RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:

Public Works and Government Services Canada
ATB Place North Tower
10025 Jasper Ave./10025 ave. Jaspe
5th floor/5e étage
Edmonton
Alberta
T5J 1S6
Bid Fax: (780) 497-3510

REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION

Proposal To: Public Works and Government Services Canada

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

Proposition aux: Travaux Publics et Services Gouvernementaux Canada

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Title - Sujet
Mechanical, Electrical and Lab Reno

Solicitation No. - N° de l'invitation	**Date**
E0209-161008/A	2015-10-02

Client Reference No. - N° de référence du client
NRCAN E0209-161008

GETS Reference No. - N° de référence de SEAG
PW-$PWU-023-10583

File No. - N° de dossier	**CCC No./N° CCC - FMS No./N° VME**
PWU-5-38193 (023)	

Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2015-11-16

Time Zone
Fuseau horaire
Mountain Standard Time MST

F.O.B. - F.A.B. Specified Herein - Précisé dans les présentes
Plant-Usine: ☐ **Destination:** ☐ **Other-Autre:** ☑

Address Enquiries to: - Adresser toutes questions à:	**Buyer Id - Id de l'acheteur**
Taylor (RPC), Ian	pwu023

Telephone No. - N° de téléphone	**FAX No. - N° de FAX**
(780) 566-9487 ( )	(780) 497-3510

Destination - of Goods, Services, and Construction:
Destination - des biens, services et construction:
DEPARTMENT OF PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
STE 1650
635-8TH AVE S.W.
CALGARY
Alberta
T2P3M3
Canada

Instructions: See Herein

Instructions: Voir aux présentes

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Delivery Required - Livraison exigée	**Delivery Offered - Livraison proposée**
See Herein	

Vendor/Firm Name and Address
Raison sociale et adresse du fournisseur/de l'entrepreneur

Telephone No. - N° de téléphone
Facsimile No. - N° de télécopieur

Name and title of person authorized to sign on behalf of Vendor/Firm (type or print)
Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)

Signature **Date**

Issuing Office - Bureau de distribution
Public Works and Government Services Canada
ATB Place North Tower
10025 Jasper Ave./10025 ave Jasper
5th floor/5e étage
Edmonton
Alberta
T5J 1S6

REFER TO THE FOLLOWING DOCUMENTS

REQUEST FOR PROPOSAL (RFP)

TABLE OF CONTENTS

The following is intended to clarify the general structure of the whole document.

SUPPLEMENTARY INSTRUCTIONS TO PROPONENTS (SI)

SI1 INTRODUCTION

1. Public Works and Government Services Canada (PWGSC) intends to retain an individual consulting firm or joint venture to provide the professional services for the project as set out in this Request for Proposal (RFP).

2. This is a single phase selection process. The nature of the services required and strict time frames to implement this project do not allow sufficient time to conduct the usual two phases selection process.

3. Proponents responding to this RFP are requested to submit a full and complete proposal. The proposal will cover not only the qualifications, experience and organization of the proposed Consultant Team, but also the detailed approach to the work, and the pricing and terms offered. A combination of the technical and price of services submissions will constitute the proposal.

SI2 PROPOSAL DOCUMENTS

1. All instructions, general terms, conditions and clauses identified in the RFP by number, date and title, are hereby incorporated by reference into and form part of this solicitation and any resultant contract.

   All instructions, general terms, conditions and clauses identified in the RFP by number, date and title, are set out in the Standard Acquisition Clauses and Conditions Manual (https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

2. The following are the proposal documents:

   (a) Supplementary Instructions to Proponents (SI);
   R1410T (2015-07-03), General Instructions (GI) – Architectural and/or Engineering Services – Request for Proposal;
   Submission Requirements and Evaluation (SRE);

   (b) the general terms, conditions and clauses, as amended, identified in the Agreement clause;

   (c) Project Brief / Terms of Reference;

   (d) the document entitled "General Procedures and Standards";

   (e) any amendment to the solicitation document issued prior to the date set for receipt of proposals; and

   (f) the proposal, Declaration/Certifications Form and Price Proposal Form.

3. Submission of a proposal constitutes acknowledgment that the Proponent has read and agrees to be bound by these documents.

SI3 QUESTIONS OR REQUEST FOR CLARIFICATION

Questions or requests for clarification during the solicitation period must be submitted in writing to the Contracting Authority named on the RFP - Page 1 as early as possible. Enquiries should be received no later than 5 working days prior to the closing date identified on the front page of the

Request for Proposal. Enquiries received after that date may not be answered prior to the closing date of the solicitation.

SI4 CANADA'S TRADE AGREEMENTS

This procurement is subject to the provisions of the North American Free Trade Agreement (NAFTA) and the World Trade Organization - Agreement on Government Procurement (WTO-AGP).

SI5 CERTIFICATIONS

1. **Integrity Provisions – Declaration of Convicted Offences**
   As applicable, pursuant to subsection Declaration of Convicted Offences, of section 01 of the General Instructions, the Proponent must provide with its bid, a completed Declaration Form, to be given further consideration in the procurement process.

2. **Federal Contractors Program for Employment Equity - Proposal Certification**

   By submitting a proposal, the Proponent certifies that the Proponent, and any of the Proponent's members if the Proponent is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list (http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml) available from Employment and Social Development Canada (ESDC) - Labour's website.

   Canada will have the right to declare a proposal non-responsive if the Proponent, or any member of the Proponent if the Proponent is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list at the time of contract award.

SI6 Workers Compensation

1. The recommended Proponent shall provide to the Contracting Authority, prior to Contract award:

   a) a Workers Compensation Board letter of good standing, also listing covered Directors, Principals, Proprietor(s) or Partners who will be or who are anticipated to be present on the work site(s).

2. The recommended Proponent shall deliver all of the above documents to the Contracting Authority on or before the date stated (usually 3-5 days after notification) by the Contracting Authority. Failure to comply with the request may result in the proposal being declared non-compliant.

SI7 CONSTRUCTION COST LIMIT

Construction Cost Estimates prepared by the Consultant shall not exceed the Construction Cost Limit as specified in the Supplementary Conditions.

SI8 WEBSITES

The connection to some of the Web sites in the RFP is established by the use of hyperlinks. The following is a list of the addresses of the Web sites:

Employment Equity Act
http://laws-lois.justice.gc.ca/eng/acts/E-5.401/index.html

Federal Contractors Program (FCP)
http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/index.shtml

Certificate of Commitment to Implement Employment Equity form LAB 1168
http://www.servicecanada.gc.ca/cgi-bin/search/eforms/index.cgi?app=profile&form=lab1168&dept=sc&lang=e

Code of Conduct for Procurement
http://www.tpsgc-pwgsc.gc.ca/app-acq/cndt-cndct/contexte-context-eng.html

Lobbying Act
http://laws-lois.justice.gc.ca/eng/acts/L-12.4/?noCookie

Contracts Canada
https://buyandsell.gc.ca/

Supplier Registration Information
https://srisupplier.contractscanada.gc.ca

Consultant Performance Evaluation Report Form
http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/2913-1.pdf

Canadian economic sanctions
http://www.international.gc.ca/sanctions/index.aspx?lang=eng

National Joint Council (NJC) Travel Directive
http://www.njc-cnm.gc.ca/directive/travel-voyage/index-eng.php

TERMS, CONDITIONS AND CLAUSES

AGREEMENT

1. The Consultant understands and agrees that upon acceptance of the offer by Canada, a binding Agreement shall be formed between Canada and the Consultant and the documents forming the Agreement shall be the following:

   (a) the Front Page and this Agreement clause;
   (b) the General Terms, Conditions and Clauses, as amended, identified as:
   R1210D (2015-07-09), General Condition (GC) 1 - General Provisions – Architectural and/or Engineering Services
   R1215D (2014-06-26), General Condition (GC) 2 - Administration of the Contract
   R1220D (2015-02-25), General Condition (GC) 3 - Consultant Services
   R1225D (2015-04-01), General Condition (GC) 4 - Intellectual Property
   R1230D (2015-02-25), General Condition (GC) 5 - Terms of Payment
   R1235D (2011-05-16), General Condition (GC) 6 - Changes
   R1240D (2011-05-16), General Condition (GC) 7 - Taking the Services Out of the Consultant's Hands, Suspension or Termination
   R1245D (2012-07-16), General Condition (GC) 8 - Dispute Resolution
   R1250D (2015-02-25) R1650D (2015-02-25), General Condition (GC) 9 - Indemnification and Insurance
   Supplementary Conditions
   Agreement Particulars
   (c) Project Brief / Terms of Reference;
   (d) the document entitled "General Procedures and Standards";
   (e) any amendment to the solicitation document incorporated in the Agreement before the date of the Agreement;
   (f) the proposal, the Declaration/Certifications Form and the Price Proposal Form.

2. The documents identified above by title, number and date are hereby incorporated by reference into and form part of this Agreement, as though expressly set out herein, subject to any other express terms and conditions herein contained.

   The documents identified above by title, number and date are set out in the Standard Acquisition Clauses and Conditions (SACC) Manual, issued by Public Works and Government Services Canada (PWGSC). The SACC Manual is available on the PWGSC Web site: https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual

3. If there is a discrepancy between the wording of any documents that appear on the following list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.

   (a) any amendment or variation in the Agreement that is made in accordance with the terms and conditions of the Agreement;
   (b) any amendment to the solicitation document incorporated in the Agreement before the date of the Agreement;
   (c) this Agreement clause;
   (d) Supplementary Conditions;
   (e) General Terms, Conditions and Clauses;
   (f) Agreement Particulars;
   (g) Project Brief / Terms of Reference;
   (h) the document entitled "General Procedures and Standards";
   (i) the proposal.

SUPPLEMENTARY CONDITIONS (SC)

SC1 SECURITY REQUIREMENT

There is no security requirement applicable to this Agreement.

SC2 Employer/Prime Consultant:

1. During the Design Stage

    a) The Consultant shall, where the Consultant is working on Federal property and is in control of the work site (no Federal presence or construction contractor), for the purposes of the applicable provincial or territorial Occupational Health & Safety Acts and Regulations, and for the duration of the Work of the Contract**:**

        i) act as the Employer, where the Consultant is the only employer on the work site, in accordance with the Authority Having Jurisdiction;

        ii) assume the role of Prime Consultant, where there are two or more employers (including sub-consultants) involved in work at the same time and space at the work site, in accordance with the Authority Having Jurisdiction; and

2. During the Construction Stage

    a) The Consultant shall, for the purposes of the Occupational Health & Safety Acts and Regulations, and for the duration of the Work of the Contract**,** agree to accept that the Construction Contractor is the Principal/Prime Contractor, and to conform to that Contractor's Site Specific Health and Safety Plan.

SC3 CONSTRUCTION COST LIMIT

1. The Construction Cost Limit is $6,160,000.00 (Applicable Taxes extra).

2. In accordance with R1220D (2015-02-25) GC 3.11 Cost Control, throughout Project Development, the Construction Cost Estimate prepared by the Consultant shall not exceed the Construction Cost Limit as specified above. This disclosure of available funds does not commit Canada to pay Consultant fees based on such an amount.

AGREEMENT PARTICULARS

The Agreement Particulars will be issued at time of award of contract and will identify the fee to be paid to the Consultant for the services determined in the Price Proposal Form.

APPENDIX A - TEAM IDENTIFICATION FORMAT

For details on this format, please see SRE in the Request For Proposal.

The prime consultant and other members of the Consultant Team shall be, or eligible to be, licensed, certified or otherwise authorized to provide the necessary professional services to the full extent that may be required by provincial or territorial law.

I. Prime Consultant (Proponent - Architect):

Firm or Joint Venture Name: .....
.....
.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

.....
.....
.....
.....
.....

II. Key Sub Consultants / Specialists:

Structural Engineer
Firm Name: .....
.....
.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

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Mechanical Engineer
Firm Name: .....
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.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

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Electrical Engineer
Firm Name: .....
.....
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Key Individuals and provincial professional licensing status and/or professional accreditation:

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.....
.....

Laboratory Design Specialist
Firm Name: .....
.....
.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

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.....
.....
.....

Commissioning Specialist
Firm Name: .....
.....
.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

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.....

Cost Estimating Specialist
Firm Name: .....
.....
.....

Key Individuals and provincial professional licensing status and/or professional accreditation:

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.....
.....

APPENDIX B - DECLARATION/CERTIFICATIONS FORM

Project Title:

Name of Proponent:

Street Address: **Mailing Address:**

Telephone Number: ( )

Fax Number: ( )

E-Mail:

Procurement Business Number:

Type of Organization:	**Size of Organization:**
_____ Sole Proprietorship _____ Partnership _____ Corporation _____ Joint Venture	Number of Employees _____ Graduate Architects / Professional Engineers _____ Other Professionals _____ Technical Support _____ Other _____

APPENDIX B - DECLARATION/CERTIFICATIONS FORM (CONT'D)

Former Public Servant (FPS) - Certification

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts awarded to FPS, proponents must provide the information required below before contract award. If the answer to the questions and, as applicable the information required have not been received by the time the evaluation of proposals is completed, Canada will inform the Proponent of a time frame within which to provide the information. Failure to comply with Canada's request and meet the requirement within the prescribed time frame will render the proposal non-responsive.

Definitions

For the purposes of this clause,

"former public servant" is any former member of a department as defined in the *Financial Administration Act*, R.S., 1985, c. F-11, a former member of the Canadian Armed Forces or a former member of the Royal Canadian Mounted Police. A former public servant may be:

(a) an individual;
(b) an individual who has incorporated;
(c) a partnership made of former public servants; or
(d) a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

"lump sum payment period" means the period measured in weeks of salary, for which payment has been made to facilitate the transition to retirement or to other employment as a result of the implementation of various programs to reduce the size of the Public Service. The lump sum payment period does not include the period of severance pay, which is measured in a like manner.

"pension" means a pension or annual allowance paid under the *Public Service Superannuation Act* (PSSA), R.S., 1985, c.P-36, and any increases paid pursuant to the *Supplementary Retirement Benefits Act*, R.S., 1985, c.S-24 as it affects the PSSA. It does not include pensions payable pursuant to the *Canadian Forces Superannuation Act*, R.S., 1985, c.C-17, the *Defence Services Pension Continuation Act*, 1970, c.D-3, the *Royal Canadian Mounted Police Pension Continuation Act*, 1970, c.R-10, and the *Royal Canadian Mounted Police Superannuation Act*, R.S., 1985, c.R-11, the *Members of Parliament Retiring Allowances Act*, R.S., 1985, c.M-5, and that portion of pension payable to the *Canada Pension Plan Act*, R.S., 1985, c.C-8.

APPENDIX B - DECLARATION/CERTIFICATIONS FORM (CONT'D)

Former Public Servant in Receipt of a Pension

As per the above definitions, is the Proponent a FPS in receipt of a pension?
YES ( ) NO ( )

If so, the Proponent must provide the following information, for all FPS in receipt of a pension, as applicable:

(a) name of former public servant;
(b) date of termination of employment or retirement from the Public Service.

By providing this information, proponents agree that the successful Proponent's status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with Contracting Policy Notice: 2012-2 and the Guidelines on the Proactive Disclosure of Contracts.

Work Force Adjustment Directive

Is the Proponent a FPS who received a lump sum payment pursuant to the terms of a work force reduction program? YES ( ) NO ( )

If so, the Proponent must provide the following information:

(a) name of former public servant;
(b) conditions of the lump sum payment incentive;
(c) date of termination of employment;
(d) amount of lump sum payment;
(e) rate of pay on which lump sum payment is based;
(f) period of lump sum payment including start date, end date and number of weeks;
(g) number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is $5,000, including Applicable Taxes.

APPENDIX B - DECLARATION/CERTIFICATIONS FORM (CONT'D)

Name of Proponent:

DECLARATION:
I, the undersigned, being a principal of the proponent, hereby certify that the information given on this form and in the attached proposal is accurate to the best of my knowledge. If any proposal is submitted by a partnership or joint venture, then the following is required from each component entity.

.....	.....
name	signature
.....	
title	

I have authority to bind the Corporation / Partnership / Sole Proprietorship / Joint Venture

.....	.....
name	signature
.....	
title	

I have authority to bind the Corporation / Partnership / Sole Proprietorship / Joint Venture

.....	.....
name	signature
.....	
title	

I have authority to bind the Corporation / Partnership / Sole Proprietorship / Joint Venture

During proposal evaluation period, PWGSC contact will be with the following person:_____.

Telephone Number: ( ) _____ Fax Number: ( ) _____

E-mail: _____

This Appendix "B" should be completed and submitted with the proposal, but may be submitted afterwards as follows: if Appendix "B" is not completed and submitted with the proposal, the Contracting Authority will inform the Proponent of a time frame within which to provide the information. Failure to comply with the request of the Contracting Authority and to provide the certifications within the time frame provided will render the proposal non-responsive.

APPENDIX C - PRICE PROPOSAL FORM

INSTRUCTIONS: Complete this Price Proposal Form and submit in a **separate sealed envelope** with the Name of Proponent, Name of Project, PWGSC Solicitation Number, and the words "PRICE PROPOSAL FORM" typed on the outside of the envelope. Price Proposals are not to include Applicable Taxes.

PROPONENTS SHALL NOT ALTER THIS FORM

Project Title: NRCan GSCC Mechanical, Electrical, Lab Renovations

Name of Proponent:

The following will form part of the evaluation process:

REQUIRED SERVICES

Fixed Fee (R1230D (2015-02-25), GC 5 - Terms of Payment)

SERVICES	FIXED FEE
Preliminary Design Service	$.....
Design Service (including up to 8 tender packages)	$.....
Contract Procurement Phase	$.....
Construction Support Services	$.....
Cost Estimating Services	$.....
Commissioning Services	$.....
Travel, time and expenses, to site (assume 75 trips)	$.....
MAXIMUM FIXED FEES	**$.....**

APPENDIX C - PRICE PROPOSAL FORM (CONT'D)

THE FOLLOWING HOURLY RATES MAY BE USED FOR FUTURE CONTRACT AMENDMENTS

Principals

Name	$ per hour
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....

