavalin.com>

Table 1-Key Personnel

3.5 DELIVERABLES

On February 16, 2010 a midterm progress report and presentation will be submitted as a course requirement and as a means of communicating project status to the client. This deliverable date coincides with the project milestone of the selection of structural alternatives to be developed for concept design. Final design calculations, structural analysis output, and design drawings will be included with a cost analysis and risk assessment in the final report and presentation on April 5, 2010. The report and presentation will summarize the design and evaluation processes applied and provide a final design recommendation for the client.

A project binder will also be maintained containing the items summarized above, along with a company Statement of Qualifications (SOQ), employee resumes, project correspondence, weekly reports and meeting agendas and minutes.

All reports and presentations will be completed using MS Office 2003. Structural analysis will be conducted using S-Frame Release 9.0 and design drawings will be completed using AutoCAD 2006. All final copies of reports, presentations, software output, drawings, sketches and hand calculations will be compiled in PDF format and made available in CD format.

3.6 TROUBLESHOOTING

There are a number of issues recognized that may arise during project execution. Mitigations will be established to ensure these problems do not negatively affect the project schedule.

The design phase of the project will require client provision of site specific environmental data. If site specific data can not be provided, then a location of similar environmental conditions will be selected to obtain data. The Meteorological Survey of Canada database or the National Building Code of Canada (2005) will be referenced in this situation.

Inexperience in using structural software and converting marine load data into specific load cases may also cause difficulty. This issue can be controlled by ensuring resource personnel are made available for constructive feedback by establishing meetings.

4 TASKS

Paramount Engineering has identified seven (7) primary tasks required in the design and development process.

These include:

1. Determination of Site Conditions
2. Selection of Design Vessel
3. Research of Marine Terminal Options
4. Selection of Design Alternatives
5. Preliminary Design of Selected Alternatives
6. Cost Analysis
7. Recommendations and Production of Final Design Deliverables

4.1 DETERMINATION OF SITE CONDITIONS

The determination of site conditions involves the collection of data with respect to site physical parameters, environmental conditions and operational loads expected during the terminal's serviceable life.

Robert Hunt will assume responsibility for the collection of data pertaining to the site. This task will commence immediately following the submittal of the work plan and two (2) days have been allotted for its completion.

4.1.1 Site Parameters

Information regarding the bathymetry and subsurface conditions will be provided by the client. Paramount Engineering will base its design on the assumption that exposed bedrock conditions exist throughout the site at a slope of 30 degrees. It has been dictated by the client that seismic conditions need not be considered.

4.1.2 Environmental Conditions

A combination of meteorological and oceanographic conditions will be examined. The client will provide the following climatic data:

- Tidal information
- Wave heights
- Current velocities
- Ice thicknesses
- Wind pressures

If data is not provided, it will be obtained from the Meteorological Survey of Canada database or the National Building Code of Canada (2005).

Consideration of tidal information and wave heights will be used to obtain a required deck elevation to prevent overtopping conditions on the marine terminal.

Paramount Engineering is responsible for the calculation of the environmental loads resulting from waves, currents, ice, and wind.

4.1.3 Operational Considerations

The terminal will be equipped with typical ship-loading and conveying equipment. The client will provide all equipment loads and expected deck surcharges to be used for design. Mooring and breasting forces will depend on vessel selection.

4.2 SELECTION OF DESIGN VESSEL

The design vessel is assumed to be 220,000 DWT dry bulk carrier as expressed by the client during the initial meeting on January 19, 2010.

The dimensioning of the vessel will be calculated based on a mean statistical analysis of the data provided in Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels and Planning and Design of Ports and Marine Terminals for common dimensions of dry bulk carriers of comparable dead weight tonnage currently in operation.

The selected dimensions will be confirmed by the client prior to proceeding to the preliminary design stage. This task is expected to be completed in one day, done concurrently with the determination of site conditions and the research of marine terminal options. Steven Greeley has been assigned responsibility for this task.

