Engineering 8700: Detailed Work Plan
DBA Consulting - Gibraltar Office Building

Premier Engineering Consultants:

Aaron Shaffer

Ashley Hobbs

Jean Gibbons

Sabrina Ishita

Submitted To A. Hussain, J. Skinner, and S. Bruneau

PREMIER ENGINEERING CONSULTANTS

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Premier Engineering Consultants
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February 4, 2013

Mr. Anstey and Mr. Morris
DBA Consulting Engineers Limited
1243 Kenmount Road, Suite 302
P.O. Box 8188
St. John's, NL, A1B 3N4

Subject: Gibraltar Office Building Detailed Work Plan

Mr. Jamie Anstey and Mr. Mervin Morris,

Please see the enclosed Detailed Work Plan for the engineering design of the Gibraltar Office Building. This work plan is a requirement of Engineering 8700 and has been compiled to ease the completion of both course and client requirements within deadlines.

The enclosed work plan outlines the requirements of the project, the method we plan to use to meet the requirements, the tasks we will have to undertake, a schedule of our planned work, costs we plan to encounter, and a list of deliverables.

If you have any questions regarding this work plan, or any other matter pertaining to this project, Premier Engineering would be please to discuss them with you.

Sincerely,

Aaron Shaffer,
Project Manager,
Premier Engineering Consultants

Enclosure: Gibraltar Office Building Detailed Work Plan

cc: Dr. S. Bruneau
Dr. A. Hussein
J. Skinner

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1.0 Project Description

Premier Engineering Consultants have been contracted to complete the design, estimate, and structural drawings of an office building in St. John's, Newfoundland by DBA Consulting Engineers Limited. Since the location has yet to be determined, we will be using geotechnical information from a building near a proposed site.

The project consists of a three-storey office building with an attached garage structure as be shown in Figure 1. The main structure will be designed and constructed using steel framing with concrete foundations and open web steel joists. Most of the flooring system will consist of Canam designed steel decking supported on steel beams and columns. A common area on the third floor will use glulam decking supported on wooden beams.

Figure 1: Back Perspective of Proposed Building

The building has two levels of flat roofing. The upper level of the building is at a constant elevation even though it appears to be two levels because there a parapet is going around the exterior of the roof. The upper roof section without the parapet (which is over the garage) will be supported using glulam and wooden beams. The remaining upper and lower roofs will use steel decking supported on open web steel joists. This structural building system will be used to support each roofing system which will transfer the loads to steel columns that extend from the third floor all the way to the basement into the concrete foundation. The

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foundation will consist of both spread and strip footings and will have to be designed to accommodate varying soil pressure around the building.

The office building also has a cantilever window portion that wraps around the southwest corner of the building and a cantilever canopy roof portion which will require special design considerations.

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2.0 Project Requirements

DBA contracted Premier to complete the structural design, quantity takeoff, and structural drawings for the Gibraltar Office Building in St. John's, Newfoundland. The following components are required in the completion of the design:

- Development of Structural Framing Plan;
- Calculation of Loads;
- Design of Roof System;
- Design of Structural Wood;
- Design of Structural Steel;
- Foundation Design;
- Drafting;
- Quantity Takeoff;
- Final Report; and
- Final Presentation.

All components of the project must be completed accurately, according to schedule, and with professional integrity. Other important factors such as economics, environment, and safety must also be considered in the design of the building structure.

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3.0 Methodology

3.1 Project Approach

Premier will first determine the scope of the project to identify all required tasks and subtasks. This will allow for an equal distribution of work among team members and a higher efficiency for completion of the project since tasks will be distributed based on knowledge and previous work experience.

To begin the design process, Premier will sketch a framing plan for each level of the building. After this has been approved by DBA, the building loads will be calculated according to the National Building Code of Canada (NBCC) including snow, wind, earthquake, dead, and live loads. These loads will then be applied to the structural building system in order to determine crossing bracing, moment connections, decks, joists, beams, and columns. Cross bracing or moment connections will be used to provide lateral support depending on the effectiveness and economic feasibility of each cross section. The placement of the lateral supports will depend on window locations. Windows will only be moved if absolutely necessary after conferring with DBA and the Architect. Premier will try to maintain the current architectural plans as much as possible. Concrete footings, foundation walls and piers will be designed to transfer all loads from the wood and steel building systems to the ground. During the completion of the project, all relevant codes and best design practices shall be followed with all assumptions clearly stated.

A quantity takeoff will be completed as each aspect of the office building is designed. A full list of quantities will be kept in a spreadsheet and upon design completion, prices can be obtained from DBA and a Class B cost estimate can be completed. A full set of structural drawings will also be provided to DBA upon completion of the project.