APPENDIX C - PRICE PROPOSAL FORM (CONT'D)

Staff

Name / Position	$ per hour
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....
.....	$ .....
.....	$ .....
.....	$ .....
.....	$.....

END OF PRICE PROPOSAL FORM

APPENDIX D - GENERAL PROCEDURES & STANDARDS

See attached document.

SUBMISSION REQUIREMENTS AND

EVALUATION

SUBMISSION REQUIREMENTS AND EVALUATION

SRE 1 GENERAL INFORMATION

1.1 Reference to the Selection Procedure

An 'Overview of the Selection Procedure' can be found in R1410T General Instructions to Proponents (GI3).

1.2 Calculation of Total Score

For this project the Total Score will be established as follows:

Technical Rating x 90%	=	Technical Score (Points)
Price Rating x 10%	=	Price Score (Points)
Total Score	=	Max. 100 Points

SRE 2 PROPOSAL REQUIREMENTS

2.1 Requirement for Proposal Format

The following proposal format information should be implemented when preparing the proposal.

- Submit one (1) bound original plus five (5) bound copies of the proposal
- Paper size should be - 216mm x 279mm (8.5" x 11")
- Minimum font size - 11 point Times or equal
- Minimum margins - 12 mm left, right, top, and bottom
- Double-sided submissions are preferred
- One (1) 'page' means one side of a 216mm x 279mm (8.5" x 11") sheet of paper
- 279mm x 432 mm (11" x 17") fold-out sheets for spreadsheets, organization charts etc. will be counted as two pages.
- The order of the proposals should follow the order established in the Request for Proposal SRE section

2.2 Specific Requirements for Proposal Format

The maximum number of pages (including text and graphics) to be submitted for the Rated Requirements under SRE 3.2 is thirty (30) pages.

The following are not part of the page limitation mentioned above;

- Covering letter
- Consultant Team Identification (Appendix A)
- Declaration/Certifications Form (Appendix B)
- Code of Conduct Certifications
- Front page of the RFP
- Front page of revision(s) to the RFP
- Price Proposal Form (Appendix C)

Consequence of non-compliance: any pages which extend beyond the above page limitation and any other attachments will be extracted from the proposal and will not be forwarded to the PWGSC Evaluation Board members for evaluation.

SRE 3 SUBMISSION REQUIREMENTS AND EVALUATION

3.1 MANDATORY REQUIREMENTS

Failure to meet the mandatory requirements will render the proposal as non-responsive and no further evaluation will be carried out.

3.1.1 Licensing, Certification or Authorization

The proponent shall be an architect, licensed, or eligible to be licensed, to provide the necessary professional services to the full extent that may be required by provincial or territorial law in the province of Alberta.

3.1.2 Consultant Team Identification

The consultant team to be identified must include the following:

Proponent (prime consultant) - Architect
Key Sub-consultants / Specialists – Structural Engineer,
Mechanical Engineer
Electrical Engineer
Laboratory Design Specialist
Commissioning Specialist
Cost Estimating Specialist

Information required - name of firm, key personnel to be assigned to the project. For the prime consultant indicate current license and/or how you intend to meet the provincial or territorial licensing requirements. In the case of a joint venture identify the existing or proposed legal form of the joint venture (refer to R1410T General Instructions to Proponents, GI9 Limitation of Submissions).

An example of an acceptable format (typical) for submission of the team identification information is provided in Appendix A.

3.1.3 Declaration/Certifications Form

Proponents must complete, sign and submit the following:

- Appendix B, Declaration/Certifications Form as required.

3.1.4 Integrity Provisions - Associated Information

Proponents who are incorporated, including those submitting proposals as a joint venture, must provide a complete list of names of all individuals who are currently directors of the Proponent. Proponents submitting proposals as sole proprietorship, including those submitting proposals as a joint venture, must provide the name of the owner. Proponents submitting proposals as societies, firms, or partnerships do not need to provide lists of names. If the required names have not been received by the time the evaluation of proposals is completed, Canada will inform the Proponent of a time frame within which to provide the information. Failure to provide the names within the time frame specified will render the bid non-responsive. Providing the required names is a mandatory requirement for contract award.

3.2 RATED REQUIREMENTS

3.2.1 Achievements of Proponent on Projects

Describe the Proponent's accomplishments, achievements and experience as prime consultant on projects.

Select a **maximum** of 3 projects undertaken within the last 10 years. Joint venture submissions are not to exceed the maximum number of projects. Only the first 3 projects listed in sequence will receive consideration and any others will receive none as though not included.

Information that should be supplied:

- clearly indicate how this project is comparable/relevant to the requested project.
- brief project description and intent. Narratives should include a discussion of design philosophy / approach to meet the intent, design challenges and resolutions.
- budget control and management - i.e. contract price & final construction cost - explain variation
- project schedule control and management - i.e. initial schedule and revised schedule - explain variation
- client references - name, address, phone and fax of client contact at working level - references may be checked
- names of key personnel responsible for project delivery

The Proponent (as defined in R1410T General Instructions to Proponents, GI2 Definitions) must possess the knowledge on the above projects. Past project experience from entities other than the Proponent will not be considered in the evaluation unless these entities form part of a joint venture Proponent.

Please indicate those projects which were carried out in joint venture and the responsibilities of each of the involved entities in each project.

3.2.2 Achievements of Key Sub-consultants and Specialists on Projects

Describe the accomplishments, achievements and experience either as prime consultant or in a sub-consultant capacity on projects. If the Proponent proposes to provide multi-disciplinary services which might otherwise be performed by a sub-consultant, this should be reflected here.

Select a **maximum** of 3 projects undertaken within the last 10 years per key sub consultant or specialist. Only the first 3 projects listed in sequence (per key subconsultant or specialist) will receive consideration and any others will receive none as though not included.

Information that should be supplied:

- clearly indicate how this project is comparable/relevant to the requested project.
- brief project description and intent. Narratives should include a discussion of design philosophy / approach to meet the intent, design challenges and resolutions.
- budget control and management
- project schedule control and management
- client references - name, address, phone and fax of client contact at working level - references may be checked
- names of key personnel responsible for project delivery

3.2.3 Achievements of Key Personnel on Projects

Describe the experience and performance of key personnel to be assigned to this project regardless of their past association with the current proponent firm. This is the opportunity to emphasize the strengths of the individuals on the team, to recognize their past responsibilities, commitments and achievements.

Information that should be supplied for each key personnel:

- professional accreditation
- accomplishments/achievements/awards
- relevant experience, expertise, number of years experience
- role, responsibility and degree of involvement of individual in past projects

3.2.4 Understanding of the Project:

The proponent should demonstrate understanding of the goals of the project, the functional/technical requirements, the constraints and the issues that will shape the end product.

Information that should be supplied:

- The functional and technical requirements
- Significant issues, challenges and constraints
- Project schedule and cost. Review schedule and cost information and assess risk management elements that may affect the project
- The Client User's philosophies and values

3.2.5 Scope of Services:

The proponent should demonstrate capability to perform the services and meet project challenges and to provide a plan of action.

Information that should be supplied:

- Scope of Services - detailed list of services
- Work Plan - detailed breakdown of work tasks and deliverables
- Project schedule - proposed major milestone schedule
- Risk management strategy

3.2.6 Management of Services:

The Proponent should describe how he /she proposes to perform the services and meet the constraints; how the services will be managed to ensure continuing and consistent control as well as production and communication efficiency; how the team will be organized and how it will fit in the existing structure of the firms; to describe how the team will be managed. The proponent is also to identify sub-consultant disciplines and specialists required to complete the consultant team.

If the Proponent proposes to provide multi-disciplinary services which might otherwise be performed by a sub-consultant, this should be reflected here.

Information that should be supplied:

- Confirm the makeup of the full project team including the names of the consultant sub-consultants and specialists personnel and their role on the project.

- Organization chart with position titles and names (Consultant team). Joint Venture business plan, team structure and responsibilities, if applicable
- What back-up will be committed
- Profiles of the key positions (specific assignments and responsibilities)
- Outline of an action plan of the services with implementation strategies and sequence of main activities
- Reporting relationships
- Communication strategies
- Response time: demonstrate how the response time requirements will be met

3.2.7 Design Philosophy / Approach / Methodology

The proponent should elaborate on aspects of the project considered to be a major challenge which will illustrate design philosophy / approach / methodology. This is the opportunity for the Proponent to state the overall design philosophy of the team as well as their approach of resolving design issues and in particular to focus on the unique aspects of the current project.

Information that should be supplied:

- Design Philosophy / Approach / Methodology
- Describe the major challenges and how your team approach will be applied to those particular challenges.

3.3 EVALUATION AND RATING

In the first instance, price envelopes will remain sealed and only the technical components of the proposals which are responsive will be reviewed, evaluated and rated by a PWGSC Evaluation Board in accordance with the following to establish Technical Ratings:

Criterion	Weight Factor	Rating	Weighted Rating
Achievements of Proponent	1.5	0 - 10	0 - 15
Achievements of Key Sub-consultants / Specialists	1.5	0 - 10	0 - 15
Achievements of Key Personnel on Projects	2.0	0 - 10	0 - 20
Understanding of the Project	1.5	0 - 10	0 - 15
Scope of Services	1.0	0 - 10	0 - 10
Management of Services	1.0	0 - 10	0 - 10
Design Philosophy / Approach / Methodology	1.5	0 - 10	0 - 15
Technical Rating	10.0		0 - 100

Generic Evaluation Table

PWGSC Evaluation Board members will evaluate the strengths and weaknesses of the Proponent's response to the evaluation criteria and will rate each criterion with even numbers (0, 2, 4, 6, 8 or 10) using the generic evaluation table below:

	INADEQUATE	WEAK	ADEQUATE	FULLY SATISFACTORY	STRONG
0 point	2 points	4 points	6 points	8 points	10 points
Did not submit information which could be evaluated	Lacks complete or almost complete understanding of the requirements.	Has some understanding of the requirements but lacks adequate understanding in some areas of the requirements.	Demonstrates a good understanding of the requirements.	Demonstrates a very good understanding of the requirements.	Demonstrates an excellent understanding of the requirements.
	Weaknesses cannot be corrected	Generally doubtful that weaknesses can be corrected	Weaknesses can be corrected	No significant weaknesses	No apparent weaknesses
	Proponent do not possess qualifications and experience	Proponent lacks qualifications and experience	Proponent has an acceptable level of qualifications and experience	Proponent is qualified and experienced	Proponent is highly qualified and experienced
	Team proposed is not likely able to meet requirements	Team does not cover all components or overall experience is weak	Team covers most components and will likely meet requirements	Team covers all components - some members have worked successfully together	Strong team - has worked successfully together on comparable projects
	Sample projects not related to this requirement	Sample projects generally not related to this requirement	Sample projects generally related to this requirement	Sample projects directly related to this requirement	Leads in sample projects directly related to this requirement
	Extremely poor, insufficient to meet performance requirements	Little capability to meet performance requirements	Acceptable capability, should ensure adequate results	Satisfactory capability, should ensure effective results	Superior capability, should ensure very effective results

To be considered further, proponents **must** achieve a minimum Technical Rating of fifty (50) points out of the hundred (100) points available as specified above.

No further consideration will be given to proponents not achieving the pass mark of fifty (50) points.

SRE 4 PRICE OF SERVICES

All price proposal envelopes corresponding to responsive proposals which have achieved the pass mark of fifty (50) points will be opened upon completion of the technical evaluation. An average price is determined by adding all the price proposals together and dividing the total by the number of price proposals being opened.

All price proposals which are greater than twenty-five percent (25%) above the average price will be set aside and receive no further consideration.

The remaining price proposals are rated as follows:

A. The lowest price proposal receives a Price Rating of 100
B. The second, third, fourth and fifth lowest prices receive Price Ratings of 80, 60, 40, and 20 respectively. All other price proposals receive a Price Rating of 0.
C. On the rare occasions where two (or more) price proposals are identical, the matching price proposals receive the same rating and the corresponding number of following ratings are skipped.

The Price Rating is multiplied by the applicable percentage to establish the Price Score.

SRE 5 TOTAL SCORE

Total Scores will be established in accordance with the following:

Rating	Possible Range	% of Total Score	Score (Points)
Technical Rating	0 - 100	90	0 - 90
Price Rating	0 - 100	10	0 - 10
Total Score		100	0 - 100

The Proponent receiving the highest Total Score is the first entity that the Evaluation Board will recommend for the provision of the required services. In the case of a tie, the proponent submitting the lower price for the services will be selected.

SRE 6 SUBMISSION REQUIREMENTS - CHECKLIST

The following list of documents and forms is provided with the intention of assisting the Proponent in ensuring a complete submission. The Proponent is responsible for meeting all submission requirements.

Please follow detailed instructions in R1410T General Instructions to Proponents, GI16 Submission of Proposal. Proponents may choose to introduce their submissions with a cover letter..

Team Identification - see typical format in Appendix A
Declaration/Certifications Form - completed and signed - form provided in Appendix B
Integrity Provisions - Associated Information - list of directors/owners
Proposal - one (1) original plus five(5) copies required
Front page of RFP
Front page(s) of any solicitation amendment

In a separate envelope:
Price Proposal Form - one (1) completed and submitted in a separate envelope

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada
Canada

Respect ◆ Integrity ◆ Excellence ◆ Leadership

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GENERAL PROCEDURES & STANDARDS

For Professional & Design Services

MMXI Edition

www.pwgsc-tpsgc.gc.ca

Table of Contents:

1 INTRODUCTION

1.1 GENERAL PROCEDURES AND STANDARDS

1.1.1 GENERAL

.1 These PWGSC *General Procedures and Standards* (P&S) have been developed to:
- .1 Facilitate the development of a rational, well-documented design process; and
- .2 Ensure compliance with federal government standards, PWGSC Policies and Treasury Board directives.

1.1.2 HARMONIZATION WITH THE TERMS OF REFERENCE (TOR)

.1 The P&S document must be used in conjunction with the TOR, as the two documents are complimentary.

.2 The TOR describes project-specific requirements, services and deliverables while the GP&S document outlines with minimum standards and procedures common to all projects.

.3 In the case of a conflict between the two documents, the requirements of the TOR override this document.

1.2 PROJECT DELIVERY

1.2.1 GENERAL REQUIREMENTS

.1 The project delivery requirements outlined in this section are applicable to the design and construction of all PWGSC projects in Western Region, unless otherwise indicated in the TOR.

.2 Under the direction of the Consultant, the Consultant team shall provide fully integrated and coordinated professional and design services for the delivery of a project, in accordance with the requirements in the TOR and as contained herein.

.3 The Consultant must:
- .1 Obtain written authorization from the Departmental Representative before proceeding from one phase of work to the next phase of a project;
- .2 Coordinate all services with the Departmental Representative;
- .3 Deliver each project utilizing best practices in support of User Department needs, respecting the approved financial budget, schedule, scope, quality energy budget;
- .4 Establish a cohesive functional partnership and open communication between all members of the project delivery team throughout all phases of the project life;
- .5 Ensure that the Consultant team has an in-depth understanding and collective 'buy-in' of the project requirements, scope, budget and scheduling objectives, working constructively to build a collaborative and cooperative team approach with knowledgeable and timely input and contribution by all project team members, including representatives from PWGSC and the User Department;
- .6 Conduct rigorous quality assurance reviews during the design and construction phases, including the application of value engineering principles during the design of all complex systems;
- .7 Provide a written response to all PWGSC comments included in Quality Assurance reviews conducted throughout the design of the project;
- .8 If any alterations are required during the development of the design, analyse the impact on all project components and resubmit for approval before proceeding further;
- .9 Establish and maintain a change control procedure for scope changes;

.10 Ensure that an experienced Project Architect or Project Engineer is assigned to each project, who shall be responsible for the production, coordination and delivery of all design and construction documents for all project disciplines;
.11 Prepare a continuous risk identification and management program employing effective methodologies to ensure construction safety as well as claims avoidance;
.12 Provide continuous and comprehensive documentation of the project at all stages of the project implementation;
.13 Ensure continuity of key personnel and maintain a dedicated working team for the life of the project;

1.2.2 SERVICE DELIVERY FOR ALL PROJECTS

.1 For all projects, the Consultant shall:
  .1 Deliver the project to be within;
    .1 The established construction budget,
    .2 The key milestones, according to the established project schedule.
  .2 Ensure that each Consultant team member:
    .1 Understands the project requirements, for seamless delivery of the required services;
    .2 Functions as a cohesive partnership with open communication between all members of the project delivery team throughout all phases of the project life;
    .3 Function as an integrated and focused team with an in-depth understanding and collective 'buy-in' of the project requirements, scope, budget and scheduling objectives.
  .3 Provide;
    .1 Full co-ordination of services with other consultants engaged by PWGSC,
    .2 A continuous risk management program to address the risks associated specifically with this project, including construction safety and claims avoidance issues.
  .4 Deliver the work in a professional manner during all phases of the project, employing best practices for budget, schedule, quality, and scope management;
  .5 Maintain continuity of key personnel and maintain a dedicated working team for the life of the project.

1.2.3 SERVICE DELIVERY (BUILDINGS)

.1 For Building projects, where an Architectural firm is the Prime Consultants, the Consultant team shall, as a minimum, adhere to the standards of services outlined in the "Canadian Handbook of Practice for Architects - Volume 2 Management" (latest edition) distributed by the Royal Architectural Institute of Canada (RAIC).

1.2.4 SERVICE DELIVERY (ENGINEERING)

.1 For Engineering projects, where an Engineering firm is the Prime Consultants, the Consultant team shall adhere to the standards of services established by the Professional Engineering Association in the Province or Territories where the project is located.

1.3 PROCUREMENT OF GOODS AND SERVICES

1.3.1 PUBLIC PROCUREMENT

.1 Public procurement by Canada is legislated and guided by a number of international and national trade agreements, and acts, as well as policies, directives, and guidelines provided by the Treasury Board Secretariat (TBS) and PWGSC.

.2 There is one over-arching principle for all PWGSC procurement activities: Integrity. Subordinate to this are guiding principles, which provide the framework for PWGSC procurement process.

.3 For further information refer to the following web link;

.1 http://www.tpsgc-pwgsc.gc.ca/app-acq/cndt-cndct/contexte-context-eng.html

1.3.2 INTEGRITY AND GUIDING PRINCIPLES

.1 PWGSC procurement processes will be open, fair and honest.