4.3 RESEARCH MARINE TERMINAL OPTIONS

The research of marine terminal options will be a collaborative effort carried out by all members of Paramount Engineering. A period of two (2) weeks has been allotted to researching the various structural alternatives used in marine terminal design.

Berthing arrangements such as alongside type and open dolphin type will be examined. Figure 1 shows a generalized view of the terminal arrangements to be considered.

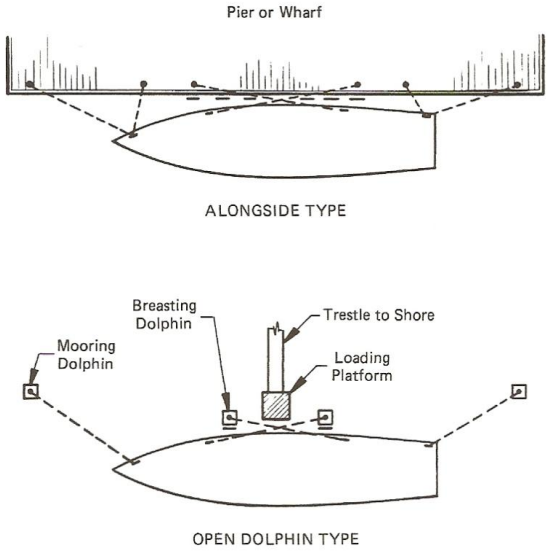


Figure 1 - Berthing Arrangements

The research will encompass a very wide perspective initially as open structures, vertical-face structures, floating and hybrid options will all be considered. The focus will be on the performance of various structures subject to a steeply sloping seabed, exposed bedrock, arctic conditions, and the effects of ice on the structure. This will result in the generation of a list of 8 to 12 possible alternatives for design.

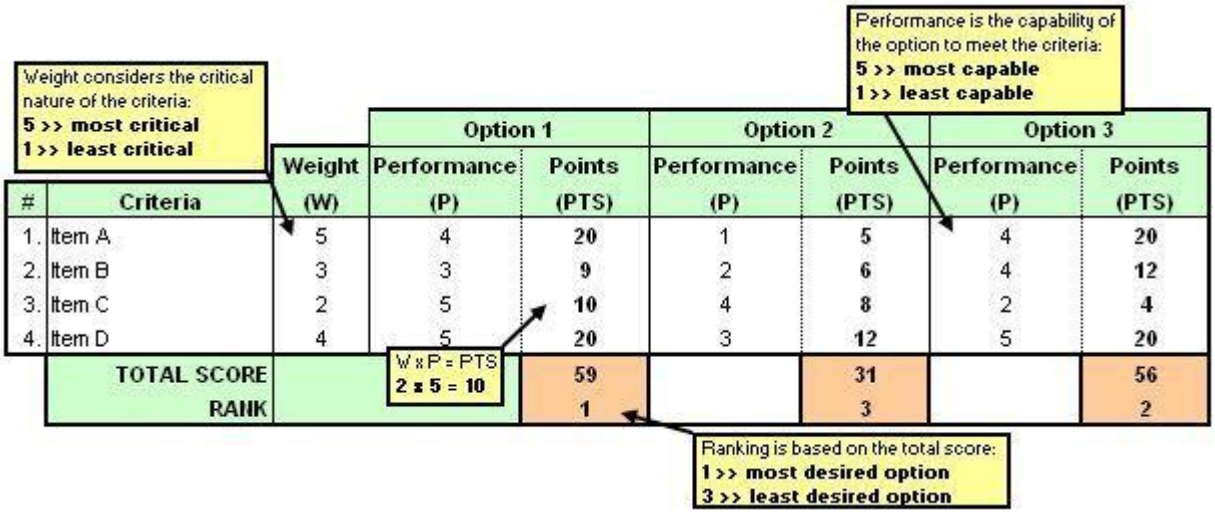
Also included will be an assessment of risks highlighting the pros and cons of all alternatives subject to the imposed site constraints.