3.2 Group Organization, Roles, and Meetings

Premier will be completing the major components of the project as a group whenever possible, but when working individually task status updates shall be provided to the entire group on a daily basis. To assist in task completion, Premier has assigned roles for each member based on interest, knowledge, skill, and previous work experience outlined in the Statement of Qualifications in Appendix A. Members with experience in a particular task will lead on those aspects of the project to ensure efficiency of the project. Also, for every project task, every subtask will be completed by more than one

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group member to provide high quality work in an efficient manner and to ensure that mistakes are kept to a minimum. These pairs will also enhance the learning experience of each individual by exposing them to the design work involved in the project. The breakdown of roles and responsibilities are as follows:

Aaron Shaffer - Project Manager:

Aaron will be responsible for overseeing the entire project and will be specifically responsible for the following tasks:

- Steel Design;
- Concrete Design;
- Wood Design;
- Roof Design;
- Quantity Takeoff; and
- Client Interaction.

Ashley Hobbs - Concrete Design Engineer:

Ashley will be responsible for overseeing the entire concrete design and will be specifically responsible for the following tasks:

- Concrete Design;
- Cost Estimate;
- Design Support;
- AutoCAD Support; and
- Design Load Calculations.

Jean Gibbons - Structural Design Engineer:

Jean will be responsible for overseeing the entire structural design and will be specifically responsible for the following tasks:

- Steel Design;
- Wood Design;
- Roof Design;

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- Quantity Takeoff; and
- Design Load Calculations.

Sabrina Ishita - Drafting Engineer:

Sabrina will be responsible for overseeing the drawings and will be specifically responsible for the following tasks:

- AutoCAD Drafting;
- Meeting Agendas and Minutes;
- Quality Control of all Documents;
- Tracking Work for Clients; and
- Design Support.

Premier will meet at least three times a week to review each other's work, discuss progress, establish goals, and work together on aspects of the project.

3.3 Client Interaction and Role

Premier will meet with representatives from DBA once per week based on client and consultant availability. The main contact will be through Jaime Anstey, B. Eng., E.I.T., but contact will also be made with Mervin Morris, P. Eng. These meetings will occur at DBA's office in Paradise unless special circumstances arise.

DBA has provided the architectural drawings for the Gibraltar Office Building, a geotechnical report from a building near the proposed site, and structural drawings to be used as guidance during the completion of the Gibraltar Office Structural Drawings. Premier will complete design calculations and chose design elements which will be reviewed and approved by DBA as progress is made on the project.

Methods to communicate and schedule meetings include email, phone calls, and texting. This will allow DBA to provide design support and up-to-date project information to Premier. An agenda for each meeting will be issued to DBA 24 hours before a schedule meeting, meeting minutes will be taken by Premier during these meetings, and meeting minutes will be forwarded to DBA within 72 hours. Premier will keep DBA up-to-date on project progress and coordinate schedules.

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3.4 Design Principles

Premier is committed to providing high quality structural design for all components of the project. The team will work efficiently to ensure that all aspects are completed accurately and on time. All design work of the Gibraltar Office Building shall follow relevant design codes, guidelines and standards applicable to the province of Newfoundland and Labrador which are listed in the required resource section.

3.5 Cost Estimating Strategy and Level of Accuracy

Premier will complete a Class B cost estimate for the project which will be provided to DBA at a minimum. This estimate will be accurate within a 10% margin. Once the quantity takeoff has been completed, Premier will obtain material prices from DBA that they use within their office.

3.6 Desired Outcomes and Deliverables

Premier strives to provide the highest quality engineering services to clients with integrity and professionalism. We offer cost effective solutions in a timely manner while safety, sustainability and environmental implications are always our top priorities. Along with the design of the Gibraltar Office Building, the team will meet all requirements as stipulated by DBA and the course instructors.

The requirements for DBA include:

- Load Calculations;
- Structural Design Sketches;
- Member Loading and Selection Calculations;
- Quantity Takeoff and Tender Estimate;
- Structural Drawings;
- Project Binder to Include All the Above Information; and
- Final Report.

The requirements for Engineering 8700 include:

- Statement of Qualifications;
- Meeting Agendas;
- Meeting Minutes;

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- Weekly Progress Reports;
- Detailed Work Plan;
- Individual Log Books;
- Final Report Presentation; and
- Final Report.