.2 Client Service:

.1 PWGSC will make every reasonable effort to satisfy the operational requirements of its clients, while obtaining the best value in each procurement process.

.3 National Objectives:

.1 PWGSC procurement activities will advance established government policies, within the limits imposed by international trade obligations.

.4 Competition:

.1 PWGSC procurement will be competitive, with specific exceptions.

.5 Equal Treatment:

.1 PWGSC must ensure that all potential bidders of a particular requirement are subject to the same conditions.

.6 Accountability:

.1 PWGSC is accountable for the integrity of the contracting process.

2 REQUIRED SERVICES STANDARDS

2.1 GENERAL

.1 Where Services are called for in the project specific TOR, the standards outlined in the following articles apply.

2.2 COST MANAGEMENT

2.2.1 GENERAL

.1 The following provides a general indication of the information needed by the Consultant's cost estimator to prepare specific classifications of estimates.

.2 These are the minimum requirements only and should be supplemented where additional information exists or is warranted.

.3 Construction cost estimates are to be prepared and submitted to PWGSC at various stages during the design process.

.4 In addition to the Consultants' estimate, PWGSC may have independent estimates performed to compare with the Consultant estimate.

2.2.2 TREASURY BOARD (TB) SUBMISSIONS

.1 Projects that are subject to TB approval are normally submitted twice.

- .1 The first submission is for Preliminary Project Approval (PPA) at Pre-Design or Schematic Design stage of a project and must include an Indicative Estimate for the cost of the work.
- .2 The second submission is for Effective Project Approval (EPA) at the completion of Design Development or Pre-Tender stage of a project and must include a Substantive Estimate for the cost of the work.

.2 The Treasury Board estimate definitions are:

- .1 Indicative Estimate;
  - .1 A low quality, order of magnitude estimate that is not sufficiently accurate to warrant TB approval as a Cost Objective.
- .2 Substantive Estimate;
  - .1 An estimate which is of sufficiently high quality and reliability as to warrant TB approval as a Cost Objective for the project phase under consideration.
  - .2 It is based on detailed systems and component design, taking into account all project objectives and deliverables.

.3 TB Terminology:

- .1 Constant dollar estimate;
  - .1 This is an estimate expressed in terms of the dollars of a particular base fiscal year.
    - .1 It includes no provision for inflation.
    - .2 Cash flows over a number of fiscal years may also be expressed in constant dollars of the base year including no allowance for inflation in the calculation of costs.
- .2 Budget-year (BY) dollar estimate:
  - .1 Budget year dollars is also be referred to as Nominal dollars or Current dollars.
    - .1 This is an estimate based on costs arising in each FY of the project schedule.
    - .2 It is escalated to account for inflation and other economic factors affecting the period covered by the estimate.
  - .2 The costs and benefits across all periods should initially be tabulated in budget year dollars for thee following reasons:

.1 First; this is the form in which financial data are usually available,
.2 Second; adjustments, such as tax adjustments, are accurately and easily made in budget year dollars,
.3 Finally; working in budget-year dollar enables the analyst to construct a realistic picture over time, taking into account changes in relative prices.

2.2.3 CLASSES OF ESTIMATES

.1 PWGSC applies a detailed, four level, classification using the terms Class A, B, C and D.
.2 Apply these estimate classifications at the project stages as defined in the TOR.
.3 For projects required to be submitted to TB for approval:
  .1 An Indicative Estimate shall be at least a class 'D'; and
  .2 A Substantive Estimate shall be at least a class 'B'.

2.2.4 CLASS 'D' (INDICATIVE) ESTIMATE

.1 Based upon a comprehensive statement of requirements and an outline of potential solutions, this estimate is to provide an indication of the final project cost, and allow for ranking of all the options being considered.
.2 Submit Class 'D' cost estimates in elemental analysis format, in accordance with the latest edition issued by the Canadian Institute of Quantity Surveyors, with cost per m^2 for current industry statistical data for the appropriate building type and location.
.3 Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.
.4 The level of accuracy of a class D cost estimate shall be such that no more than a 20% design contingency allowance is required.

2.2.5 CLASS 'C' ESTIMATE

.1 Based on a comprehensive list of requirements and assumptions, including a full description of the preferred Schematic Design option, construction experience, design experience and market conditions, this estimate must be sufficient for making the correct investment decision.
.2 Submit Class 'C' cost estimates in elemental analysis format, in accordance with the latest edition issued by the Canadian Institute of Quantity Surveyors, with cost per m^2 for current industry statistical data for the appropriate building type and location.
.3 Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.
.4 The level of accuracy of a class C cost estimate shall be such that no more than a 15% design contingency allowance is required.

2.2.6 CLASS 'B' (SUBSTANTIVE) ESTIMATE

.1 Based on design development drawings and outline specifications, which include the preliminary design of all major systems and subsystems, as well as the results of all site/installation investigations, this estimate must provide for the establishment of realistic cost objectives and be sufficient to obtain effective project approval.
.2 Submit Class 'B' cost estimates in both elemental analysis format and trade divisional format, in accordance with the latest edition issued by the Canadian Institute of Quantity Surveyors.
.3 Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.
.4 The level of accuracy of a class 'B' cost estimate shall be such that no more than a 10% design contingency allowance is required.

2.2.7 CLASS 'A' (PRE-TENDER) ESTIMATE

.1 Based on completed construction drawings and specifications prepared prior to calling competitive tenders, this estimate must be sufficient to allow a detailed reconciliation and/or negotiation with any contractor's tender.
.2 Submit Class 'A' cost estimates in both elemental analysis format and trade divisional format, in accordance with the latest edition issued by the Canadian Institute of Quantity Surveyors.
.3 Include a summary in the cost estimate, plus full back up, showing items of work, quantities, unit prices, allowances and assumptions.
.4 The level of accuracy of a class 'A' cost estimate shall be such that no more than a 5% design contingency allowance is required.

2.3 SCHEDULE MANAGEMENT

2.3.1 SCHEDULER

.1 The Scheduler shall provide a Project Planning and Control Schedule for the project, for the purpose of Planning, Scheduling, Progress Monitoring (Time Management), during all the design phases up to the construction procurement phase.
.2 A qualified Scheduler, with experience commensurate with the complexity of the project, is required to develop and monitor the project schedule during the design process.
.3 The Scheduler shall adhere to good industry practices for schedule development and maintenance, as recognized by the Project Management Institute (PMI).
.4 PWGSC presently utilizes the Primavera Suite software and Microsoft Project for it's current Control Systems and any software used by the consultant should be fully integrated with either of these programs, using one of the many commercially available software packages.

2.3.2 PROJECT SCHEDULE

.1 A Detailed Project Schedule is a schedule developed in reasonable detail to ensure adequate Time Management planning and control of the project.
.2 Project Schedules are used as a guide for the planning, design and implementation phases of the project, as well as to communicate to the project team when activities are to happen, based on network techniques using Critical Path Method (CPM).
.3 When building a Project Schedule, the Consultant must consider:
  .1 The level of detail required for control and reporting;
  .2 The reporting cycle shall be monthly, unless otherwise identified in the Terms of Reference;
  .3 What is required for reporting in the Project Teams Communications Plan; and
  .4 The nomenclature and coding structure for naming of scheduled activities, which must be submitted to the Project Manager for acceptance.

2.3.3 MILESTONES

.1 The Major Milestones are standard Deliverables and Control Points within NPMS and are required in all schedule development.
.2 These Milestones will be used in Time Management Reporting within PWGSC as well as used for monitoring project progress using Variance Analysis.
.3 Milestones may also be external constraints such as the completion of an activity, exterior to the project, affecting the project.

2.3.4 ACTIVITIES

.1 All activities will need to be developed based on:
  .1 Project Objectives;
  .2 Project Scope;

.3 Milestones;
.4 Meetings with the project team; and
.5 The scheduler's full understanding of the project and it's processes.

.2 Subdivide the elements down into smaller more manageable pieces that organize and define the total scope of work in levels that can be scheduled, monitored and controlled.
.1 This process will develop the Activity List for the project.

.3 Each activity will describe the work to be performed using a verb and noun combination (i.e. Review Design Development Report).

.4 These elements will become activities, interdependently linked in the Project Schedule.

2.3.5 SCHEDULE REVIEW AND APPROVAL

.1 Once the scheduler has identified and properly coded all the activities to the acceptance of the Project Manager, the activities are then sorted into a logical order and appropriate duration are applied to complete the schedule.

.2 The scheduler, together with the Project Team, can then analyze the schedule to see if the milestone dates meet the project timelines and then adjust the schedule accordingly by modifying durations or changing logic.

.3 When the schedule has been satisfactorily prepared, the scheduler can present the detailed schedule back to the Project Team for acceptance and application as the project baseline.

.4 There may be several iterations before the schedule meets with the Project Teams agreement and the critical project timelines.

.5 The final agreed version must be copied and saved as the baseline to monitor variances during the design process.

2.3.6 SCHEDULE MONITORING AND CONTROL

.1 Once Baselined, the schedule can be better monitored, controlled and reports can be produced.

.2 Monitoring is performed by, comparing the baseline activities completed and milestone dates to the actual and forecast dates to identify the variance and record any potential delays, outstanding issues and concerns and provide options for dealing with any serious planning and scheduling issues.

.3 There will be several schedules generated from the analysis of the baseline schedule as outlined in the Required Services Sections of the TOR.

.4 Each updated schedule reflects the progress of each activity to date, any logic changes, both historic and planned, projections of progress and completion indicating the actual start and finish dates of all activities being monitored.

.5 The Scheduler is to provide continuous monitoring and control, timely identification and early warning of all unforeseen or critical issues that affect or potentially affect the project in accordance with the TOR.

.6 If unforeseen or critical issues arise, the Scheduler will advise the Project Manager and submit proposed alternative solutions in the form of an Exception Report.
.1 An Exception Report will include sufficient description and detail to clearly identify:
.1 Scope Change: Identifying the nature, reason and total impact of all identified and potential project scope changes affecting the project;
.2 Delays and accelerations: Identifying the nature, the reason and the total impact of all identified and potential duration variations;
.3 Options Enabling a Return to the project baseline: Identifying the nature and potential effects of all identified options proposed to return the project within baselined duration.

.7 At each submission or deliverable stage, provide an updated schedule and exception report.

2.4 RISK MANAGEMENT

2.4.1 CONTEXT

.1 The Departmental Representative prepares the Risk Management Plan.

.2 The Departmental Representative may ask for assistance from the Consultant Team for identification of risk items and factors arising from the technical requirements of the project.

2.5 WASTE MANAGEMENT

2.5.1 PROTOCOL

.1 The Construction, Renovation, and Demolition (CRD) Non-hazardous Solid Waste Management Protocol to which PWGSC is bound, provides direction on the undertaking of non-hazardous solid waste management actions on projects.

.1 The protocol is designed to meet the federal requirements, provincial/territorial policies and the objectives of the PWGSC Sustainable Development Strategy (SDS).

.2 The contractor must implement a solid waste management program.

.3 Contractors must be instructed to plan for extra project time when implementing CRD waste diversion initiatives.

.1 Added labour costs can be recuperated and waste management costs savings can be achieved through reduced tipping fees, avoided haulage costs, and the sale of reusable and recyclable materials.

2.5.2 CONSULTANT RESPONSIBILITIES

.1 Research and investigate hazardous waste disposal strategies in context of the project and make recommendations.

.2 Include in the contract documents, a requirement for the contractor to develop a waste reduction and management plan during the construction of this project.

.3 Identify, on the site plan where large (garbage) bins shall be stored, as well as easy disposal truck access/exit to/from same, to assist the Contractor in reducing waste or re-cycling of materials on and off site.

2.6 TECHNICAL REPORTS

2.6.1 PURPOSE

.1 This section provides direction and standards for the preparation of reports delivered to PWGSC during all the various stages of project delivery and for specific services such as investigations, studies, analysis, strategies, audits, surveys, programs, plans, etc.

.2 Technical Reports are official government documents, which are typically used to support an application for approval or to obtain authorization or acceptance and as such they must:

.1 Be complete, clear and professional in appearance and organization, with proper reference to related parts and contents in the report;

.2 Clearly outline the intent, objectives, process, results and recommendations;

.3 Present the flow of information and conclusions in a logical, easy to follow sequence;

.4 Be in written narrative, graphic, model (traditional and / or computer generated), and photographic format, which can be web enabled;

.5 Ensure that all pages are numbered in sequence; and

.6 Be printed double-sided, if hard copies are produced.

2.6.2 STANDARDS FOR PWGSC TECHNICAL REPORTS

.1 Standard practice for the organization of technical reports requires:

.1 A cover page, clearly indicating the nature of the report, the date, the PWGSC reference number and who prepared the report;
.2 A Table of Contents;
.3 An Executive Summary;
.4 The body of the report is to be structured such that the reader can easily review the document and locate, respond to and /or reference related information contained elsewhere in the report;
.5 Appendices used for lengthy segments of the report, supplementary and supporting information and / or for separate related documents.

.2 The report content must:
.1 Ensure that the executive summary is a true condensed version of the report following the identical structure, including only key points and results / recommendations requiring review and / or approval;
.2 Use a proper numbering system (preferably legal numbering), for ease of reference and cross-reference;
.1 The use of 'bullets' is to be avoided.
.3 Use proper grammar, including using complete sentences, in order to ensure clarity, avoid ambiguity and facilitate easy translation into French, if required;
.1 The use of undefined technical terms, industry jargon and cryptic phrases are to be avoided.
.4 Be written as efficiently as possible, with only essential information included in the body of the report and supporting information in an appendix if needed.

2.6.3 PRE-DESIGN REPORT CONTENT

.1 Administrative aspects to be included (but not limited to) are:
.1 Quality management process for the consultant team;
.2 Confirmation that all necessary pre-design documentation required for this project is available and confirmation that the information is still current and up-to-date.

.2 Regulatory Analysis aspects to be included (but not limited to) are:
.1 Preliminary summary of regulatory and statutory requirements, authorities having jurisdiction, and codes, regulations, and standards.

.3 Program Analysis aspects to be included (but not limited to) are a review and analysis of:
.1 Functional program, User Department reports and studies, Space data sheets, Work stations, offices, common areas and commercial space requirements, Laboratories, Data Room requirements, etc.

.4 Site Analysis aspects to be included (but not limited to) are a review and analysis of:
.1 Site features and restrictions (i.e. landscape features, topographical feature, climatic influences, setback requirements, easements, existing buildings, and / or structures.);
.2 Subsurface, geotechnical analysis of soils;
.3 Municipal infrastructure, subsurface and above grade services, including capacities and limitations (i.e. storm water drainage, fire protection, domestic water, power, telecommunications,);
.4 Historical/archaeological features, previous uses;
.5 Environmental features including sustainable design opportunities.

.5 Building Analysis aspects to be included (but not limited to) are a review and analysis of:
.1 Substructure, including foundations and basement(s), parking;
.2 Shell, including superstructure, interior structural systems, exterior enclosure, roofing;
.3 Interiors, including interior construction, stairs, interior finishes;

.4 Services, including conveying (elevators, escalators), plumbing, HVAC, fire protection, electrical, telecommunications, building automation;
.5 Equipment and furnishings;
.6 Special construction and demolition, materials abatement.

.6 Budget, Schedule, and Risk Analysis aspects to be included (but not limited to) are:
.1 Updated Class 'D' estimate and revised schedule;
.2 Analysis of risk implications and preliminary mitigation strategies.

.7 Sustainable Development Strategies
.1 Proposed policy for the project to minimize environmental impacts consistent with the project objectives and economic constraints, including:
.1 Recommendations on Sustainable Development Design standards to be applied to the project;
.2 Achievable levels for LEED® or Green Globes certification;
.3 Preliminary sustainability targets for water and energy use, waste reduction etc.
.2 Environmental impacts and application of the Canadian Environmental Assessment (CEA) Act.

2.6.4 SCHEMATIC DESIGN REPORT CONTENT

.1 Standard practice for the organization of technical reports requires:
.1 Executive Summary;
.2 Regulatory Analysis;
.1 Preliminary building code analysis,
.2 Preliminary zoning analysis,
.3 Fire and life safety strategy, and
.4 Preliminary standards analysis.
.3 Program Analysis;
.1 Updated Functional Program requirements,
.2 Preliminary horizontal and vertical zoning diagrams,
.3 Spatial relationship diagrams,
.4 Facilities services strategy,
.5 Basic area calculations and analyses.
.4 Site Analysis;
.1 Drawings, renderings and supporting 3D visualization illustrating the building and site,
.2 Site features and restrictions (i.e. landscape features, topographical features, climatic influences, setback requirements, easements, existing buildings and/or structures etc.),
.3 Subsurface features,
.4 Municipal infrastructure, subsurface and above grade services, including capacities and limitations (i.e. storm water drainage, fire protection, domestic water, power, telecommunications etc.),
.5 Historical site features,
.6 Archaeological features,
.7 Environmental features including sustainable design strategies (i.e. storm water management, landscaping etc.).

.2 Building Analysis and Design Options;
.1 Architectural,

.1 Prepare a site plan indicating relationships, landscape concept, building outlines, main accesses, roadways, vehicular and pedestrian traffic patterns,
.2 Provide building plans, showing relative disposition of main accommodation areas, circulation patterns, floors, horizontal and vertical space relationships, mechanical / electrical shafts,
.3 Include elevations, sections and typical wall details for the building envelope,
.4 Provide perspectives and / or 3D visualization diagrams, and
.5 Calculate the gross building area and provide a net area summary of all accommodation areas required.

.2 Civil,
.1 Describe the overall impact on the site systems infrastructure,
.2 Verify of all site services information,
.3 Provide a site plan showing the existing building, proposed site services, building service connections, site drainage, roads, parking and sidewalks, and
.4 Include a preliminary analysis of the impact on existing systems, where contributing to existing sewer lines.

.3 Structural / Seismic,
.1 Describe the potential impact on the existing building structure and include any required structural modifications and /or upgrades,
.2 Provide a general description of structures, including systems considered and benefits/disadvantages,
.3 Include design loads for all load cases, and
.4 Prepare concept drawings of structural systems proposed, including typical floor plans, foundations, lateral systems and explanatory sketches.