A variety of resources obtained from the Queen Elizabeth II Library located at the Memorial University of Newfoundland campus in St. John's, NL will be referenced. Similarly, internet resources will be used in the research process. A list of references may be found in Section 9 of this report.

4.4 SELECTION OF STRUCTURAL ALTERNATIVES

Upon completion of the research phase of the project, Paramount Engineering will select four (4) alternatives to proceed to the preliminary design stage.

To aid in the evaluation process a selection matrix will be created in order to rank the alternatives based on a point system. The point system will be based on a weighted value and rank method, which is to be developed internally by Paramount Engineering. An example showing how the point system works is given in Figure 2.



#	Criteria	Weight (W)	Option 1 Performance (P)	Option 1 Points (PTS)	Option 2 Performance (P)	Option 2 Points (PTS)	Option 3 Performance (P)	Option 3 Points (PTS)
1.	Item A	5	4	20	1	5	4	20
2.	Item B	3	3	9	2	6	4	12
3.	Item C	2	5	10	4	8	2	4
4.	Item D	4	5	20	3	12	5	20
	TOTAL SCORE			59		31		56
	RANK			1		3		2

Figure 2-Selection Matrix Schematic

The criteria used in the matrix will be selected by Paramount Engineering based on information obtained throughout the research stage.

Selection of structural alternatives for further analysis has been identified as a project milestone to coincide with the submittal of the mid-term progress report.

4.5 PRELIMINARY DESIGN

Each member of Paramount Engineering will be assigned a design alternative. The preliminary design of each option will be conducted based on a global stability analysis. The resistance of the structure to sliding and overturning will be analyzed, as well as any other unique global failure mechanisms inherent to the structural alternative under consideration. Bearing pressure will be neglected as a result of the exposed bedrock conditions.

The level of design at this stage will be limited to a gross sizing of the structure and dimensioning of members. This will be required for the preparation of the material take-offs needed to perform a cost analysis.

Particular attention will be paid to such items as corrosion protection and reinforcement due to ice loading.

Additionally, berthing and mooring forces will be assessed based on the design vessel and berthing arrangement associated with each alternative. These loads will be utilized in the design of fender units unique to each option. Suitable fenders will be selected from an industry product catalogue to be obtained at a later stage in the design process.

Preliminary design drawings will be created using AutoCAD 2006 by Peter Collins. The drawings will show a plan and typical cross section view of each alternative.

4.6 PERFORM COST ANALYSIS

Each alternative will be subject to a cost analysis. Although each structure will be unique, a consistent costing procedure will be utilized for each option. The major division of costing will be material-based consistent with preliminary design. The cost for each design will include the marine structure, fenders and deck structure.

Unit prices will be obtained from the client where available. For additional unit prices, CostWorks software data will be referenced or a search of historical data will be conducted.

This analysis will be conducted to a level of accuracy deemed acceptable by the client. Further direction will be provided by the client at a later stage. In the event that multiple options are comparable in costs, an assessment of risk will be used to determine the more favorable option. The criteria in the risk assessment will include constructability, operation and maintenance costs, serviceable life, and projected material and labour costs.

4.7 DESIGN RECOMMENDATION

Paramount Engineering will recommend a final design to the client following a cost comparison and risk assessment of the selected alternatives. Submittal of the final recommendation will include a final design report outlining the pros and cons of each alternative and the benefits of the recommended design. A submittal of final design drawings and a final report presentation will also be included as part of the final set of deliverables.

5 SCHEDULE

A Gantt chart has been created in MS Project 2003 to outline a schedule of tasks guiding the design process and to identify project milestones. Paramount Engineering will model efforts toward project execution in alignment with the schedule.

The schedule is an evolving tool that is subject to updates as project items become more or less critical. The schedule will help facilitate group organization and prevent delays.

The current schedule summarizes the entire course of the project from January 31, and durations have been allotted for all identified tasks. However, these durations are tentative and other tasks may be added later in the project life.