3.7 Troubleshooting

When issues arise during completion of this project, Premier will attempt to resolve them internally using resources such as personal design experience, the Queen Elizabeth II Library and online program tutorials. If the issues cannot be solved internally, Premier will consult Memorial University of Newfoundland's Faculty of Engineering and DBA. Premier will attempt to solve all issues internally before consulting the Faculty or DBA unless the issue is related to project clarification.

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4.0 Tasks

4.1 Primary Task and Subtask Description

The primary tasks and subtasks required for the Gibraltar Office Building are listed below with details given about each task. This work breakdown structure has also been provided in Appendix B as a flow chart.

1. Determine Design Criteria:

The design criteria is defined based on DBA's scope of work and specifications, as well as the regulations stipulated in the NBCC for building structures. These will be determined before beginning the design process.

2. Sketch Plan Layouts:

Premier will sketch a framing plan for each level of the building, including the placement of footings, joists, beams, and columns. All sketches will be reviewed by DBA before continuation of the project.

- Basement Level:

The basement level will outline the placement of footings. The dimensions for the layout of the basement level will be taken from the architectural drawings. This will include the building portion only and not the garage because the foundation is at grade.

- Main (Ground) Level:

The main level will outline the placement of footings for the garage only and joists, beams, and columns for the rest of the building. The dimensions for the layout of the main level will also be taken from the architectural drawings.

- Second Level:

The second level will outline the placement of joists, beams, and columns for the building and lower roof. The dimensions for the layout of the second level will also be taken from the architectural drawings.

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- Roof:

The roof level will outline the placement of joists, beams, and columns for the upper roof only. The dimensions for the layout of the roof level will also be taken from the architectural drawings.

3. Calculate Loads:

The loads will be calculated based on the NBCC and all other relevant codes, standards, and design principles.

- Snow Loads:

The snow loads will be calculated by taking into account snow drifting since there are two distinct roof levels as well as a parapet. This will be done according to the NBCC.

- Wind Loads:

Since the final location for the building is not finalized, Premier will use a conservative approach when making assumptions for calculating wind loads according to the NBCC.

- Earthquake Loads:

Earthquake loads will be calculated in accordance with the NBCC.

- Dead Loads:

Dead loads will be calculated by considering the building materials used, furnishings, mechanical and electrical systems, and partition walls.

- Live Loads:

Live loads will be determined from the NBCC.

4. Roof Design:

The roof of the building contains a glulam portion, as well as steel decking. Premier will be using Canam as well as the NBCC to design the roof levels.

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- Decks:

The roof decking will be triple span. Canam design guidelines will be used to determine the optimum decking.

- Joists:

The roof will consist of open web steel joists.

- Beams:

Beams will be both steel and wood. Most of the beams will be steel. The beams will be designed using the proper steel and wood codes and standards.

- Columns:

The columns will be steel and will be designed according to the proper steel codes and standards.

5. Design Steel Members (Structure):

The Handbook of Steel Construction 10e S16-09 will be used in all steel design. Moment connections or cross bracing will be used to provide lateral support depending on which is more effective and economically feasible. Once all the loads have been calculated, Premier will determine the needed steel members including:

- Cross Bracing;
- Moment Connections;
- Joists;
- Beams; and
- Columns.

6. Design Wood Members (Structure):

A portion of the roof will be glulam. Premier will use the Structurlam Cross Laminated Timber Design Guide as well as the CSA-086 Engineering Design in Wood to determine the needed wood members including:

- CLT Panels;
- Glulam Beams; and
- Decking.

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7. Design Concrete Foundation:

Premier will use the calculated loading to determine the criteria for the concrete slabs. The concrete members will be designed according to the CAC Concrete Design Handbook, 3rd Edition including:

- Spread Footings;
- Strip Footings;
- Piers; and
- Foundation Walls.

8. Drafting:

Once the building design has been completed, Premier will generate structural drawings using AutoCAD. DBA has requested the following drawings be completed:

- Structural Floor Plan Layouts;
- Elevations;
- Cross Sections;
- Foundation Details;
- Steel Details; and
- Connection Details.

9. Quantity Takeoff:

Using the structural drawings, a quantity takeoff will be completed to determine the amount of materials needed to complete the project. Total costs for materials will be determined from unit costs given from DBA.

10. Course Requirements:

Engineering 8700 have the following requirements, which will completed during the project:

- Statement of Qualifications;
- Meeting Agendas;

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- Meeting Minutes;
- Weekly Progress Reports;
- Detailed Work Plan;
- Individual Log Books;
- Final Report Presentation; and
- Final Report.

4.2 Task Allocation

Tasks will be divided evenly among members depending on their interests, knowledge, skills, and work experience. In Appendix C, all tasks are listed including the personnel responsible for completing the task.