.4 Mechanical Engineering,
.1 Provide narratives describing the following,
.1 Overview,
.2 Code & Standards Considerations & Concerns,
.3 Potential Energy Conservation Measures,
.4 Description of three distinct mechanical options including,
.1 Narratives of each option,
.2 Discussion of advantages and disadvantages of each,
.3 System schematics sufficient to describe each option,
.4 Preliminary energy analysis for each,
.5 Discussion of recommendations.

.5 Electrical Engineering,
.1 Provide an electrical design synopsis, describing the electrical work in sufficient detail for assessment and acceptance by the Departmental Representative,
.1 Include feasibility and economic studies of proposed systems complete with cost figures and loads, and in accordance with Sustainable Development requirements.
.2 Prepare a site plan showing the location of electrical and telecommunication service entrances.
.3 Prepare floor plans indicating locations and size of,
.1 Major electrical equipment and distribution centres,
.2 Telecommunications rooms, closets and major conduits,

.4 Provide Normal and Emergency power distribution details, including a diagram showing the distribution up to distribution centres on each floor,
.5 Indicate typical lighting concepts for the interior and exterior environments,
.6 Indicate typical ceiling (or floor) distribution systems for lighting, power and telecommunications, and
.7 Provide concept descriptions of Fire alarm and Security systems.

.3 Commissioning;
.1 Provide preliminary commissioning plan.
.4 Cost Management;
.5 Schedule Management;
.6 Furniture / Equipment;
.1 Prepare a Furniture Recommendation Report based on the Functional Program and on parameters developed in conjunction with the Departmental Representative and the Client / User. Report to include an examination of the following;
.1 Procurement process and requirements,
.2 Furniture type and layout,
.3 Panel screen height,
.4 Power requirements,
.5 Finishes.
.2 Recommendations are to take into consideration current inventory of furniture and reflect the client's vision, functional requirements, proposed planning alternatives, space allocation and project budget.
.3 Prepare a Class 'C' cost estimate for refurbishment of existing furniture and / or the purchase of new furniture and equipment.
.4 Document scheduling requirements for refurbishment of existing furniture and / or the procurement of new furniture and equipment.
.7 Budget;
.1 Class 'C' Estimates for each option.
.8 Schedule;
.1 Milestone project schedule including allowances for reviews and approvals for each stage of the project life cycle.
.9 Risk Analysis;
.1 Report on any deviations that may affect cost or schedule and recommend corrective measures.
.10 Sustainable Development Strategies;
.1 Indicate how each option can meet the sustainability targets, and
.2 Provide energy simulations of the proposed design options, including estimated annual energy cost as predicted by using current energy cost for the appropriate area.
.11 Response to PWGSC Quality Assurance Report ; and
.12 Project Log tracking all approved major decisions including those affecting changes to project scope, budget and schedule.

2.6.5 DESIGN DEVELOPMENT REPORT CONTENT

.1 Executive Summary
.2 Regulatory Analysis
.1 Preliminary building code analysis;

.2 Preliminary zoning analysis;
.3 Fire and life safety strategy;
.4 Preliminary standards analysis

.3 Program Analysis
.1 Updated Functional Program requirements
.2 Preliminary horizontal and vertical zoning diagrams;
.3 Facilities services strategy;
.4 Basic area calculations and analyses;

.4 Site Analysis
.1 Drawings, renderings and supporting 3D visualization illustrating the building and site,
.2 Site features and restrictions (i.e. landscape features, topographical features, climatic influences, setback requirements, easements, existing buildings and/or structures etc.);
.3 Subsurface features;
.4 Municipal infrastructure, subsurface and above grade services, including capacities and limitations (i.e. storm water drainage, fire protection, domestic water, power, telecommunications etc.);
.5 Historical site features;
.6 Archaeological features;
.7 Environmental features including sustainable design strategies (i.e. storm water management, landscaping etc.);

.5 Building Analysis and Design Options
.1 Architectural
.1 Prepare a site plan showing the building and Infrastructure items including the following:
.1 Pedestrian, vehicular, security, delivery service access,
.2 Provide floor plans of each level (including the roof) showing all accommodation required, including all necessary circulation areas, stairs, elevators, and ancillary spaces anticipated for service use. Indicate building grids, modules, and key dimensions.
.3 Provide reflected ceiling plans of ceilings with special features.
.4 Show elevations of all exterior building facades indicating all doors and windows, accurately sized and projected from the floor plans and sections.
.1 Clearly indicate levels for grade, all floors, ceilings, roof and penthouse levels.
.5 Develop cross-sections through the building to show floor levels, room heights, inner corridor elevations, etc.
.6 Identify primary architectural materials proposed for the exterior and interior of the building, including choice of finishes.
.7 Provide plans and preliminary details for millwork, built-in furniture and lab casework.
.8 Provide detail sections of walls with special design features requiring illustration and explanation at this stage, such as firewalls, acoustical barriers, security partitions, isolation or separation of laboratory spaces, etc.
.9 Special construction and demolition, including heritage conservation and rehabilitation requirements, hazardous materials abatement,
.10 Provide sections and details for any spaces requiring acoustic security.
.1 Include STC ratings for doors, transfer ducts and other assemblies
.2 Civil

.1 Further refine site plans showing site services and building service connections referenced to proposed building outlines, site access roads and sidewalks, including existing and proposed grades and drainage improvements.
.2 Indicate locations of manholes (complete with invert elevations), valves, and fire hydrant locations.
.3 Identify proposed pipe sizes and slopes, where applicable, and include pipe invert elevations at building foundation.
.4 Identify, by means of Design Summary Sheets, pipe capacity and estimated flows for storm and sanitary sewers. Where contributing to an existing sewer, include analysis of impact on existing systems.
.5 Provide Hydraulic Analysis of any relevant alterations to existing water distribution system in the vicinity of the proposed building to confirm anticipated maximum available fire flow. Calculate and compare site flows to building site fire flow.
.6 Provide typical trench and related details, including profiles of below grade services.

.3 Structural
.1 Provide drawings indicating modifications to existing structure and new structural systems, structural materials, cladding details, fireproofing methods and other significant or unusual details.
.2 Indicate all design loads, e.g. dead and live loads on all plans with atypical loads marked. Live loads to include localized seismic, wind and snow.
.3 Provide brief design calculations including outputs from computerized analysis.

.4 Mechanical
.1 Provide narratives describing the following
.1 Overview
.2 Code & Standards Analysis
.3 Site Services & Utilities
.4 Fire Protection Systems
.5 Plumbing Systems
.6 Heating Systems
.7 Cooling Systems
.8 Ventilation Systems
.9 Exhaust Systems
.10 Insulation
.11 Humidification Systems
.12 Acoustic and sound control measures
.13 Controls
.14 Energy Conservation Measures & Energy Analysis & Report
.2 Provide system schematics for heating water, chilled water, ventilation and plumbing systems.
.3 Provide catalogue cut sheets of representative equipment for each type of component to be used on the project.
.4 Provide preliminary layout drawings showing locations of all major components.
.5 Provide brief design calculations including outputs from computerized analysis.

.5 Electrical
.1 Update the electrical design synopsis for the selected option. Provide data on the total connected load, the maximum demand and diversity factors, and the sizing of the emergency load.

.2 Elaborate on proposed emergency power scheme and provide preliminary installation details for any emergency generator installation.
.3 Indicate metering locations on distribution diagram.
.4 Provide typical lighting, power and telecommunication system details for all workspaces.
.5 Include lighting design and control schemes for typical lighting arrangements.
.6 Elaborate on exterior lighting scheme. Provide typical fixture concepts.
.7 Provide a fire alarm riser diagram.
.8 Indicate security system major conduit requirements on floor plans.
.9 Provide typical security system details (conduit and boxes) that will be included on construction drawings.
.10 Provide brief design calculations including outputs from computerized analysis.

.6 Sustainable Development Strategies:
.1 Indicate how each option can meet the sustainability targets
.2 Provide energy simulations of the proposed design options, including estimated annual energy cost as predicted by using current energy cost for the appropriate area,

.7 Response to PWGSC Quality Assurance Report

2.7 CODES, ACTS, STANDARDS, REGULATIONS

2.7.1 GENERAL

.1 The Codes, Acts, Standards and Guidelines listed in the following articles, may apply to this project. The Consultant must identify and analyse the applicable documents in the Code Analysis.
.2 In all cases the most stringent Code, standard and guideline shall apply.

2.7.2 PWGSC DOCUMENTS AVAILABLE FROM PWGSC PROJECT MANAGER:

.1 PWGSC Fit-Up Standards: Technical Reference Manual;
.2 Public Works and Government Services MD Standards – Departmental Representative to provide on request;
.1 MD 15000; Environmental Standards for Office Accomodation,
.2 MD 15116-2006; Computer Room Air conditioning Systems,
.3 MD-15126; Laboratory HVAC (currently in draft form),
.4 MD 15128; Laboratory Fume Hoods: Guidelines for owners, design professionals and maintenance personnel – 2008,
.5 MD 15129; Guidelines for Perchloric Acid fumehoods and their exhaust systems – 2006,
.6 MD 15161; Control of Legionella in Mechanical Systems - 2006,
.7 MD 250005; Energy Monitoring and Control Systems Design Guidelines - 2009,
.3 PWGSC Best Practice; Prescribing indoor humidity levels for Federal Buildings - 2006,
.4 Public Works and Government Services Commissioning Standards and Guidelines,
.5 PWGSC Commissioning Manual CP-1 version 2006.

2.7.3 CODES AND REGULATIONS:

.1 The NRC National Building Code of Canada 2010;
.2 The NRC National Fire Code of Canada, 2010;
.3 The NRC National Plumbing Code of Canada 2010;
.4 The NRC Model National Energy Code for Buildings 2011;
.5 CSA C22.1-09, Canadian Electrical Code Part I Safety Standard for Electrical Installations and CE Code Handbook. Amendments for Provinces;

.6 Canadian Code for Preferred Packaging;
.7 National Electrical Manufacturers Association (NEMA);
.8 Electrical and Electronic Manufacturers' Association of Canada (EEMAC);
.9 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) - ANSI/IEEE C62.41-1991, Surge Voltages in Low-Voltage AC Power Circuits;
.10 American Society for Testing and Materials (ASTM);
.11 ASTM F 1137-00(2006), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners;
.12 The Canada Labour Code;
.13 http://laws.justice.gc.ca/en/L-2/
.14 The Canada Occupational Health and Safety Regulations;
.15 http://laws.justice.gc.ca/eng/SOR-86-304/index.html
.16 All other Territorial and Municipal Acts, Codes, By-laws and regulations appropriate to the area of concern.

2.7.4 STANDARDS AND GUIDELINES PRODUCED BY THE GOVERNMENT OF CANADA:

.1 Standards and Directives of the Treasury Board (TB):
  .1 http://www.tbs-sct.gc.ca/pol/index-eng.aspx?tree=standard
  .2 http://www.tbs-sct.gc.ca/pol/index-eng.aspx?tree=directive
  .3 And including;
    .1 Accessibility Standard for Real Property,
      .1 http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=12044
    .2 Fire Protection Standard.
      .1 http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316
.2 Labour Canada's, Fire Commissioner of Canada Standards;
  .1 http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/index.shtml.
  .2 And including,
    .1 FC-301 Standard for Construction Operations, June 1982,
    .2 FC-302 Standard for Welding and Cutting, June 1982,
    .3 FC-311 Standard for Record Storage, May 1979.
    .4 FC-403 Fire Protection Standard for sprinkler Systems, November 1994
.3 The Standards and Guidelines for the Conservation of Historic Places in Canada
  .1 www.historicplaces.ca;
.4 Labour Canada's, Technical Documents;
  .1 http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/guidelines/index.shtml
  .2 And Including,
    .1 Fire Protection for Information Technology Facilities and Equipment.
.5 Canadian Food Inspection Agency's Containment Standard for Facilities Handling Plant Pests.
.6 Public Health Agency of Canada's Laboratory Biosafety Guidelines, 3rd Edition,
.7 Canadian Council of Animal Care's Guidelines on: Laboratory Animal Facilities – Characteristics, Design and Development.

2.7.5 HEALTH CANADA STANDARDS AND GUIDELINES:

.1 Guidelines for Canadian Drinking Water Quality – Sixth Edition – 1996;
.2 Guidelines for Canadian Drinking Water Quality – Summary Table – Dec 2010;

.3 Guidance for Providing Safe Drinking Water in Areas Of Federal Jurisdiction – Version 1 – 2005;
.4 The Canadian Council of Ministers of the Environment (CCME) ;
.5 Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (CCME, 2003);
.6 Canada – Wide Strategy for the Management of municipal Waste Water Effluent;
.7 The Canadian Environmental Protection Act (CEPA, 1999);
.8 The Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, published in Canada Gazette Part II on June 12, 2008 (Registration SOR/2008-197).

2.7.6 STANDARDS AND GUIDELINES:

.1 Air Conditioning and Refrigeration Institute (ARI);
.2 American Conference of Governmental Industrial Hygienists (ACGIH, Industrial Ventilation Handbook);
.3 Air Diffusion Council (ADC);
.4 Air Movement and Control Association (AMCA);
.5 American Association of State Highway and Transportation Officials (AASHTO) Standards
.6 American National Standards Institute (ANSI);
.7 ANSI/AIHA Z9.5, Laboratory Ventilation;
.8 .1 ANSI/NEMA C82.1-04, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast;
.9 .2 ANSI/NEMA C82.4-02, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps;
.10 ANSI/TIA/EIA-606- Administration Standard for the Telecommunications Infrastructure of Commercial Buildings;
.11 ANSI Z358.1, Emergency Eyewash and Shower Equipment;
.12 American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), including but not limited to;
  .1 ASHRAE Laboratory Design Guide,
  .2 ASHRAE Standards and Guidelines,
  .3 ASHRAE Applications Handbook – 2007,
  .4 ASHRAE HVAC Systems and Equipment Handbook – 2008,
  .5 ASHRAE Fundamentals Handbook – 2009,
  .6 ASHRAE Refrigeration Handbook – 2010,
  .7 ASHRAE 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size – 2007,
  .8 ANSI/ASHRAE 55, Thermal Environmental Conditions for Human Occupancy – 2004,
  .9 ANSI/ASHRAE 62.1, Ventilation for Acceptable Indoor Air Quality – 2010,
  .10 ASHRAE 90.1, Energy Efficient Design of New Buildings – 2010,
  .11 ASHRAE 105: Standard Method of Measuring and Expressing Building Energy Performance,
  .12 ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods,
  .13 ASHRAE 111; Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC&R Systems,
  .14 ASHRAE 114; Energy Management Control Systems Instrumentation, and
  .15 ASHRAE 135; BACnet: A Date Communication Protocol for Building Automation and Control Networks.
.13 Asphalt Institute Standards for Hot Mix;

.14 American Society of Mechanical Engineers (ASME);
.15 American Society for Testing and Materials (ASTM);
.16 American Water Works Association (AWWA) Standards;
.17 American Welding Society (AWS);
.18 Associated Air Balance Council (AABC);
.19 Canadian Standards Association;
.20 CSA A23.3-04 (2010) Design of Concrete Structures;
.21 CSA B51-09 Boiler, pressure vessel and pressure piping Code;
.22 CSA B52-05 Mechanical Refrigeration Code;
.23 CSA B64-01 Backflow Preventers and Vacuum Breakers;
.24 CSA B139-09 Installation Code for Oil Burning Equipment;
.25 CSA B149.1-10 Natural Gas and Propane Installation Code;
.26 CSA B651-04 Accessible Design for the Built Environment;
.27 CSA C22.2 No. 41-07 Grounding and Bonding Equipment;
.28 CSA S16-09 Design of Steel Structures;
.29 CSA Z204-1994 Guideline for Managing Indoor Air Quality in Office Buildings;
.30 CSA Z320-11 Building Commissioning Standard & Check Sheets;
.31 CSA Z316.5-94, Fume Hoods and Associated Exhaust Systems;
.32 CAN/CSA-23.1-04 and CAN/CSA-A23.2-04 Concrete materials and methods of concrete construction; and Methods of test and standard practice for concrete CAN/CSA-C22.2 No. 214-94 "Communications Cables";
.33 CAN/CSA-C22.3 No.3-[98(R2007)], Electrical Co-ordination;
.34 CAN/CSA-B651-04(R2010), Accessible Design for the Built Environment;
.35 CAN3 C235-[83(R2010)], Preferred Voltage Levels for AC Systems, 0 to 50,000 V;
.36 CAN/CSA-T528-93, "Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings", Canadian Standards Association;
.37 CAN/ULC – S524-06 Standard for the Installation of Fire Alarm Systems;
.38 CAN/ULC – S537-04 Fire Alarm System Verification Report;
.39 CAN/ULC – S102-07 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies;
.40 CAN/ULC – S102.2-07 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies
CAN/ULC S112-M90 (R2001) Standard Methods of Fire Test of Fire-Damper Assemblies;
.41 CAN/ULC S115-05 Standard Method of Fire Tests of Fire stop Systems;
.42 International Mechanical Code – Latest Version;
.43 Institute of Boiler and Radiation, Hydronic Institute (IBR);
.44 Manufacturers Standardization Society of Valve and Fitting Industry (MSS);
.45 National Fire Protection Association (NFPA), including;
    .1 NFPA 10; Standard for Portable Fire Extinguishers – 2010,
    .2 NFPA 13; Standard for Installation of Sprinkler Systems – 2010,
    .3 NFPA 14; Standard for Installation of Standpipe and Hose Systems – 2010,
    .4 NFPA 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances-2010,
    .5 NFPA 30; Flammable and Combustible Liquids Code,
    .6 NFPA 45; Standard on Fire Protection for Laboratories Using Chemicals,
    .7 NFPA 1142: Standard on Water Supplies for Suburban and Rural Fire Fighting-2007.