Days shaded in gray represent non-working days which coincide with weekends, other academic commitments, and holidays. These days can be converted to working days given impending deadlines and other critical items are constraining the project.

No critical path has been identified at this point in time since the schedule is of a linear nature. Once a greater understanding of the project is developed, a critical path will be identified.

The initial steps of the project include three (3) concurrent activities which entail gathering design information and researching potential solutions. A selection process will ensue following the completion of research, and four (4) options will be considered as potential designs.

The mid-term progress report and presentation will focus on the efforts to obtain a narrowed list of alternatives to be considered for design. The date for mid-term report presentations is currently set as February 16, 2010.

The design of the four (4) alternatives, tentatively labeled as options A through D, will commence following the progress report. This task constitutes the majority of group effort. Currently, the schedule has the preliminary design lumped has one task but this will be refined into a more detailed structure highlighting the various sub-tasks required as they become more defined from research.

Preparation of preliminary design drawings and material take-offs are required to perform a cost analysis of the options. A cost analysis will permit the issue of recommendations, and the preparation of the final report and presentation, identified by the second milestone on April 5, 2010.

Any other schedule revisions completed throughout the course of the project will be done on a necessity basis.

A copy of the schedule can be found on the following page in Figure 3.

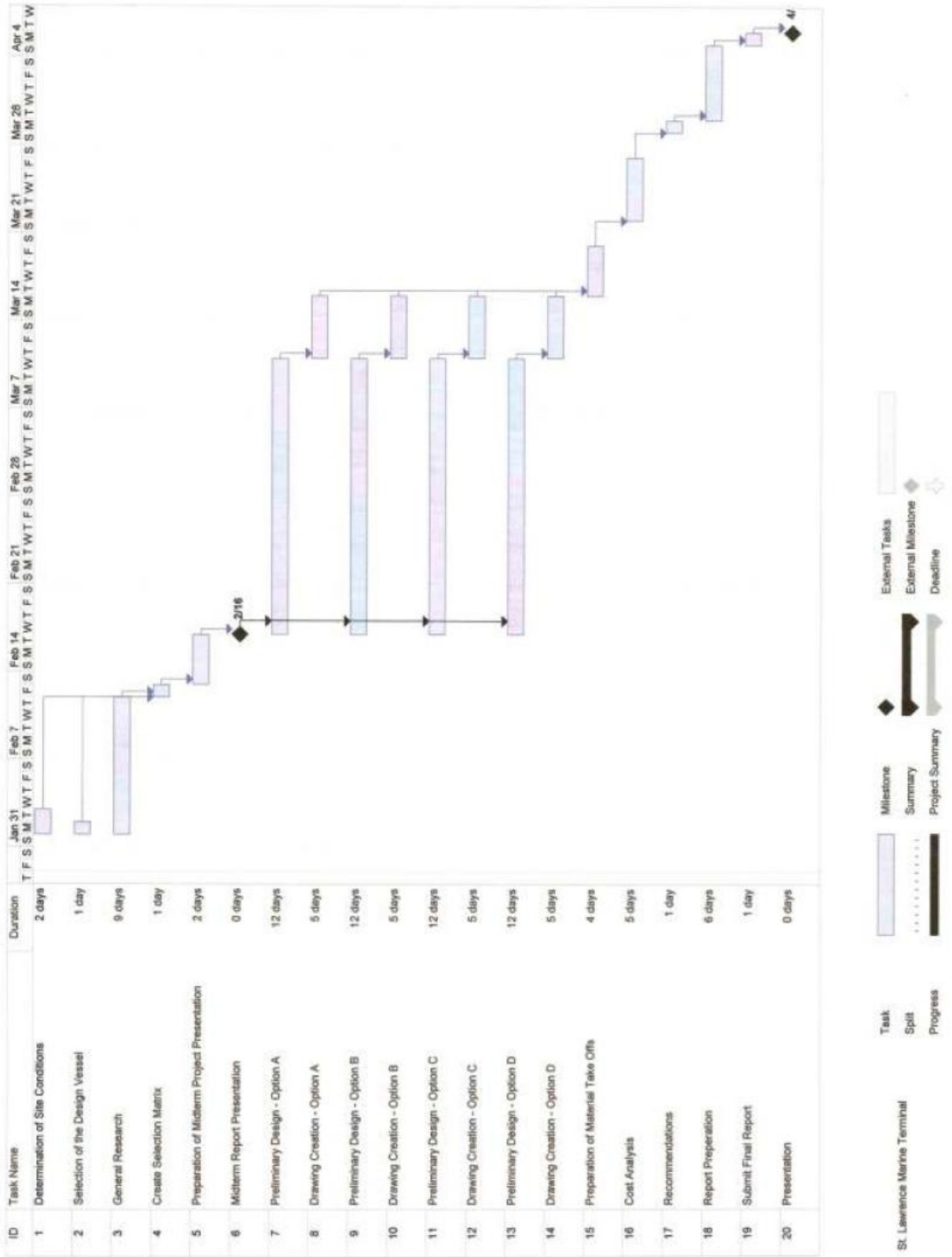


Figure 3-Project Schedule

6 COSTS

The costs associated with the execution of the project course will arise from the printing and binding requirements for report submissions. Paper will be required to prepare drafts for the Work Plan, Mid-term Report and Final Report. Report submissions will be bound by printing services and electronic copies will be stored on compact discs. A project binder will also be purchased to store project deliverables. The total estimated cost for project execution is $65.00. A breakdown of anticipated costs is shown below in Table 2.