4.3 Task Duration

Task durations were chosen by the entire team using their previous work experience. Task durations are shown in the table in Appendix C.

4.4 Resource Requirements

The software required throughout this project will include:

- Microsoft Office Suite;
- AutoCAD; and
- S-FRAME.

Other resources that are required throughout this project will include:

- National Building Code of Canada, 2010;
- CAC Concrete Design Handbook, 3rd Edition;
- CISC Handbook of Steel Construction, 10th Edition;
- CSA-086 Engineering Design in Wood;
- Structurlam Cross Laminated Timber Design Guide; and
- Canam.

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Premier will also consult with practicing engineers, who include:

- Jamie Anstey, B. Eng, E.I.T of DBA Consulting Engineers Limited;
- Mervin Morris, P. Eng. of DBA Consulting Engineers Limited;
- Dr. Amgad Hussein of Memorial's Engineering Faculty for Concrete Design;
- Dr. Bipul Hawlander of Memorial's Engineering Faculty for Foundation Design;
- Dr. Seshu Adluri of Memorial's Engineering Faculty for Steel Design;
- Dr. Stephen Bruneau of Memorial's Engineering Faculty for Overall Project Guidance; and
- Justin Skinner of Memorial's Engineering Faculty for Overall Project Guidance.

This list is subject to change as additional resources may be used during the completion of the project. The resources required to complete each task is outlined in the table in Appendix C.

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5.0 Schedule

Premier's planned schedule for the completion of the Gibraltar Office Building illustrated by a Gantt chart is in Appendix D. The schedule began on January 29th with an anticipated completion date of March 20th. All the major project tasks identified above in Section 4.1 are used to track project progress as well as the major milestones identified by DBA as seen in Table 1. Table 1 has been colour coded so that each task can be easily identified on the Gantt chart with the same colour coding. Each week, the team will review the work completed to ensure all required tasks have been completed and to set goals for the next week. This progress and plan will be presented to both DBA and professors each week.

Project Milestones	Due Dates
Gravity Loads Wind Loads (Primary Structural Action and Uplift) Design Development Report Preliminary Framing Plan Sketch	Feb. 7th, 2013
Steel Deck Design OWSJ Design Steel Beam and Column Design Sketch of Load Transfer and Column, Beam Sizes	Feb. 14th, 2013
Wood Deck/CLT Panels/Glulam Beams Foundation Design	Feb. 21st, 2013
Earthquake loads	Feb. 28th, 2013
Roof Diaphragm Design Brace Design/Moment Connection Design	Mar. 7th, 2013
Quantity Takeoff Final CAD Drawings	Mar. 14th, 2013
Report (Draft)	Mar. 21st, 2013

Table 1: Project Milestones

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6.0 Costs

The estimated costs associated with this project are colour printing of drawings and reports, costs associated with transportation related to the project, and other miscellaneous supplies including binders and logbooks. All project costs will be shared by the team. Receipts will be maintained and at the end of the project all costs will be totaled to ensure equal contribution amongst the team.

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7.0 References

No references were used in the compilation of this detailed work plan.

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8.0 Deliverables

Upon successful completion of this project Premier will provide documentation of our design to both DBA and Engineering 8700 professors as outlined below. All the deliverables will be submitted in both hardcopies and softcopies (in a PDF format) by the associated deadlines which are yet to be confirmed, with the exception of the presentation which will only be provided as a PDF.

The requirements for DBA include:

- Load Calculations;
- Structural Design Sketches;
- Member Loading and Selection Calculations;
- Quantity Takeoff and Tender Estimate;
- Structural Drawings;
- Project Binder to Include All the Above Information; and
- Final Report.

The requirements for Engineering 8700 include:

- Statement of Qualifications;
- Meeting Agendas;
- Meeting Minutes;
- Weekly Progress Reports;
- Detailed Work Plan;
- Individual Log Books;
- Final Report Presentation; and
- Final Report.

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9.0 Risks

Premier is dedicated to maintaining quality and minimizing any risks associated with project planning and time management. However, there are some potential risks that may obstruct the timely completion. These risks include the availability of data from DBA, the availability of software, weather delays, and time constraints. The software required for design completion have high licensing costs, making them only available on certain computers in the Engineering Faculty. This limits computer availability as well as makes it nearly impossible to access software if inclement weather closes Memorial.