.46 SEFA 1.2, Scientific Equipment & Furniture Association;
.47 Sheet Metal and Air Conditioning Contractors National Association (SMACNA);
.48 Transportation Association of Canada (TAC) Guide for Canadian Roads;
.49 Manual of Uniform Traffic Control Devices (MUTCD);
.50 Telecommunications Industry Association (TIA);
  .1 Commercial Building Telecommunications Cabling StandardTIA/EIA-568,
    .1 Part 1: General Requirements, TIA/EIA-568-B.1,
    .2 Part 2: Balanced Twisted Pair Cabling Components, TIA/EIA-568-B.2,
    .3 Addendum 1 - Transmission Performance Specification for 4-pair 100 Ohm Category 6 Cabling, TIA/EIA-568-B.2-1,
    .4 Optical Fibre Cabling Components Standards, TIA/EIA-568-B.3.
  .2 ANSI/TIA/EIA-569-A Commercial Building Standards for Telecommunications pathways and spaces,
  .3 Pathways and Spaces, ANSI/TIA/EIA-569-B,
  .4 Telecommunications Infrastructure Standard for Data centers TIA-942,
  .5 J-STD-607-A Commercial Building Grounding and - Bonding Requirements for Telecommunications.
.51 Underwriters' Laboratories of Canada (ULC);
.52 ULC/CSA Approval is required for all electrical and mechanical equipment.

2.7.7 STANDARDS AND GUIDELINES FOR TRANSPORTATION

.1 Canadian Highway Bridge Design Code
.2 Transportation Association of Canada - Manuals, Guides and Handbooks.

2.8 COMMISSIONING PROCESS

2.8.1 GENERAL

.1 This section summarizes the PWGSC commissioning process, the requirements and associated roles and responsibilities as they relate to the various phases in the delivery of a project.
.2 It is to be used as a guide in further developing the commissioning plan, specification and related documents for a project.
.3 Commissioning is not a replacement for good design and construction practices.
  .1 It requires coordinated efforts on the part of all parties involved in the Project.
.4 The Commissioning overlaps the design phase through construction and into the operation phase.
.5 The PWGSC Commissioning Manual CP.1 4th edition, November 2006, is available for free download at the following site:
  .1 http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/bi-rp/tech/miseenservice-commissioning/manuel-manual-eng.html
.6 The PWGSC Commission Manual CP.2 – Commissioning Glosary is available for free download at the following site:
  .1 http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/bi-rp/tech/miseenservice-commissioning/manuel-manual-b-eng.html
.7 "Commissioning" is a quality assurance process, in which the functional requirements of the Owner/occupant and the operational requirements of facility management are proven to function as intended.

.8 The "commissioning process" is a planned program of quality management and information transfer that extends through all phases of a project's development and delivery, up to and including the warranty period.

.9 The process consists of a series of checks and balances to ensure that the work is designed, installed and proven to operate as intended.

.10 Commissioning has two main components, functional and operational.

.1 The functional component deals with:

.1 Security, Health (indoor air quality) and occupant safety;

.2 Comfort (temperature, relative humidity, ventilation, air flow patterns, air purity and well being);

.3 Cost-effectiveness of design; and

.4 Systems and equipment supporting Owner's functional requirements.

.2 The operational component deals with:

.1 Operation and Maintenance (O&M) issues; e.g., design review with a particular concern for the operation and maintenance of the systems today and in the future, when repairs are required;

.2 Performance evaluation of systems and equipment;

.3 Accessibility to O&M Documentation; and

.4 Review of the training plan against the current needs now and in the future.

2.8.2 COMMISSIONING PLAN

.1 The Commissioning Plan will typically be developed by the Contractor through his own Commissioning Agent.

.2 The Commissioning Plan is the project-specific document and which describes the process for verifying that all built works meet the Investor's requirements within the limits of the working documents.

.3 It is essential that the Consultant provide specifications that detail requirements for all submittals and testing in each Specification Section in order for the Contractor to properly prepare a complete Commissioning Plan.

.4 The Commissioning Plan will be reviewed and accepted by the Departmental Representative prior to commencement of construction.

.5 The Commissioning Plan may require periodic update throughout design.

2.8.3 COMPONENT VERIFICATION

.1 Component verification sheets (CV) sheets are developed by the Consultant and incorporated in the contract documents to ensure the facility is an operating entity and meets the requirements as described in the Agreement.

.2 The CV sheets are intended to monitor and track the supply and shop drawing requirements associated with each component. The *Consultant* must verify that the components being installed in the built works are acceptable to their design and the approved shop drawings.

.3 The commissioning process requires the documentation of all the components installed as part of a system that will have performance verification testing conducted.

.4 Sample CV sheets for various types of components are to be provided by the Consultant in Div 01.

2.8.4 SYSTEM & INTEGRATED SYSTEM TESTING

.1 The "performance verification tests" (PVTs) are developed by the Design-Builder to ensure the facility is an operating entity and meets the requirements as described in the Agreement.

.2 The PVTs are intended to demonstrate the functional performance of the systems & integrated system during the various modes of operation, against the design intent. Each test must be uniquely identified and reflected in the contractor's commissioning schedule.

.3 Once the contract has been awarded the Design-Builder must monitor the sub-contractor's process to help ensure the timely completion of these tests. The Design-Builder must witness each test. The Design-Builder must provide final certification of the test results. After an acceptable review of the test document, the PWGSC Commissioning Specialist will recommend to the Departmental Representative the acceptance or rejection of the test results.

.4 Sample PVT sheets for various types of system are to be provided by the Consultant in Div 01.

2.8.5 TEST REQUIREMENTS

.1 Each CV or PVT shall be uniquely named, numbered and categorized by discipline.

.2 Tests shall define:

- .1 Test Purpose;
- .2 System design narrative;
- .3 Test Prerequisites;
- .4 Testing Procedures;
- .5 Test Comments; and
- .6 Test Sign-off Block.

.3 System Performance Verifications Tests

- .1 These tests have prerequisites that are to be completed and approved prior to conducting the tests, which, may include but are not limited to:
  - .1 CV and PVT sheets developed and accepted,
  - .2 Contractor proving start-up and tests,
  - .3 Manufacturers start-ups,
  - .4 Consultant has certified testing, adjusting & balancing (TAB) results, per TAB specification.
    - .1 TAB work must be completed and approved prior to the control system Pts.
  - .5 Associated control device calibrations and physical point verifications are completed and approved.
    - .1 Note, control system end to end checks to be completed and approved prior to the control system PVTs.
  - .6 Other specified deliverables, i.e. factory test reports, O&M submissions, etc.
  - .7 System performance tests associated with the integrated systems under test,
  - .8 Integrated System Performance Verifications,
  - .9 Fire alarm verifications.

2.8.6 COMMISSIONING (EVALUATION) REPORT

.1 The Commissioning (Evaluation) Report must provide:

- .1 An executive summary,
- .2 Completed CV and PVT sheets,
- .3 A complete assessment of the project,
- .4 Lessons learned from this project and any necessary recommendations,
- .5 Variances between the actual and planned levels of performance,
- .6 An evaluation of the validation and acceptance process and of the commissioning phase.

2.8.7 OVERVIEW OF ROLES AND RESPONSIBILITIES

.1 The following provides a general overview of the roles, responsibilities and implementation of the commissioning process. The commissioning process is a logical sequence of verifications from component verifications through to system & integrated system, performance verification testing.

.2 At completion of the commissioning process all results are documented and audited for acceptance.

2.8.8 MAJOR TASKS AND RESPONSIBILITIES

.1 Schematic Design and Design Development Phase:

- .1 Consultant;
  - .1 Develop commissioning strategy,
  - .2 Develop preliminary commissioning plan.
- .2 Construction Documentation Phase:
  - .1 Consultant;
    - .1 Complete the final commissioning plan,
    - .2 Specify the Commissioning requirements in Div 01 and provide sample Commissioning CV and PCT sheets in Div 01 for Bidders purposes,
    - .3 Develop project specific CV and PVT sheets.
- .3 Construction Phase:
  - .1 Consultant;
    - .1 Monitor and report on contract commissioning activities,
    - .2 Finalize development of job specific CV and PVT sheets,
    - .3 Review and certify component verification sheets as they are completed by the Contractor, and
    - .4 Review commissioning schedule
  - .2 Contractor;
    - .1 Comply with the requirements in the Specifications,
    - .2 Complete the component verification,
    - .3 Conduct the equipment system start-up and proving, and
    - .4 Develop the commissioning schedule, reflecting the PVTs.
- .4 Commissioning Phase
  - .1 Consultant
    - .1 Witness all system and integrated systems tests,
    - .2 Review and certify commissioning test results,
    - .3 Track and compile all commissioning documentation submitted by the contractor and confirm that all commissioning tasks are completed,
    - .4 Incorporate all commissioning documentation into a preliminary commissioning report and recommend interim acceptance.
    - .5 Identify "deferred" commissioning tests due to seasonal constraints, etc.
  - .2 Contractor
    - .1 Comply with the requirements in the specifications,
    - .2 Conduct the system testing, and
    - .3 Conduct the integrated system testing.
- .5 Operating Phase
  - .1 Consultant
    - .1 Provide advice and recommendations for fine tuning, if required,
    - .2 Witness "deferred" commissioning tests,

.3 Review and certify "deferred" systems test results,
.4 Incorporate deferred system test results and all other commissioning documentation into a final commissioning report with an executive summary recommending final acceptance.
.2 Contractor
.1 Address warranty issues,
.6 Evaluation Phase
.1 Consultant
.1 Provide advice and recommendations during the final evaluation.

2.9 CONSTRUCTION DOCUMENTS

2.9.1 PURPOSE

.1 This section provides direction in the preparation of construction contract documents (namely specifications, drawings and addenda) for PWGSC.
.2 Drawings, specifications and addenda must be complete and clear, in order that a contractor can prepare a bid without guesswork. Standard practice for the preparation of construction contract documents requires that:
.1 Drawings are the graphic means of showing work to be done, as they depict shape, dimension, location, quantity of materials and relationship between building components.
.2 Specifications are written descriptions of materials and construction processes in relation to quality, colour, pattern, performance and characteristics of materials, installation and quality of work requirements.
.3 Addenda are changes to the construction contract documents or tendering procedures, issued during the tendering process.

2.9.2 PRINCIPLES FOR PWGSC CONTRACT DOCUMENTS

.1 PWGSC's contract documents are based on common public procurement principles.
.2 PWGSC does not use Canadian Construction Document Committee (CCDC) documents.
.3 The construction contract and the terms and conditions are prepared and issued by PWGSC, along with all other related bidding and contractual documents.
.1 For more detailed information, the clauses are available on the following web site:
.2 http://ccua-sacc.tpsgc-pwgsc.gc.ca/pub/acho-eng.jsp
.3 Any questions should be directed through the PWGSC Project Manager.

2.9.3 QUALITY ASSURANCE

.1 Consultants are required to undertake their own quality control process and must review, correct and coordinate (between disciplines) their documents before issuing them to PWGSC.

2.9.4 ADDENDA

.1 Format
.1 Prepare addenda using the format shown in Appendix 'C'.
.2 No signature type information is to appear.
.3 Every page of the addendum (including attachments) must be numbered consecutively.
.4 All pages must have the PWGSC project number and the appropriate addendum number.
.5 Sketches shall appear in the PWGSC format, stamped and signed.
.6 No Consultant information (name, address, phone #, consultant project # etc.) may appear in the addendum or its attachments (except on sketches).
.2 Content

.1 Each item should refer to an existing paragraph of the specification or note/detail on the drawings. The clarification style is not acceptable.

2.9.5 SUBMISSIONS

.1 For each construction document submission, the Consultant shall provide:
  .1 A completed and signed Checklist for the Submission of Construction Documents (See Appendix 'B')
  .2 Original specification; printed one side on 216 mm x 280 mm white bond paper.
  .3 Index, as per Appendix 'C'
  .4 Reproducible original drawings; sealed and signed by the design authority.
  .5 Addenda (if required), as per Appendix 'D;' (to be issued by PWGSC)
.2 Tender information:
  .1 Include a description of all units and estimated quantities to be included in unit price table.
  .2 Include a list of significant trades including costs.
    .1 PWGSC will then determine which trades, if any, will be tendered through the Bid Depository.
.3 Government Electronic Tendering System (MERX):
  .1 Consultants shall provide an electronic true copy of the final documents (specifications and drawings) on one or multiple CD-ROM in Portable Document Format (PDF) without password protection and printing restrictions.
  .2 The electronic copy of drawings and specifications is for bidding purposes only and do not require to be signed and sealed.

2.9.6 PWGSC ROLE

.1 PWGSC shall provide:
  .1 General and Special Instructions to Bidders
  .2 Bid and Acceptance Form
  .3 Standard Construction Contract Documents

2.10 SPECIFICATIONS

2.10.1 GENERAL

.1 In preparing project specifications, the Consultant must use the current edition of the National Master Specification (NMS) in accordance with the "NMS User's Guide".

2.10.2 NATIONAL MASTER SPECIFICATION (NMS)

.1 In preparing project specifications, the Consultant must use the current edition of the National Master Specification (NMS) in accordance with the "NMS User's Guide".
.2 The NMS is a master construction specification available in both official languages, which is divided into 48 Divisions (Masterformat 2004) and is used for a wide range of construction and/or renovation projects.
.3 The Consultant retains overriding responsibility for content and shall edit, amend and supplement the NMS as deemed necessary to produce an appropriate project specification, free of conflict and ambiguity.

2.10.3 SPECIFICATION ORGANIZATION

.1 Narrow scope sections describing single units of work are preferred for more complex work; however, broad scope sections may be more suitable for less complex work.
.2 Use either the NMS 1/3 - 2/3 page format or the Construction Specifications Canada full-page format.

.3 For specifications not included in the NMS, but required for the project, follow the number and title recommendations of Masterformat 2004
.4 Number each page and start each Section on a new page
.5 Bind specifications
.6 Include Division 1, edited to PWGSC requirements.
.7 Note: Consultant's name is not to be indicated in the specifications..

2.10.4 TERMINOLOGY

.1 Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect.
.2 "Departmental Representative" means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor.
.3 Notations such as: "verify on site", "as instructed", "to match existing", "example", "equal to" or "equivalent to", "to be determined on site by "Departmental Representative", should not be indicated in the specifications as this promotes inaccurate and inflated bids.
.4 Specifications must permit bidders to calculate all quantities and bid accurately.
  .1 If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices).
.5 Ensure that the terminology used throughout the specifications is consistent and does not contradict the applicable standard construction contract documents.

2.10.5 DIMENSIONS

.1 Dimensions are to be in metric only (no dual dimensioning).

2.10.6 STANDARDS

.1 As references in the NMS may not be up to date, it is the responsibility of the consultant to ensure that the project specification uses the latest applicable edition of all references quoted.
.2 Canadian standards should be used wherever possible.

2.10.7 SPECIFYING MATERIALS

.1 The practice of specifying actual brand names, model numbers, etc., is against departmental policy except for special circumstances.
.2 The method of specifying materials shall be by using industry recognized standards.
.3 If the above method cannot be used and where no standards exist, specify by a non-restrictive, non-trade name "prescription" or "performance" specifications.
.4 In exceptional or justifiable circumstances, or if no standards exist and when a suitable non-restrictive, non-trade name "prescription" or "performance" specification cannot be developed; specify by trade name
.5 Include all known materials acceptable for the purpose intended, and in the case of equipment, identify by type and model number.

2.10.8 ACCEPTABLE PRODUCTS AND MATERIALS

.1 The term "Acceptable Manufacturers" must not be used, as this restricts competition and does not ensure the actual material or product will be acceptable.
  .1 A list of words and phrases that should be avoided is included in the NMS User's Guide.
.2 Listing of acceptable products or materials is to be an exception, due to a unique specification or for the purpose of assisting bidders in identifying lesser known potential products or materials.

.3 For exceptions, provide justifiable reasons for listing products and materials and submit to the *Departmental Representative* for acceptance.

.4 When authorized to list acceptable products or materials, list all, with a minimum of three (3), trade names of products and materials acceptable for the intended purpose.

2.10.9 ALTERNATE PRODUCTS AND MATERIALS

.1 Alternates must be approved by addendum issued by the *Departmental Representative* in accordance with Instructions to bidders.

.2 Review applications for approval of alternate products and materials and provide recommendations to the *Departmental Representative.*

.3 Compare products/materials to specifications. Do not compare product-to-product or material-to-material.

2.10.10 SEPARATE AND ALTERNATE PRICES

.1 Do not include Separate or Alternate Pricing .

2.10.11 SOLE SOURCING

.1 Sole sourcing for materials and work may be used for proprietary systems (i.e. fire alarm systems, EMCS systems).

.2 Substantiation and/or justification will be required.

.3 Prior to including sole source materials and/or work, the Consultant must contact the Departmental Representative to obtain the approval for the sole sourcing.

2.10.12 UNIT PRICES

.1 Unit prices are used where the quantity can only be estimated (e.g. earth work) and the approval of the Project Manager must be sought in advance of their use.

2.10.13 CASH ALLOWANCES

.1 Construction contract documents should be complete and contain all of the requirements for the contractual work.

.2 Cash allowances are to be used only under exceptional circumstances (i.e. utility companies, municipalities), where no other method of specifying is appropriate.

.3 Obtain approval from the Project Manager in advance to include cash allowances and then use "Section 01 21 00 - Allowances" of the NMS to specify the criteria.

2.10.14 WARRANTIES

.1 It is the practice of PWGSC to have a 12-month warranty and to avoid extending warranties for more than 24 months.

.2 When it is deemed necessary to extend a warranty beyond the 12 month period provided for in the General Conditions of the contract, obtain approval from the Project Manager.

.3 Delete all references to manufacturers' guarantees.

2.10.15 SCOPE OF WORK

.1 No paragraphs noted as "Scope of Work" are to be included.

2.10.16 SUMMARY AND SECTION INCLUDES

.1 In Part -1 All Sections; do not use (delete):

.1 "Summary" and

.2 "Section Includes."

2.10.17 RELATED SECTIONS

.1 In Part 1 All Sections; do not use (delete)

2.10.18 INDEX

.1 List all the plans and specification sections with correct number of pages, section names and correct drawing titles in the format shown in Appendix C.

2.10.19 HEALTH AND SAFETY

.1 Confirm with the Project Manager to determine if there are any instructions to meet regional requirements.