Item	Qty	Unit Price	Cost
Paper	300 sheets	$0.10	$30.00
Binding + Cover	3 reports	$5.00	$15.00
CD's	5	$1.00	$5.00
Project Binder + Dividers	1	$15.00	$15.00
Total			**$65.00**

Table 2-Cost Breakdown for Project Course

7 DELIVERABLES

Deliverables will be required for project course evaluation and client submission.

7.1.1 Course Specific

Course deliverables include:

- Statement of qualifications (Jan 13 ,2010)
- Midterm progress report and presentation (Feb 16, 2010)
- Final report and presentation (April 5, 2010)
- Project binder (April 5, 2010)
  - E-mail correspondence
  - Design calculations
  - Weekly reports
  - Meeting minutes
  - Design drawings
- CD copy of all files (April 5, 2010)

7.1.2 Client

Client deliverables include:

- Statement of qualifications (Jan 13 ,2010)
- Design calculations, analysis results and design drawings (April 5, 2010)
- Cost analysis & risk assessment (April 5, 2010)
- Final report including recommendations (April 5, 2010)
- CD copy of all files (April 5, 2010)

8 RISKS

Some risks are anticipated during the duration of project design. Possible risks that may be encountered include:

- Location risk – An assumption of environmental data will be required in the event that site-specific information can not be provided. Due to the confidentiality of project location, there is a risk that the assumed data will have inaccuracies.
- Software accessibility – Desired project software and licensing is only accessible on campus computers. Given the limited availability of computers equipped with these resources there may be delays in project execution.
- Unique project requirements – The nature of this project requires a significant amount of time spent on research. The dedication of resources to this effort and course duration imposes time constraints on the design and evaluation of structural concepts.

9 REFERENCES

A variety of resources will be referenced throughout the duration of the project to help facilitate in the planning and design of our chosen alternatives. A list of text books obtained form Queen Elizabeth II Library, as well as current codes and standards are provided below:

1. Agerschou et al. Planning and Design of Ports and Marine Terminals 2nd edition. London: Hans Agerschou and Thomas Telford Limited, 2004. Print.
2. Bennett, F. Lawrence and Terry T. Mcfaddend. Construction in Cold Regions: A guide for Planners, Engineers, Contractors and Managers 1st edition. Toronto: John Wiley & Sons Inc, 1991. Print
3. Canadian Institute of Steel Construction. Handbook of Steel Construction 9th edition fourth printing. Canada: Lakeside Group Inc., 2008. Print
4. Cement Association of Canada. Concrete Design Handbook 3rd edition. Canada: Cement Association of Canada, 2006. Print
5. Centre for Civil Engineering Research and Codes. Handbook Quay Walls. Gouda: Centre for Civil Engineering Research and Codes, 2005. Print
6. “Coastal Engineering Manual” US Army Corps: http://users.coastal.ufl.edu/~sheppard/euc6430/Coastal_Engineering_Manual.htm
7. Gaythwaite, John W. Design of Marine Facilities for the Berthing, Mooring, and Repair of Vessels 2nd edition. Reston: American Society of Civil Engineers, 2004. Print.
8. Sanderson, T. J. O. Ice Mechanics: Risks to Offshore Structures 1st edition. London: Graham and Trotman Limited, 1988. Print.
9. Tsinker, Gregory P. Floating Ports: Design and Construction Practices 1st edition. Toronto: Gulf Publishing Company, 1986. Print.

It is also planned to access internet resources as required and secure a copy of OCIMF guidelines.

APPENDIX A: STATEMENT OF QUALIFICATIONS

PARAMOUNT ENGINEERING

"Paramount Engineering strives to deliver innovative, sustainable and cost effective designs of PARAMOUNT quality in a timely and professional manner to exceed client's expectations"

PARAMOUNT ENGINEERING

Engineering 8700 Project Group 7
Faculty of Engineering & Applied Science
Memorial University of Newfoundland
St. John's, NL
A1B 3X5

Phone: 709-693-5086
Phone: 709-683-0425
E-mail: paramounteng2010@gmail.com

PARAMOUNT

ABOUT US

Established in January 2010, Paramount Engineering is a Civil-Structural group offering engineering design and cost analysis services to its clients. At Paramount, we strive to create innovative, sustainable and economic solutions in a timely and professional manner. The team at Paramount includes four members with backgrounds in Project Management, Work Planning, Civil Works, Structural Design, Structural Analysis and Cost Analysis. The team at Paramount Engineering team has the ability and desire to complete exciting and challenging projects and looks to the future with confidence and anticipation.

PARAMOUNT

TEAM MEMBERS

PETER COLLINS

Peter is a senior civil engineering student with a varied background of experience including construction materials quality control, structural analysis, inspection and creation of drawings. He has worked extensively in laboratory settings, testing and upholding standards of materials including aggregates, concrete, and asphalt. His field experience involves inspections from multiple stages of residential construction to various commercial construction projects. Peter also has experience analyzing self-support and guyed communication towers. Peter's enthusiasm lies in the field of structural design and analysis. His working knowledge of materials will prove to be an asset in his future design endeavors.

Selected Project Involvement:

- Trans Labrador Highway Project
- Town of Paradise Residential Construction Inspection Program
- Long Harbour Interim Facility Aggregate Testing
- Review of Building Accessibility Act Compliance

STEVEN GREELEY

Focusing his studies at Memorial University of Newfoundland in the field of structural engineering, Steven has attained a great range of skills as a senior student. He has acquired field experience on construction projects which involved the inspection of pile installations, and pre-fabricated modules from an off site fabrication facility. Steven also has structural experience including the design of concrete, steel, and timber members. Additionally, he has been involved in the design of marine structures such as concrete caissons, sheet-pile cells, and rubble-mound breakwaters. Steven is familiar with many of the latest national codes and standards, and is familiar with various types of software such as AutoCAD, and STAAD.

Selected Project Involvement:

- Canaport LNG Terminal, Saint John, NB
- St. Lawrence Fluorspar Mine Development
- Central Newfoundland Waste Management Project
- Pearlgate Recreation Complex

PARAMOUNT

TEAM MEMBERS

ROBERT HUNT

Robert Hunt is a senior civil engineering student with experience in project management and geotechnical analysis. He has experience working with clients to bring their needs and goals to reality. He has been an invaluable member of various teams collaborating on projects and his experience as a liaison between client and contractors has proven to be an asset. He has worked in laboratory settings performing geotechnical testing on a variety of soil samples. Robert has gained a great deal of experience through his work terms working at various locations.