APPENDIX A:

Statement of Qualification

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THE PREMIER TEAM

OUR PEOPLE

AARON SHAFFER

Aaron is a senior civil engineering student at Memorial University of Newfoundland. The diverse hands-on experiences he has acquired during his four month work terms in various fields include: engineering design, field review, design verification, and project management in geo-structural engineering in Toronto (three terms); field review and project management in municipal engineering in St. John's; and project management for the Lower Churchill Project (mega project >$1B) in St. John's. Aaron has exceptional experience with problem solving on the spot, management of project activities for various projects, and the safety of workers and projects.

SABRINA ISHITA

Sabrina is a senior civil engineering student at Memorial University of Newfoundland. The hands-on experiences she acquired during her work terms have helped her develop a strong work ethic, and strong interpersonal, leadership, and time-management skills. She has extensive experience in project management, contractor supervision, road building, quality assurance and control, and environmental site assessments and remediation. Sabrina safely managed various capital and operating expenditure projects for the Operations, Maintenance, and Technical Services of Iron Ore of Canada in a timely manner, within approved budgets. She was involved with creating as-built drawings related to construction, and rehabilitation of highways and associated structures for the Department of Transportation and Works of Newfoundland and Labrador. Sabrina was also involved with monitoring the quality assurance for upgrades and paving of the Trans-Labrador Highway for AMEC.

ASHLEY HOBBS

Ashley is a senior civil engineering student at Memorial University. She has a diverse work background which includes municipal engineering, transmission line analysis, and quality assurance. During two work terms with Nalcor Energy, Ashley became skilled at learning how to master different types of software in a short amount of time. During her work term with Suncor, she dealt with the quality assurance of the Terra Nova Floating Production Storage and Offloading Vessel to ensure proper safety regulations were being followed at all times. She was also responsible for the internal auditing process. Her most recent work term was with the Town of Paradise where she re-designed residential road and storm sewer systems to accommodate the increase in population. From her work experience, Ashley has enhanced both her technical knowledge and work ethic.

JEAN GIBBONS

Jean is a senior civil engineering student at Memorial University of Newfoundland. Having previously worked with the Department of Municipal Affairs, Department of Transportation and Works, Nalcor Energy, and H.J. O'Connell, Jean has gained a wide range of experience. She has become familiar with the request for proposal, tendering, and permit application processes. Her field experience includes knowledge of surveying, pavement testing, and structural concrete inspection. Through these placements, Jean has developed a strong skill set in both construction management and environmental engineering.

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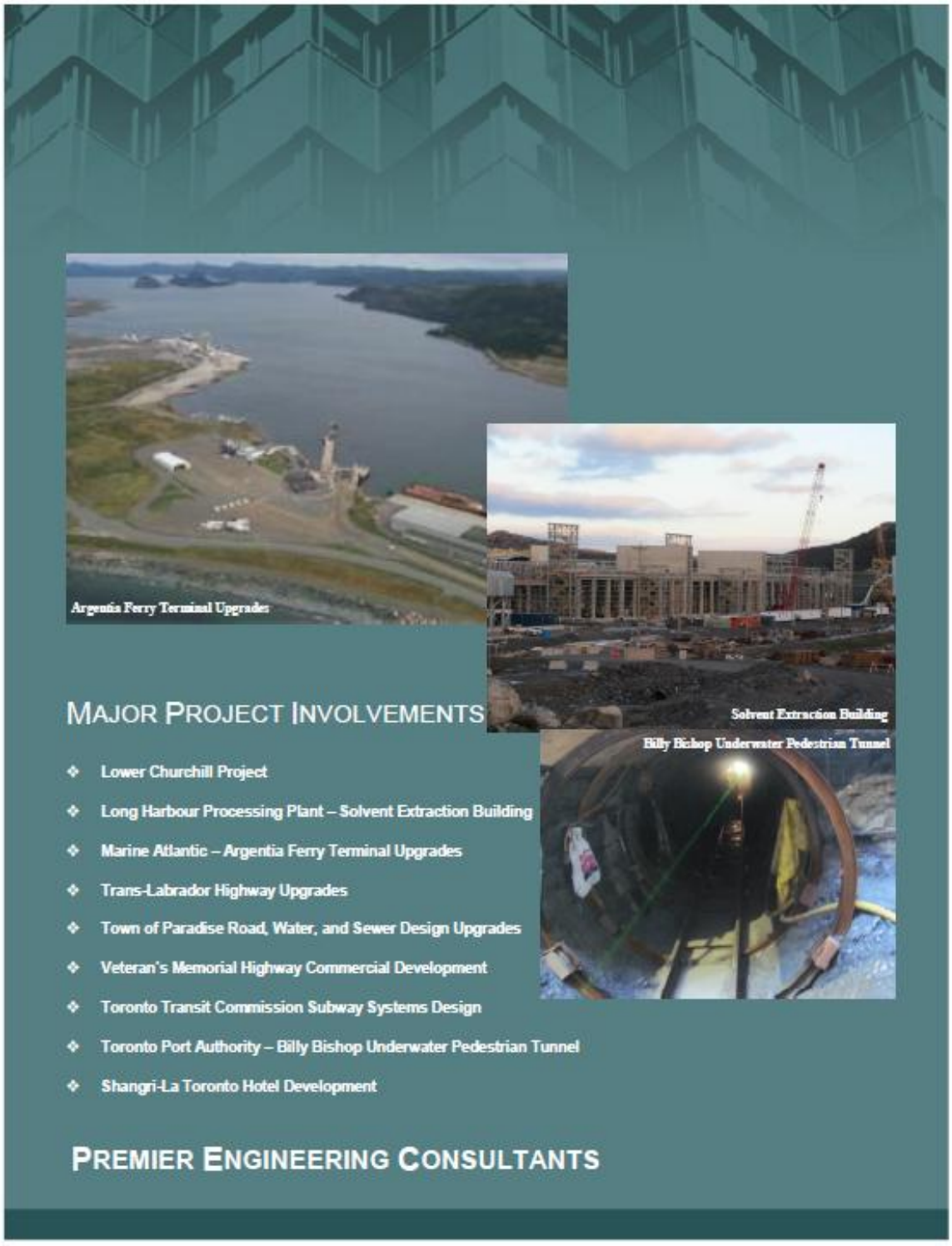