2.10.20 EXPERIENCE AND QUALIFICATIONS

.1 Remove experience and qualification requirements from specification sections.

2.10.21 PREQUALIFICATION

.1 Do not include in the specification any mandatory contractor and/or subcontractor prequalification requirements that could become a contract award condition.

.2 If a prequalification process is required, contact the Project Manager.

.3 There should be no references to certificates, transcripts or license numbers of a trade or subcontractor being included with the bid.

2.10.22 CONTRACTING ISSUES

.1 Specifications describe the workmanship and quality of the work.

.1 Contracting issues should not appear in the specifications.

.2 Division 00 of the NMS is not used for PWGSC projects.

.3 Remove all references within the specifications, to the following:

.1 General Instructions to Bidders
.2 General Conditions
.3 CCDC documents
.4 Health and Safety requirements
.5 Priority of documents
.6 Security clauses
.7 Terms of payment or holdback
.8 Tendering process
.9 Bonding requirements
.10 Insurance requirements
.11 Alternative and separate pricing
.12 Site visit (Mandatory or Optional)
.13 Release of Lien and deficiency holdbacks

2.11 DRAWINGS

2.11.1 GENERAL

.1 Drawings shall be in accordance with PWGSC Western CADD Standards and CSA B78.3.

.2 Refer to:

.1 http://www.tpsgc-pwgsc.gc.ca/cdao-cadd/ouest-western/tdm-toc-eng.html
.2 The above link is subject to change
.3 The Consultant shall check with the Project Manager to ensure that the link is current.

.3 Download and use the Toolkit which includes drawing border templates, layer utility and drawing standards checker.

2.11.2 TITLE BLOCKS

.1 Use PWGSC title block for drawings and sketches (including addenda).

2.11.3 DIMENSIONS

.1 Dimensions are to be in metric only (no dual dimensioning).

2.11.4 TRADE NAMES

.1 Trade names on drawings are not acceptable.
.2 Refer to SECTON 2.3, SPECIFICATIONS; 2.3.6 Specifying Materials for specifying materials by trade name.

2.11.5 SPECIFICATION NOTES

.1 No specification type notes are to appear on any drawing.

2.11.6 TERMINOLOGY

.1 Use the term "Departmental Representative" instead of Engineer, PWGSC, Owner, Consultant or Architect.
.2 "Departmental Representative" means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor.
.3 Notations such as: "verify on site", "as instructed", "to match existing", "example", "equal to" or "equivalent to", "to be determined on site by "Departmental Representative", may not be indicated on the drawings or in the specifications as this promotes inaccurate and inflated bids.
.4 Specifications & drawings must permit bidders to calculate all quantities and bid accurately.
.5 If quantities are impossible to identify (i.e. cracks to be repaired) give an estimated quantity for bid purposes (unit prices).
.6 Ensure that the terminology used throughout the drawings & specifications is consistent and does not contradict the applicable standard construction contract documents.

2.11.7 INFORMATION TO BE INCLUDED

.1 Drawings must show the quantity and configuration of the project, the dimensions and details of how it is constructed.
.2 There should be no references to future work and no any information that will be changed by future addenda.
.3 The scope of work should be clearly detailed and elements not in contract should be eliminated or kept to an absolute minimum.

2.11.8 DRAWING NUMBERS

.1 Number drawings in sets according to the type of drawing and the discipline involved as follows:
  .1 The requirements of SECTION 2 PWGSC NATIONAL CADD STANDARD will supersede these requirements, where warranted.
.2 During the Design Phase of the project each submission and review must be noted on the Notes block of the drawing title, but at the time of construction document preparation, all revision notes should be removed.

Discipline	Drawing
Demolition	D1, D2, etc.
Architectural	A1, A2, etc.
Civil	C1, C2, etc.
Landscaping	L1, L2, etc.
Mechanical	M1, M2, etc.
Electrical	E1, E2, etc.
Structural	S1, S2, etc.
Interior Design	ID1, ID2, etc.

2.11.9 PRINTS

.1 Print with black lines on white paper.
.2 Blue prints are acceptable for document submissions at stages outlined in the TOR.
.3 Confirm with Departmental Representative the size of prints to be provided for review purposes.

2.11.10 BINDING

.1 Staple or otherwise bind prints into sets.
.2 Where presentations exceed 20 sheets, the drawings for each discipline may be bound separately for convenience and ease of handling.

2.11.11 LEGENDS

.1 Provide a legend of symbols, abbreviations, references, etc., on the front sheet of each set of drawings or, in large sets of drawings, immediately after the title sheet and index sheets.

2.11.12 SCHEDULES

.1 Where schedules occupy entire sheets, locate them next to the plan sheets or at the back of each set of drawings for convenient reference.
    .1 See CGSB 33-GP-7 Architectural Drawing Practices for schedule arrangements.

2.11.13 NORTH POINTS

.1 On all plans include a north point.
.2 Orient all plans in the same direction for easy cross-referencing.
.3 Wherever possible, lay out plans so that the north point is at the top of the sheet.

2.11.14 DRAWING SYMBOLS

.1 Follow generally accepted drawing conventions, understandable by the construction trades, and in accordance with PWGSC publications.

3 PROJECT ADMINISTRATION

3.1 GENERAL REQUIREMENTS FOR ALL PROJECTS

.1 The administration requirements outlined in this section are applicable to all PWGSC projects in Western Region, unless otherwise indicated in the TOR.
.2 "Project Team" refers to key representatives involved in this project.
.3 All team members must maintain a professional, cordial and collaborative relationship.

3.2 LANGUAGE

.1 Construction documents must be prepared in English.

3.3 MEDIA

.1 The Consultant shall not respond to any media inquiry.
.2 Direct all media requests to the Departmental Representative.

3.4 PROJECT MANAGEMENT

3.4.1 GENERAL

.1 Public Works and Government Services Canada administers the project on behalf of Canada and exercises continuing control over the project during all phases of development.
.2 This project is to be organized, managed and implemented in a collaborative manner.
.3 The PWGSC project management team, the Consultant, the Contractor and the User Department teams are to work cooperatively at every stage of the design and construction process in order to assure the creation of a successful and meaningful work of architecture.
.4 Under the leadership of the PWGSC Departmental Representative, all team members are responsible for establishing and maintaining a professional and cordial relationship.

3.4.2 NATIONAL PROJECT MANAGEMENT SYSTEM

.1 PWGSC uses the National Project Management System (NPMS) for management of its building projects in order to align with the Federal Government approvals processes. Refer to the PWGSC NPMS web site for more details.
.2 http://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/index-eng.html
.3 This GP&S document speaks to services that are normally provided by the professional during the Project Delivery Phase of the NMPS.

3.4.3 DESIGN STAGE

.1 Pre-design Process
  .1 The purpose of this phase is to analyze all project requirements including codes, regulations, programming, sustainability, cost, time management and risk to demonstrate a full understanding of the project
  .2 The approved deliverable will become the formal project work plan and will be utilized throughout the project to guide the delivery.
.2 Schematic Design Process
  .1 The purpose of this phase is to explore three distinctly different design options and to analyze them against the project requirements.
  .2 The Schematic Design will be in sufficient detail to illustrate and communicate the project characteristics.
    .1 Provide a detailed review and analysis of the project requirements including all updates and amendments to ensure all requirements are fully integrated into the Schematic Design.

.2 Out of this process the Schematic Design will be accepted and authorization to proceed to Design Development will be based on the accepted Schematic Design.

.3 The *Departmental Representative*, in concert with others shall choose one option to be further developed.

.1 Although the *Consultant* is required to identify a preferred option, the *Departmental Representative* may select another option.

.2 The approved deliverable will become the formal project work plan and will be utilized throughout the project to guide the delivery.

3.4.4 IMPLEMENTATION STAGE

.1 Design Development Process

.1 The purpose of this phase is to further develop the design option selected for refinement at the Schematic Design stage.

.2 The Design Development documents consist of drawings and other documents to describe the scope, quality and cost of the project in sufficient detail to facilitate design approval, confirmation of code compliance, detailed planning of construction and project approval.

.3 This design will be used as the basis for preparation of construction documents.

.4 The approved deliverable will become the formal project work plan and will be utilized throughout the project to guide the delivery.

.2 Commissioning Process

.1 "Commissioning" is a quality assurance process, in which the functional requirements of the Owner/occupant and the operational requirements of facility management are tested, verified and proven to function as intended.

.2 Commissioning deliverables occur at various phases throughout the project as detailed in section 2.8.

.3 Commissioning shall be in accordance with the PWGSC Commissioning Manual CP.1 (2003).

.3 Construction Document Process

.1 The purpose of this phase is to translate design development documents into construction drawings and specifications, for use by the contractor to determine a cost for the work and to construct the building.

.4 Contract Procurement Process

.1 The purpose of this phase is to obtain and evaluate bids/proposals from qualified contractors to construct the project, as per the Construction Contract Documents and to award the construction contract according to government regulations.

.5 Construction Contract Administration Process

.1 The purpose of this phase is to implement the project in compliance with the Construction Contract Documents and to direct and monitor all necessary or requested changes to the scope of work during construction, commissioning and closeout.

3.4.5 CLOSEOUT STAGE

.1 Post Construction Process

.1 The purpose of this phase is to ensure the orderly completion and recording of all aspects of the work during the construction and liaise with the Public Works And Government Services Canada and other agencies as appropriate to close out the project.

3.4.6 ENGINEERING PROJECTS

.1 Refer to the project specific TOR where the stages for an Engineering Project differs slightly.

3.5 LINES OF COMMUNICATION

.1 In general, communications will be through the Departmental Representative, unless directed otherwise.
  .1 This includes formal contact between the Consultant, the Contractor, the PWGSC Project Team and the User Department.

.2 Direct communication between members of the PWGSC Project Team on routine matters may be required for resolution of technical issues.
  .1 However, this shall not alter project scope, budget or schedules, unless confirmed in writing by the Departmental Representative.

.3 During construction tender call, PWGSC will conduct all correspondence with bidders and award the contract.

3.6 MEETINGS

.1 The Departmental Representative will arrange meetings throughout the project, with representatives from:
  .1 The User Department;
  .2 PWGSC
  .3 The Consultant team; and
  .4 The Contractor (during the construction phase)

.2 Standing agenda items shall include:
  .1 Project Schedule,
  .2 Cost,
  .3 Risk,
  .4 Quality,
  .5 Health and safety

3.7 CONSULTANT RESPONSIBILITIES

.1 The "Consultant Team" includes the Consultant's staff, sub-consultants and specialists.
  .1 This team must maintain its expertise for the duration of the project.
  .2 The team must include qualified registered architectural and engineering professionals, with extensive relevant experience, capable of providing all required services.
  .3 Team members may be qualified to provide services in more than one discipline.
  .4 The Consultant may expand the team to include additional disciplines.

.2 The Consultant is responsible for:
  .1 Obtaining Departmental Representative acceptance for each project phase before proceeding to the next phase.
  .2 Accurately communicating design, budget, and scheduling issues to staff, sub-consultants and specialists.
  .3 Co-ordinating input for the Departmental Representative's Risk Management Plan
  .4 Co-ordinating the quality assurance process and ensuring that submissions of sub-consultants are complete and signed-off by reviewers;
  .5 During the design phases:
    .1 Attend meetings,
    .2 Record the issues and decisions,
    .3 Prepare and distribute minutes within two working days of the meeting,

.4 Ensure all meetings are green i.e. using electronic documents or double-sided hard copies and
.5 Ensure sub-consultants attend required meetings.
.6 During the construction phase:
.1 Attend meetings and provide site inspection services
.2 Ensure sub-consultants provide site inspection services and attend required meetings.

.3 The Consultant is responsible for:
.1 Coordinating and directing the work of all team activities, sub-consultants and specialists
.2 Preparing a design that meets project requirements.
.3 Obtaining approvals on behalf of the Departmental Representative from the User and other levels of government such as provincial and municipal governments
.1 The Consultant shall adjust the documentation to meet the requirements of these authorities.

3.8 PWGSC RESPONSIBILITIES

.1 Administration
.1 PWGSC administers the project and exercises continuing control over the project during all phases of development.
.2 The following administrative requirements apply during all phases of the project delivery.

.2 Reviews
.1 PWGSC will review the work at various stages and reserves the right to reject unsatisfactory work at any stage.
.2 If later reviews show that earlier acceptances must be withdrawn, the Consultant shall re-design and re-submit at no extra cost.

.3 Acceptance
.1 PWGSC acceptance of submissions from the Consultant simply indicates that, based on a general review, the material complies with governmental objectives and practices, and meets overall project objectives
.2 Acceptance does not relieve the Consultant of professional responsibility for the work and for compliance with the contract.

.4 PWGSC Project Management
.1 The Project Manager assigned to the project is the Departmental Representative.
.2 The Departmental Representative is directly responsible for:
.1 The progress and administration of the project, on behalf of PWGSC
.2 Day-to-day project management and is the Consultant's single point of contact for project direction.
.3 Providing authorizations to the Consultant on various tasks throughout the project.
.3 Unless directed otherwise by the Departmental Representative, the Consultant obtains all Federal approvals necessary for the work.

.5 PWGSC Professional & Technical Resources Team
.1 Provides professional advice and quality assurance reviews of consultant deliverables by Architectural and Engineering professional disciplines.
.2 Offers expert technical advice on related project issues, such as functional programming, options analysis, risk management, cost planning, scheduling, contract interpretation, specifications, terms of reference, commissioning, claims management, project delivery approach and project compliance.

.3 Participates regularly in design phases and may attend (during construction), contractor meetings and conduct field reviews on behalf of the Departmental Representative.
.4 Provides a Design Manager for the project, who will coordinate the services of the Professional & Technical Resources Team through the Departmental Representative;
.1 The Design Manager is the assembler and coordinator of the Resources Team of Architects, Engineers, Interior Designers, Project Planners, Cost Planners and Commissioning Specialists, all with specific areas of expertise.

.6 PWGSC Commissioning Specialist represents the Departmental Representative's interests in the commissioning process for buildings by:
.1 Providing technical advice on O&M matters, operational criteria and quality assurance on the commissioning process throughout the project life cycle;
.2 Coordinating and overseeing internal PWGSC commissioning activities during all project phases to ensure that O&M concerns are addressed;
.3 Working closely with the Consultant, the Consultant's Commissioning Manager, the Contractor, and the Departmental Representative for Commissioning activities and,
.4 Reviews all documentation and reported results relative to commissioning throughout the project delivery.

3.9 USER DEPARTMENT RESPONSIBILITES

.1 The User Department Project Leader
.1 Is accountable for the expenditure of public funds and delivery of the project in accordance with terms accepted by the Treasury Board
.2 Reports to senior User Department executive management
.3 Will play several critical roles for the successful implementation of the project, as follows:
.1 Coordinate the quality, timing and completeness of information and decisions relating to issues related to the functional performance of the facility;

3.10 REVIEW AND APPROVAL BY PROVINCIAL AND MUNICIPAL AUTHORITIES

.1 The federal government generally defers to provincial and municipal authorities for specific regulations, standards and inspections but in areas of conflict, the more stringent authority prevails.
.2 Municipal authority review
.1 The purpose of this review is information and awareness;
.2 Submissions will be reviewed at the completion of specific phases as outlined in the Required Services Section of the TOR.

3.11 BUILDING PERMITS AND OCCUPANCY PERMITS

.1 The Consultant will support the Contractor in applying for building permits by providing the required documentation.
.1 These documents will be submitted at phases as requested by the municipal authorities.
.2 The Consultant will negotiate and resolve building permit related issues.
.2 The Consultant shall support the Contractor in its application for an occupancy permit and coordinate the resolution of all outstanding issues relating to the permit.
.3 The Contractor shall pay for the permits on behalf of PWGSC.

3.12 TECHNICAL AND FUNCTIONAL REVIEWS

.1 This includes both COE reviews and User Department reviews.

.1 The Purpose of these reviews is technical and functional quality assurance;
.2 Submissions will be reviewed at the completion of specific phases as outlined in the Required Services Section of the TOR.

.2 HRSDC Reviews of building projects
.1 The purpose of these reviews is for fire protection, health and life safety;
.2 Submissions will be reviewed at the completion of specific phases as outlined in the Required Services Section of the TOR.