Selected Project Involvement:

- Albian Sands Muskeg River Mine- Muskeg Removal Project
- Public Works – Fiber Optic Communications Project
- NRCan – Consolidation Testing for Pipeline Project

ANDREW SMALL

With a diverse range of experience, Andrew is highly adaptable engineering student with valuable qualities including a commitment to completing quality work, initiative, problem solving, planning and organizational skills. Andrew has industry experience in the areas of Structural Analysis, Work Plans, Scheduling and Cost Analysis. He has conducted structural design hand-calculations and completed FEA analysis for various steel structures. Using industry specific software, Andrew has also completed structural analysis of communication towers for a regional infrastructure upgrading project. Most recently, Andrew completed Work Plans, Scheduling, and job end Cost Analysis reports for the initial phase of an $8 billion dollar oil sands construction project.

Selected Project Involvement:

- St. John's Waste Water Treatment Facility Project
- Bell Odyssey Tower Infrastructure Upgrading Project
- Dry-Tree Semi-Submersible Global Analysis Report
- Kearl Oil Sands - Deep Undergrounds Project

PARAMOUNT

PROFESSIONAL EXPERIENCE

- Network Utility Services
- BAE-Newplan Ltd./SNC-Lavalin Ltd.
- Kiewit Eastern Canada District
- Department of Government Services
- Town of Paradise
- AMEC Earth and Environmental
- Tiller Engineering Inc.
- Newfoundland Design Associates Ltd.
- SBM Atlantia
- Kiewit Energy Canada Corp.
- Syncrude Ltd.
- North American Construction Group Ltd.
- Deptartment Of Transportation and Works
- Public Works Government Services Canada
- NRCan
- Wier's Construction

INDUSTRY CODES & STANDARDS

- CAN/CSA A23.3-04 Design of Concrete Structures
- CAN/CSA S16-01 Limit States Design of Steel Structures
- CAN/CSA S304.1-04 Design of Masonry Structures
- CAN/CSA S37-01 Antennas, Towers, and Antenna-Supporting Structures
- National Building Code of Canada 2005
- American Society of State Highway and Transportation Officials (ASSHTO) 2003
- American Society for Testing and Materials (ASTM) 1997
- ABS 6 – Modular Offshore Drilling Units-2001-2003
- ABS Guide for Buckling and Ultimate Strength Assessment of Offshore Structures – March 2004

SOFTWARE APPLICATIONS

- Autodesk/AutoCAD
- STAAD Pro
- MS Office & Project
- ANSYS 11.0
- S Frame
- PCA Column
- CostWorks

PARAMOUNT

PARAMOUNT ENGINEERING

Engineering 8700 Project Group 7
Faculty of Engineering & Applied Science
Memorial University of Newfoundland
St. John's, NL
A1B 3X5

Phone: 709-693-5086
Phone: 709-683-0425
E-mail: paramounteng2010@gmail.com

PARAMOUNT

Client

Ray Bailey, P.Eng
SNC Lavalin-BAE-Newplan
Phone: 709-368-0118
E-mail: ray.bailey@snclavalin.com

Nick Gillis, P.Eng
SNC Lavalin-BAE-Newplan
Phone: 709-368-0118
E-mail: nick.gillis@snclavalin.com

Instructor

Steve Bruneau, Ph.D, P.Eng
Memorial University
Phone: 709-737-8812
E-mail: sbruneau@engr.mun.ca

PARAMOUNT ENGINEERING

Engineering 8700 Project Group 7
Faculty of Engineering & Applied Science
Memorial University of Newfoundland
St. John's, NL
A1B 3X5

Phone: 709-693-5086
Phone: 709-683-0425
E-mail: paramounteng2010@gmail.com

PARAMOUNT