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PREMIER'S CORE VALUES

MISSION STATEMENT

Premier Engineering strives to provide the highest quality engineering services to clients with integrity and professionalism. We offer cost effective solutions in a timely manner while safety, sustainability and environmental implications are always our top priorities.

COMPANY PROFILE

Premier Engineering is a collaboration of motivated individuals with a common interest of providing engineering services to suit individual client needs. Our team consists of four civil engineering students, who collectively have a wide range of knowledge and skills in the civil engineering field, gathered through diversified work experiences. Members of Premier Engineering have been involved with many projects located across Newfoundland and Labrador, Nova Scotia, the Greater Toronto Area, and Vancouver. These involvements have lead to proficiency in a variety of areas including residential and commercial development, environmental assessment, wharf construction, geostructural shoring design and construction, transmission line design, site remediation and demolition, and handling of various materials.

Premier Engineering provides a wide range of services including engineering design, drawings, procurement, field review and design verification, and project management including estimating, cost tracking, quality control, and scheduling.

SOFTWARE CAPABILITIES

Premier Engineering's team has a wide range of software capabilities including:

- Microsoft Office Suite
- Microsoft Project
- AutoCAD
- S-Frame
- TEDDS
- ANSYS
- HEC-RAS
- EPANET
- PLS-CADD
- PLS-POLE
- ProAct

OTHER MAJOR PROJECT INVOLVEMENTS

- Holyrood Wharf Development
- Marine Simulation Group – Fast Rescue Craft Simulator
- Terra Nova – Floating Production, Storage and Offloading Vessel
- Detailed Site Investigation of Surrey Gas Station
- National Research Council – PIRAM Project
- South Side Dump – Hydro Seeding

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Site Investigation of Surrey Gas Station