APPENDIX A CHECKLISTS

A.1 CHECKLIST FOR THE SUBMISSION OF CONSTRUCTION DOCUMENTS

A1.1 TITLE BLOCK

Project Title:		Date:
Project Location:		**Project Number:**
Consultant's Name:		**Contract Number:**
PWGSC PM:	**Review Stage:**	

A1.2 STANDARDS & GUIDELINES

ITEM		Checked by:	Progress Submission	Pre-Tender or Tender Ready Submission	Comments:
1. General The design meets the requirements of;					
.1	National Building Code - 2005				
.2	National Fire Code - 2005				
.3	National Plumbing Code - 2005				
.4	Canada Labour Code				
.5	NFPA 10 - Standard for Portable Fire Extinguishers - 2002				
.6	NFPA 13 - Standard for the Installation of Sprinkler Systems - 2007				
.7	NFPA 14 – Standard for the Installation of Standpipe and Hose Systems - 2003				
2. Treasury Board The design meets the requirements of;					
.1	Chapter 3-6: Fire Protection Standard for Correctional Institutions. http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=13580				
.2	Chapter 3-2: Fire Protection Standard for Design & Construction. http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=13581				
.3	Fire Protection Standard for Electronic Data Processing				

	Equipment. http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=13582				
	3. HRSDC Fire Protection Engineer Standards The design meets the requirements of;				
.1	Federal Fire Protection Standards. http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/index.shtml				
.2	FC-403 Standard for Sprinkler Systems. http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/403/page00.shtml				
.3	FC-311-M Standard for Record Storage. http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/commissioner/311/page00.shtml				
	4. Labour Canada Standards The design meets the requirements of;				
.1	Canada Labour Code. http://laws.justice.gc.ca/en/L-2/				
.2	Canada Occupational Health and Safety Regulations. http://laws.justice.gc.ca/eng/SOR-86-304/index.html				
.3	Movable Storage Units Standard. http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/guidelines/mobile.shtml				
	5. ASHRAE Standards The design meets the requirements of;				
.1	ANSI/ASHRAE 55 – 2004 Thermal Environmental Conditions for Human Occupancy				
.2	ASHRAE 62.1 – 2007 – Ventilation for Acceptable Indoor Air Quality				
.3	ASHRAE Applications Handbook				
.4	ASHRAE Fundamentals Handbook				

6. PWGSC MD Standards The design meets the requirements of;				
.1 MD 15116 – Computer Room Air Conditioning Systems - 2006				
.2 MD 15128 – Minimum Guidelines for Laboratory Fume Hoods – March 2004				
.3 MD 15129 – Perchloric Acid Fume Hoods - 2006				
.4 MD 15161 – Guidelines for the control of Legionalla in mechanical systems				
.5 MD 250005 – Energy Monitoring and Control Systems Design Guidelines - 2009				

A1.3 SPECIFICATIONS – ALL DISCIPLINES

ITEM	Checked by:	Progress Submission	Pre-Tender or Tender Ready Submission	Comments:
1. General The Specifications meet the requirements of;				
.1 The NMS Users Guide. .				
.2 Masterformat 2004				
.3 The current edition of the NMS database				
.4 Deletion of "Related Sections" and "Section Includes" throughout.				
.5 PWGSC GCs for projects tendered through PWGSC				
.6 Consistent use of CCDC or other for privately tendered projects.				
.7 Non-proprietary Specifications.				
.8 Being completely edited with removal of all square choice brackets and Spec Notes.				
.9 Including all relevant Sections as evident by the by the scope of work indicated by the drawings.				
.10 Not referring to the Tender Submission (Contract B)				
.11 Use of command imperative style of language.				
.12 Formatting in either the NMS				

	1/3 - 2/3 page format or the Construction Specifications Canada full page format.				
.13	Each Section starting on a new page and the Project Number, Section Title, Section Number and Page Number show on the header of each page only.				
.14	Specification headers not including date or consultant's name.				
.15	Departmental Representative being used throughout instead of Engineer, PWGSC, Owner, Consultant or Architect. (That is; the contractual entity)				
.16	Non use of notations such as: "verify on site", "as instructed", "to match existing", "example", "equal to", "equivalent to" and "to be determined on site by".				
.17	Dimensions being provided in metric only.				
.18	Indicating the latest edition of all references noted in Part 1 of each Section and that un-used reference Standards are deleted.				
.19	No bolding of text.				
.20	Use of Western Regions standard payments procedures clause.				

A1.4 DRAWINGS GENERAL – ALL DISCIPLINES

ITEM		Checked by:	Progress Submission	Pre-Tender or Tender Ready Submission	Comments:
1. General The Drawings meet the requirements of;					
.1	PWGSC Western Region AutoCAD drafting standards.				
.2	Using the "toolkit" and the "drawing checker".				
.3	All dimensions in SI. No dual dimensioning has been used.				
.4	Providing a north arrow.				
.5	Providing a legend on all relevant sheets.				
.6	Indicating grid lines on all				

	sheets.				
.7	Using standard scales. (1:50, 1:100 etc.)				
.8	Cross referencing and detailing is consistent.				
.9	No Specifications on drawings.				
.10	All notes being written in the command imperative style of speech.				
.11	Not naming the “Contractor” or “sub trades” in the notes.				
.12	Numbering all rooms on all floor plans.				
.13	Using appropriate line weights to differentiate new versus existing versus demolition.				
.14	Using font sizes and types following PWGSC drafting standards.				
.15	Providing separate drawings for demolition and new work.				
.16	Drawing acceptance by the FPE of HRSDC.				

A1.5 DRAWINGS - DISCIPLINE SPECIFIC

ITEM		Checked by:	Progress Submission	Pre-Tender or Tender Ready Submission	Comments:
1. Architectural The Drawings meet the requirements of;					
.1	Providing a Building Code Analysis.				
.2	Indicating fire separations and firewalls and rating.				
.3	Providing a complete site plan with all related details.				
.4	Providing a fully detailed reflected ceiling plan showing lighting, diffusers, sprinkler heads, etc.				
.5	Wall sections being coordinated with the structural and other disciplines drawings.				
.6	Building elevations showing all mechanical and electrical ancillaries.				
.7	Sub surface drainage being shown on the foundation plans and coordinated with all other disciplines.				

.8	Accessibility conforming to CAN/CSA 651-04.				
.9	Coordination of door, finish, hardware schedules in conjunction with fire separations and other disciplines.				
.10	All conflict points identified by BIM have been resolved.				
2. Structural The Drawings meet the requirements of;					
.1	Ensuring that General Notes provide additional information that is NOT covered in Specifications.				
.2	Remove all information that is or should be covered by the Specifications.				
.3	Note loads used for design.				
.4	PWGSC policy of using general product descriptions, not proprietary product names followed.				
.5	Table of Abbreviations used provided.				
.6	Section bubbles properly cross referenced.				
.7	Coordination with all other disciplines.				
3. Mechanical The Drawings meet the requirements of;					
.1	Separate drawings for Plumbing, HVAC, Fire Suppression, etc.				
.2	Provision for humidification with a clean source of water and no standing water				
.3	Provision of separate HVAC zoning for each unique thermal zone.				
.4	Providing Ventilation to ASHRAE 62.1.				
.5	Meets all requirements of ASHRAE 62.1, Section 5.				
.6	All thermostats are wall mounted.				
.7	The building and systems and equipment meeting all requirements of Section 5 of ASHRAE 62.1.				
.8	Conformance to ASHRAE 55 for; .1 Operative				

	temperature .2 Air motion .3 Radiant Temperature Asymmetry .4 Draft .5 Vertical Temperature Difference .6 Floor Surface Temperature .7 Temperature Variations with Time .8 Cyclic Variations .9 Drifts and Ramps				
.9	Providing building cross-sections at all key locations showing clearances for the mechanical installation and access for maintenance.				
.10	Providing sufficient access to mechanical equipment for maintenance.				
.11	Providing mechanical schematics showing design pressure and temperatures as well as all instrumentation and control points labels.				
.12	Design complies with all referenced PWGSC MD Standards.				
.13	Equipment schedules on the drawings coordinate and agree with the Book Specifications.				
.14	Duct attenuation is designed to conform to the STC requirements shown on the architectural drawings.				
.15	Coordination with all other disciplines.				
4. Electrical The Drawings meet the requirements of;					
.1	Separate drawings for Lighting, Power, Fire Alarm System, Communication and Data, Security & CCTV etc.				
.2	Verification and acceptance of the Grounding condition for this project.				
.3	The Overcurrent and Short Circuit Study and confirming all components are fully coordinated.				
.4	The Arch-Flash Study and confirming all components are fully coordinated.				
.5	Providing Arch protection				

	warning signs and labeling.				
.6	Providing lighting Levels in accordance with the National Building Code and IESNA recommendations.				
.7	Not using Armored Cable. Using Armored Cable will be allowed only for jumping from one light fixture to the other in a distance up to 3m.				
.8	Providing identification for each circuit including: .1 Name .2 Voltage, .3 Phase, .4 Amps, .5 Circuit-s .6 Fed from Panel, Destination.				
.9	The Voltage Drop Calculation for each circuit and conformance to CEC requirements.				
.10	Providing phase load and total load for each panel and ensuring proper balance of the Electrical System.				
.11	Coordination with all other disciplines.				
	5. Civil The Drawings meet the requirements of;				
.1	The design criteria. (e.g. deign vehicle for surface structures, design period and other data for WM.WW, SW and other systems including data and calculations showing design requirements and provided capacities)				
.2	The reference standards. (e.g. minimum service connection pipe or minimum WM size, etc have been used for municipal works, name the local authority whose standards are used.)				
.3	Indicating existing sub-grade soil properties and strength that has been used for the design is indicated on drawings or in a report.				
.4	Indicating Bench Marks used for the Topographic Survey are shown with Northing, Easting and elevation data.				
.5	Indicating the Final				

	Geometric layout for existing and new infrastructures and facilities including centerline of all access roads and pipes. The data provided includes Northing and Easting of all points including start and end point and for all other points wherever there is change in direction, and all horizontal curve data				
.6	Providing typical X-sections for all structures, including type, thickness of various materials for pavement structures, and pipe diameter, material types and thickness and SDR values.				
.7	Providing design grades and slopes.				
.8	Providing details for all infrastructures and facilities indicating all works and type of materials and all geometrics and dimensions..				
.9	Coordination with all other disciplines.				

APPENDIX B SPECIFICATION TOC STANDARDS

B.1 GENERAL

B1.1 SPECIFICATIONS

.1 List all Divisions, Sections (by number and title) and number of pages.

B1.2 DRAWINGS

.1 List all Drawings by number and title.

B.2 SAMPLE OF TABLE OF CONTENTS

Project No: **Table of Contents** **Index**
R.xxxxxx **Page 1 of xx**

SPECIFICATIONS:

.3
.4
No. Pages
.5 Division 01 – GENERAL REQUIREMENTS

.6 01 11 00 – Summary of Work xx pages
.7 01 14 00 – Work Restrictions xx pages
.8 01 29 00 – Payment Procedures xx pages

.9 Division 02 – EXISTING CONDITIONS

.10 ETC.

.11

DRAWINGS:

C-1	Civil
L-1	Landscaping
A-1	Architectural
S-1	Structural
M-1	Mechanical
E-1	Electrical

APPENDIX C ADDENDUM FORMAT STANDARD

C.1 SAMPLE OF ADDENDUM FORMAT

C1.1 DRAWINGS

.1 Indicate drawing number and title, then list changes or indicate revision number and date, and re-issue drawing with addendum.

C1.2 SPECIFICATIONS

.1 Indicate section number and title.

.2 List all changes (i.e. delete, add or change) by article or paragraph

Project Title:	**Addendum No:**
Project Location:	**Project Number:**
Consultant's Name:	**Date:**

The following changes in the bid documents are effective immediately.
This addendum will form part of the contract documents

Drawings

1 A1 Architectural

Specifications

1 Section 01 00 10 - General Instructions

.1 Delete article (xx) entirely.

.2 Refer to paragraph (xx) and revise "xxx", to read "xxxx"..

2 Section 23 05 00 - Common Work Results - Mechanical

.1 Add new article (x.xx) as follows:

APPENDIX D DIGITAL TENDER DOCUMENTS STANDARDS

D.1 CONVENTION STANDARDS FOR TENDER DOCUMENTS

D1.1 USER MANUAL

.1 Refer to the User manual on directory structure and naming convention standards for construction tender documents on CD ROM.

.1 Issued by: Real Property Contracting Directorate, PWGSC,

.2 Version 1.0, May 2005.

D1.2 PREFACE

.1 The Government of Canada (GoC) has committed to move towards an electronic environment for the majority of the services it offers.

.2 This covers the advertisement and distribution of contract opportunities, including construction solicitations.

.3 As a result, it is now necessary to obtain a copy of construction drawings and specifications (in PDF format *without* password protection) on one or multiple CD-ROM to facilitate for the GoC the transfer of the construction drawings and specifications electronically to the Government Electronic Tendering System (GETS).

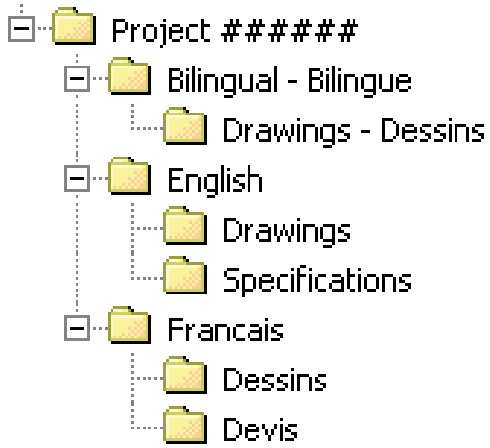
.4 There is therefore a need to adopt a common directory structure and file-naming convention to ensure that the information made available to contractors electronically and in hard (printed) copy is in accordance with the sequence adopted in the real property industries, both for design and construction.

.5 This manual defines the standard to be followed by both consultants and print shops at time of formatting and organizing the information, whether drawings and specifications are created by scanning print documents or saved as PDF files from the native software (AutoCAD, NMS Edit, MS-Word, etc…) in which these were created.

.6 It is important to note that the procedure described in this manual is not an indication that consultants are relieved from following the established standards for the production of drawings and specifications.

.7 The sole purpose of this manual is to provide a standard for the organization and naming of the electronic files that will be recorded on CD-ROM.

D1.3 DIRECTORY STRUCTURE



D1.4 1ST, 2ND AND 3RD TIER SUB-FOLDERS

.1 Each CD-ROM, whether it is for the original solicitation (tender call) or for an amendment (addendum), must have the applicable elements of the following high-level Directory Structure created:

.2 The following important points are to be noted about the Directory Structure:

.1 The "*Project* ######" folder is considered the 1st Tier of the Directory Structure where ###### represents each digit of the Project Number.

.2 The Project Number must always be used to name the 1st Tier folder and it is always required.

.3 Free text can be added following the Project Number, to include such things as a brief description or the project title;

.3 The "*Bilingual - Bilingue*", "*English*" and "*Français*" folders are considered the 2nd Tier of the Directory Structure. The folders of the 2nd Tier **cannot** be given any other names since GETS uses these names for validation purposes. At least one of the "*Bilingual - Bilingue*", "*English*" and "*Français*" folders is always required, and these must always have one of the applicable sub-folders of the 3rd Tier;

.4 The "*Drawings - Dessins*", "*Drawings*", "*Specifications*", "*Dessins*" and "*Devis*" folders are considered the 3rd Tier of the Directory Structure. The folders of the 3rd Tier **cannot** be given any other names since GETS also uses these names for validation purposes. There must be always at least one of the applicable 3rd Tier folder in each document.

.5 IMPORTANT NOTE:

.1 The applicable elements of the Directory Structure (1st, 2nd and 3rd Tier folders) are always required and cannot be modified.

D1.5 4TH TIER SUB-FOLDERS FOR DRAWINGS

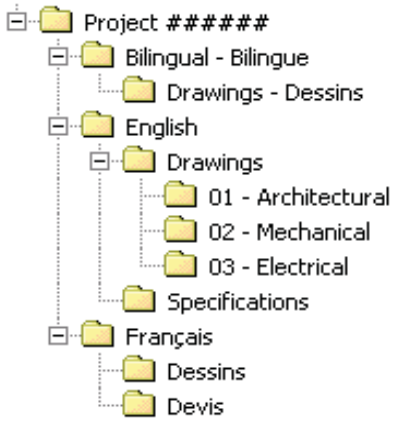
.1 The "*Drawings – Dessins*", "*Drawings*" and "*Dessins*" folders must have 4th Tier sub-folders created to reflect the various disciplines of the set of drawings.

.2 Because the order of appearance of the sub-folders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the sub-folders in the "*Drawings – Dessins*", "*Drawings*" and "*Dessins*" folders.

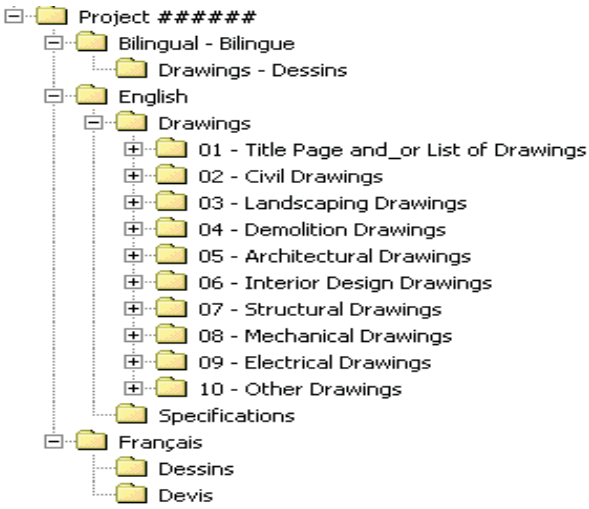
.3 Note:

.1 The first sub-folder must be always reserved for the Title Page and/or the List of Drawings unless the first drawing of the set is an actual numbered discipline drawing.

.4 Examples of 4th Tier sub-folders for drawings:



or



D1.6 NAMING CONVENTION - 4TH TIER DRAWINGS

.1 The 4th Tier sub-folders for drawings must adhere to the following standard naming convention.

.1 For the "*Drawings*" and "*Dessins*" folders:

1 ## - Y, Where:

1 ## = A two digit number ranging from 01 to 99 (leading zeros must be included)

2 Y = The title of the folder

2 Example: 03 – Mechanical

.2 For the "*Drawings - Dessins*" folder:

1 ## - Y – Z, Where:

1 ## = A two digit number ranging from 01 to 99 (leading zeros must be included)

2 Y = The English title of the folder

3 Z = The French title of the folder

2 Example: 04 - Electrical – Électricité

.2 It should be noted that the numbering of the 4th Tier sub-folders is for sorting purposes only and is not tied to a specific discipline. For example, "*Architectural*" could be numbered 05 for a project where there is four other disciplines before "*Architectural*" in the set of drawings or 01 in another project where it's the first discipline appearing in the set.

.3 It is essential to ensure that the order of the drawings on the CD-ROM be exactly the same as in the hard copy set. GETS will sort each drawing for both screen display and printing as per the following rules:

.1 The alphanumerical sorting is done on an ascending order;

.2 The alphanumerical order of the sub-folders determines the order of appearance on the screen as well as the order of printing (as an example: all the drawing PDF files in the 01 sub-folder will be printed in alphanumerical order before the drawings in the 02 sub-folder etc…);

.3 Each drawing PDF file within each sub-folder will also be sorted alphanumerically. This will determine the order of appearance on the screen as well as the order of printing

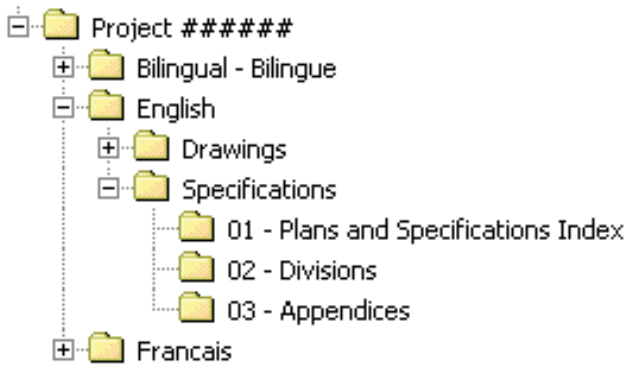
(i.e. Drawing A001 will be printed before Drawing A002, Drawing M02 before Drawing M03, etc…).