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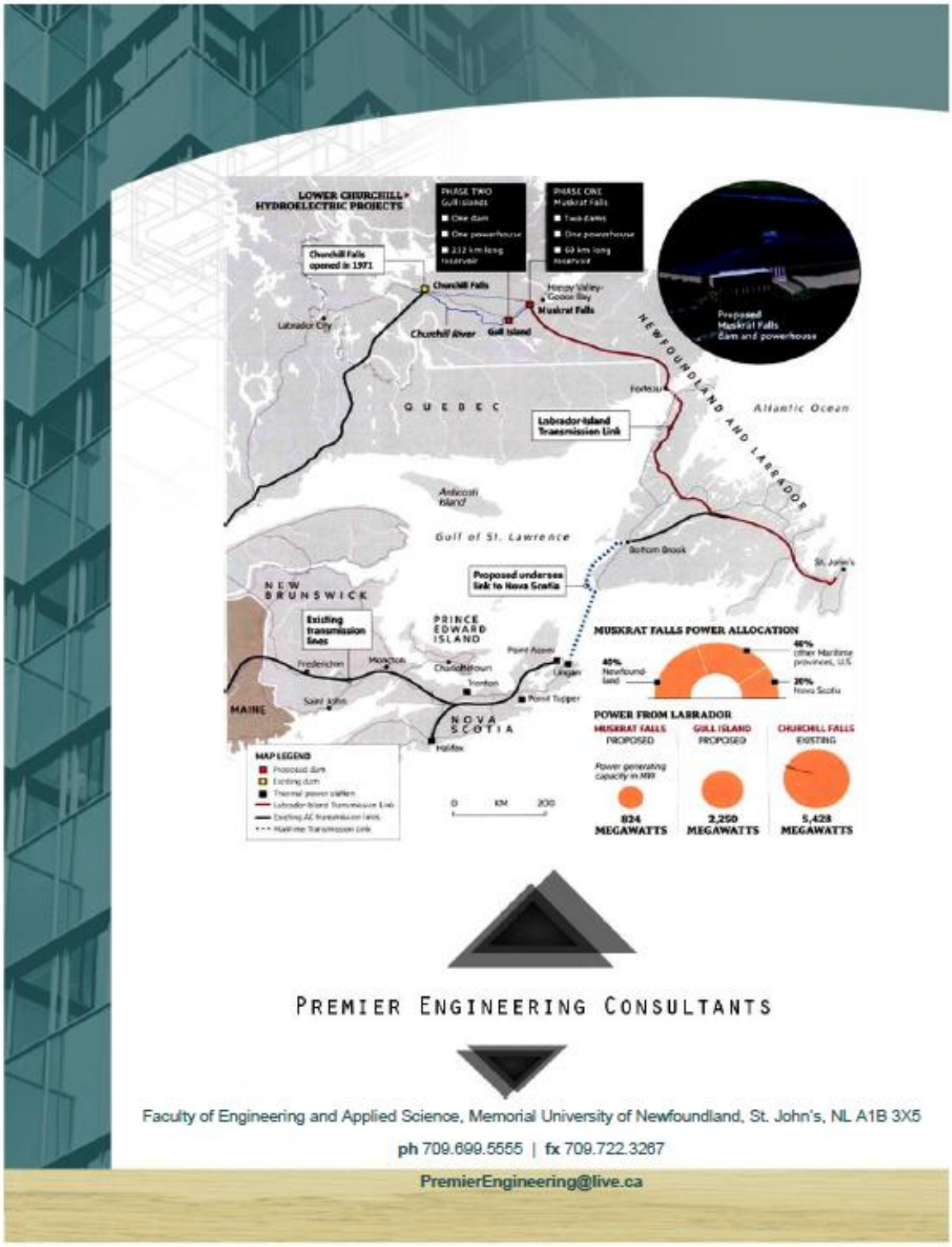

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APPENDIX B:

Work Breakdown Structure

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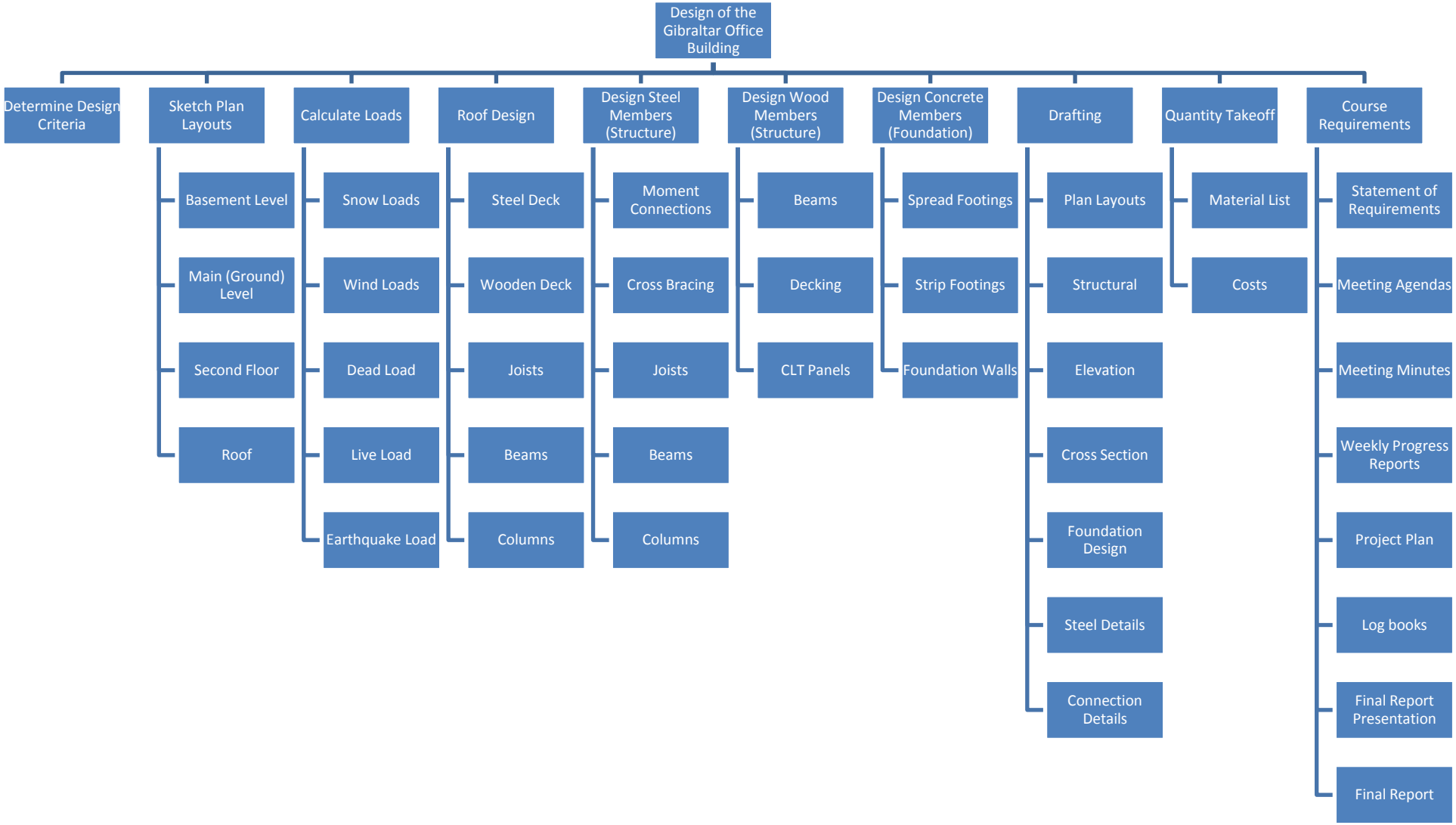

APPENDIX C:

Task Allocation, Resources, and Durations

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Tasks	Subtasks	Duration/Day	Personnel	Resource Requirements
Determine Design Criteria		3	All	NBC
Sketch Plan Layouts	Basement Level	0.5	All	
	Ground Level	0.5	All	
	Second Level	0.5	All	
	Roof	0.5	All	
Calculate Loads	Snow Load	1	All	Building System Notes
	Wind Load	1	All	Building System Notes
	Dead Load	0.5	All	Building System Notes
	Live Load	0.5	All	Building System Notes
	Earthquake Load	1	All	Building System Notes
Roof Design	Steel Deck	1	AS, SI	Steel Code
	Joists	1	AS, SI	Steel Code
	Beams	5	AS, SI	Steel Code
	Columns	5	AS, SI	Steel Code
Design Structural Wood	Beams, Deck, CLT Panels	4	AH,JG	Wood Code
Design Steel Members	Moment Connections	3	JG, AS	Steel Code
	Cross Bracing	4	JG, AS	Steel Code
	Joists	2	JG, AS	Steel Code
	Beams	6	JG, AS	Steel Code
	Columns	6	JG, AS	Steel Code
Design Concrete Members	Footings, Piers	2	AH, AS	Concrete Code
	Slabs	3	AH, AS	Concrete Code
	Foundation Walls	2	AH, AS	Concrete Code
Drafting	Plan Layouts	1	SI, AH	AutoCAD
	Structural	14	SI, AH	AutoCAD
	Elevation	2	SI, AH	AutoCAD
	Cross Section	2	AH, AS	AutoCAD
	Foundation Details	4	SI, AH	AutoCAD
	Steel Details	6	SI, AH	AutoCAD
	Connection Details	7	SI, AS	AutoCAD
Quantity Takeoff	Material List	2	AH,JG	Client
	Cost	2	AH,JG,AS	Client
Final Report		7	All	MS Office Suite
Final Presentation		3	All	MS Office Suite

APPENDIX D:

Project Schedule

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Task	Duration	January			February																												March																															April			
	(days)	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4
Design Criteria	3																																																																	
Sketch Framing Plan	2																																																																	
Calculate Loads	4																																																																	
Design Roof	12																																																																	
Design Structural Wood	4																																																																	
Design Structural Steel	21																																																																	
Design Foundation	7																																																																	
Drafting	36																																																																	
Quantity Takeoff	4																																																																	
Final Report	7																																																																	
Final Presentation	3																																																																	

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