D1.7 4TH TIER SUB-FOLDERS FOR SPECIFICATIONS

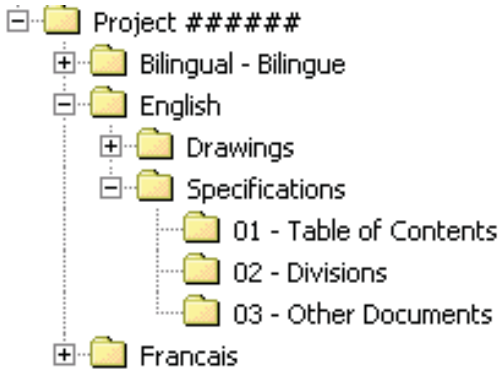
.1 The "*Specifications*" and "*Devis*" folders must have 4th Tier sub-folders created to reflect the various elements of the specifications.

.2 Because the order of appearance of the sub-folders on the screen will also determine the order of printing, it is necessary to start with a number the identification name of the sub-folders in the "*Specifications*" and "*Devis*" folders.

.3 Examples of 4th Tier sub-folders for specifications:



or



D1.8 NAMING CONVENTION - 4TH TIER SPECIFICATIONS

.1 The 4th Tier sub-folders for specifications must adhere to the following standard naming convention.

.1 For the "*Specifications*" and "*Devis*" folders:

1 ## - Y, Where:

1 ## = A two digit number ranging from 01 to 99 (leading zeros must be included)

2 Y = The title of the folder

2 Example: 02 – Divisions

.2 It should be noted that the numbering of the 4th Tier sub-folders is for sorting purposes only and is not tied to an element of the specifications.

.3 It is essential to ensure that the order of the elements of the specifications on the CD-ROM be exactly the same as in the hard copy. GETS will sort each element of the specifications for both screen display and printing as per the following rules:

.4 The alphanumerical sorting is done on an ascending order;

.1 The alphanumerical order of the sub-folders determines the order of appearance on the screen as well as the order of printing (as an example: all the specifications PDF files in the 01 sub-folder will be printed, in alphanumerical order before the PDF files in the 02 sub-folder, etc…);

.2 Each specifications PDF file within each sub-folder will also be sorted alphanumerically.

1 This will determine the order of appearance on the screen as well as the order of printing (i.e. Division 01 will be printed before Division 02, 01 - Appendix A before 02 - Appendix B, etc…).

D1.9 NAMING CONVENTION FOR PDF FILES

.1 Each drawing, specifications division or other document that are part of the tender documents must be converted in PDF format (without password protection) in accordance with the following standard naming convention and each PDF file must be located in the appropriate sub-folder of the Directory Structure.

D1.10 DRAWINGS

.1 Each drawing must be a separate single page PDF file.

.2 The naming convention of each drawing must be:

.1 X### - Y, Where;

1 X = The letter or letters from the drawing title block ("*A*" for Architectural or "*ID*" for Interior Design for example) associated with the discipline,

2 ### = The drawing number from the drawing title block (one to three digits),

3 Y = The drawing name from the drawing title block (for bilingual drawings, the name in both English and French is to appear).

.2 Example; A001 - First Floor Details.

.3 Each drawing that will be located in the appropriate discipline 4th Tier sub-folders must be named with the same letter ("*A*" for Architectural Drawings for example) and be numbered.

.4 The drawing number used to name the PDF file must match as much as possible the drawing number of the actual drawing (the exception being when leading zeros are required).

.5 The following important points about drawings are to be noted:

.1 The drawing PDF files within each sub-folder are sorted alphanumerically for both displaying and printing. If there are more than 9 drawings in a particular discipline the numbering must use at least two numerical digits (i.e. A01 instead of A1) in order to avoid displaying drawing A10 between A1 and A2.

1 The same rule applies when there are more than 99 drawings per discipline i.e. three digits instead of two must be used for the numbering (for example M003 instead of M03);

.2 If drawing PDF files are included in the "*Bilingual - Bilingue*" folder, these cannot be included as well in the "*English*" and/or "*Français*" folders;

.3 If drawings not associated with a particular discipline are not numbered (Title Page or List of Drawings for example), these will be sorted alphabetically.

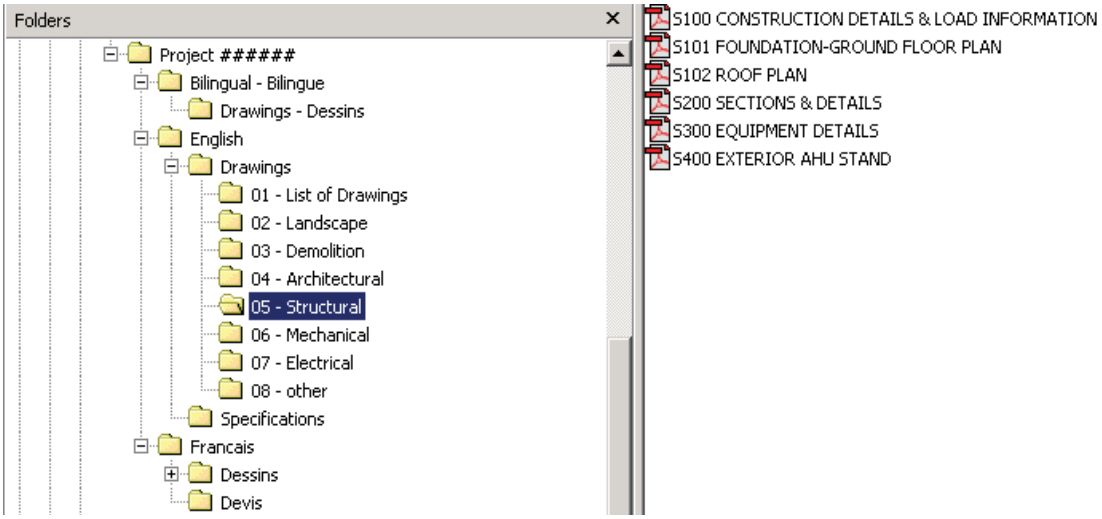
1 While this does not represent a problem if there is only one drawing in the sub-folder, it could disrupt the order when there are two or more drawings. If the alphabetical order of the drawings name does not represent the order on the

hard copy set, the drawings are to be named as per the following standard convention when converted in PDF format to ensure proper display and printing order.

1 ## - Y, Where:
  1 ## = A two digit number ranging from 01 to 99 (leading zeros must be included)
  2 Y = The name of the drawing
2 Example:
  1 01 - Title Page
  2 02 - List of Drawings

.4 If numbers are not used in the PDF files name, "*List of Drawings*" will be displayed before "*Title Page*" because "L" comes before "T" in the alphabet.

D1.11 EXAMPLE OF A 4TH TIER DRAWINGS SUBFOLDER'S CONTENT:



D1.12 SPECIFICATIONS

.1 Each Specifications Division must be a separate PDF file and all pages contained in each PDF file must have the same physical size (height, width).

.2 The Plans and Specifications Index must also be a separate PDF file.

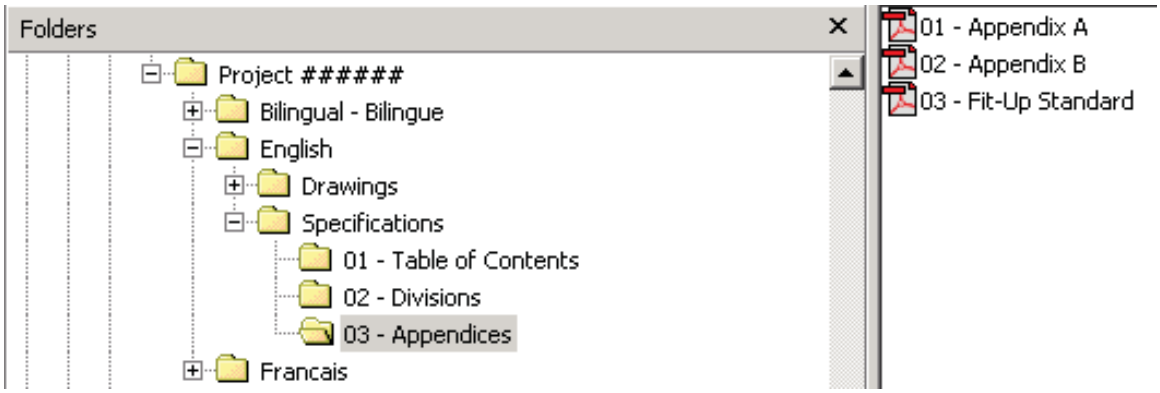
.3 If there are other documents that are part of the Specifications (e.g. Appendix or other) these are to be separate PDF files as well.

D1.13 DOCUMENTS OTHER THAN SPECIFICATIONS DIVISIONS

.1 Because PDF files within the Specifications sub-folders are sorted alphanumerically (in ascending order) for both on screen display and printing order, all files that appear in folders other than the "*Divisions*" sub-folder must be named using a number:

  .1 ## - Y, Where:
    1 ## = Two digit number ranging from 01 to 99 with leading zeros required
    2 Y = Name of the document
  .2 Example: 01 - Plans and Specifications Index

D1.14 EXAMPLE OF A SUB-FOLDER CONTENT (SUB-FOLDER OTHER THAN "*DIVISIONS*"):



D1.15 SPECIFICATIONS DIVISIONS

.1 The Specifications Divisions must be named as follows:

.1 Division ## - Y, Where:

1 Division ## = The actual word "*Division*" followed by a space and a two digit number ranging from 01 to 99 (with leading zeros required)

2 Y = Name of the Specifications Division as per CSC/CSI MasterFormat™

.2 Example: Division 05 – Metals

.2 The following important point about specifications is to be noted:

.1 The Numbering of the Divisions cannot be altered from CSC/CSI MasterFormat™ even if some Divisions are not used in a given project.

1 For example, Division 05 will always remain Division 05 even if Division 04 is not used for a given project.

D1.16 EXAMPLE OF A "*DIVISIONS*" SUB-FOLDER CONTENT:

D1.17 CD-ROM LABEL

.1 Each CD-ROM is to be labelled with the following information:
  .1 Project Number;
  .2 Project Title;
  .3 Documents for Tender;
  .4 CD *X* of *X*.

.2 Example:
  .1 Project 123456;
  .2 Repair Alexandra Bridge;
  .3 Documents for Tender;
  .4 CD 1 of 1.

APPENDIX E PDF CREATION STANDARDS

E.1 CONVERTING CONSTRUCTION DRAWINGS INTO PDF

E1.1 REFERENCE GUIDE

.1 Refer to the basic reference guide on converting construction drawings into portable document format (PDF), Issued by Real Property Contracting Directorate. PWGSC, Version 1.0, May 2005.

E1.2 PREFACE

.1 Portable Document Format (PDF) is the standard format for documents that are posted on the Government Electronic Tendering System (GETS).

.2 There is therefore a need to obtain from architectural and engineering consultants an electronic copy of drawings and specifications in PDF for tendering Government of Canada (GoC) construction projects.

.3 In order to have the highest quality in term of resolution and printing, consultants should to the greatest extent possible have the PDF drawing and specification files derived from the native software in which they were created. Scanning is permissible but only in special circumstances, for example when there is no electronic version of a drawing being included in a construction tender package.

.4 The purpose of this document is to provide basic information on the conversion of Computer Aided Design and Drafting (CADD) drawings in PDF. Creating a PDF file from a CADD drawing is a relatively simple process once all the necessary configurations and settings are in place.

.1 It actually should not take any longer than it would take to create a plot file or to send a drawing to a printer.

.2 The information in this guide is not intended to cover all technical aspects of the conversion, which can be done using various methods, but rather to highlight important points about the process and file settings.

.3 The conversion of specifications is not covered in this basic reference guide since it does not require any special configuration or setting.

.5 The information provided in this basic reference guide is not an indication that consultants are relieved from following the established standards for the production of drawings and specifications.

.1 The sole purpose of this guide is to provide basic information on the PDF conversion process bearing in mind that additional detailed technical information is available from the various software manufacturers.

E1.3 PRINTER DRIVERS

.1 Adobe Acrobat provides two different printer drivers that are able to convert CADD drawing into PDF format, Acrobat PDF Writer and Acrobat Distiller.

.2 Before creating a PDF file from a CADD drawing, a choice must be made as to which one will be used.

.3 Acrobat PDF Writer is a non-PostScript printer driver that works best with documents that don't contain complex graphics.

.4 Acrobat Distiller is a PostScript printer driver that works best with documents that contain PostScript fills, Encapsulated PostScript (EPS) graphics, or other complex elements.

.5 It is recommended that Acrobat Distiller be used to create PDF file of architectural and engineering drawings due to their size and complex graphical nature.

E1.4 PRINTER CONFIGURATION

.1 Before converting a CADD drawing to PDF, an Acrobat printer configuration file for the PDF paper size needs to be created.

.2 This function can be done in the CADD software rather than using a custom paper size defined for the Acrobat distiller feature.

.3 The recommended method is to add a PostScript Adobe plotter in the CADD software and making the necessary setting in terms of media source and size, scale and orientation.

.4 The configuration can then be re-used to simplify the conversion process for future files that use the same page size.

.5 As an alternative, although not recommended, a custom-defined size can be created in Acrobat Distiller in the *properties* menu.

E1.5 CREATING PDF FILES

.1 Once the printer configuration has been done in the CADD software, open Acrobat Distiller and make the necessary settings in the *preferences* and *job options* sub-menu.

- .1 Ensure that the page size match the sheet size selected in the CADD software to create the file.
- .2 Particular settings can be saved under different names for future use.

.2 With the Acrobat Distiller application open, ensure the required sheet size is displayed in the job options window. Then it is simply a matter of bringing the CADD file into the Acrobat Distiller creation box.

.3 A progress bar will show during the conversion and the newly converted PDF file should open up and be displayed for verification.

E1.6 PDF FILES SETTINGS

.1 Security

- .1 Adobe Acrobat contains security features that can de used to secure the files by restricting any changes to the files.
- .2 Since the files will be posted on MERX and will be used for printing copies, the files must not be password protected and must allow printing.

E1.7 DRAWING ORIENTATION

.1 The final PDF drawing files must be displayed on the screen in the same direction that the users are intended to view them. This can be achieved by adjusting the setup of the plotter. If the drawing is not oriented properly after the conversion, it can be rotated manually within Adobe Acrobat.

E1.8 FONT TYPE

.1 In order to avoid any problems during the conversion and to minimize the potential for font display errors, the fonts used for the production of construction drawings must be PostScript or True Type fonts.

E1.9 RESOLUTION

.1 Since the PDF files will be used for printing, it is important that a proper resolution be selected. It is recommended to select 600 dots per inch (dpi).

E1.10 SCALE

.1 When choosing the Plot scale in Adobe, it is important to choose the 1:1 scale to ensure the integrity of the scale from which the drawings were created in the CADD software.

E1.11 SCANNING

.1 Scanning is not recommended and should be done only when the drawing is not available electronically.
.2 When scanning a drawing, it is important that it be done in real size (scale 1:1) to ensure that the scale remains intact in subsequent printing.
.3 It is recommended that each scanned drawing be opened and verified to ensure that the resolution, scale and border are of an acceptable quality.

E1.12 FINAL CHECKLIST

.1 When the drawing file has gone trough the PDF conversion, it is recommended to open it and verify the following:
  .1 That the sheet size displayed is what was intended to be created (the size is viewable in the lower left corner of the drawing);
  .2 That the orientation of the sheet is correct;
  .3 That the line types, line weights and fonts match the CADD drawing.
  .4 That the PDF file is in black and white;
  .5 That each drawing is a single PDF file;
  .6 That the PDF file is not password protected and printable.
.2 If all the items are verified, the PDF file is useable.

E1.13 ADDITIONAL INFORMATION

.1 For more information about the creation of PostScript and EPS files please refer to the User's Guide of the CADD software being used to produce the drawings. For more information about creating PDF file please refer to the Acrobat Distiller User's Guide and/or visit the Adobe Web site at www.adobe.com.

APPENDIX F DEFINITIONS

F.1 TERMINOLOGY

TERMS	DESCRIPTION
As-builts/Record Drawings	See Record Drawings
Base Building	Refers to the building shell, as opposed to the tenant fit-up. It includes finished floors, exterior walls, interior core, finished ceilings with lighting, and other building systems for the planned general use of the building. Generally, the work for the base building is separate from the work for tenant-fit-ups
Circulation	Space used, primarily by people, to move from one area to another. It includes major as well as secondary aisles.
Client	A term that refers to the client, the client department or user department
Co-location	Placing items together for better organization
Consultant	The word refers both to an individual consultant, or a consultant team. The consultant is generally selected by PWGSC using a Request for Proposal.
Contractor	The company, organization or firm who is responsible for the construction of the project
Consolidation	Reducing the number of co-located items by placing them in a common floor facility to eliminate duplication of space.
Constant dollar estimate	This is an estimate expressed in terms of the dollars of a particular base fiscal year.
Cost Specialist	Refers to the cost estimating, planning and control team or an individual performing these functions.
Current dollar estimate	Refer to: *budget year dollars*
Budget-year dollars	This is an estimate based on costs arising in each FY of the project schedule, which is escalated to account for inflation and other economic factors affecting the period covered by the estimate ***Budget year*** dollars is also be referred to as ***Nominal*** dollars or ***Current*** dollars
Departmental Representative	The person designated in the contract, or by written notice to the Consultant or Contractor, to act for PWGSC for the purposes of the contract. It can also be a person designated in writing by the Departmental Representative to act on his/her behalf. In most cases, the PWGSC Project Manager is the Departmental Representative
EMV	Expected monetary value of risk event (i.e. cost or saving to the project if risk event occurs)

Final Certificate of Completion	A document issued by the Project Manager after the final inspection by the Project Acceptance Board. The final payment to the Contractor by PWGSC is based on the final certificate of completion
Final Inspection	The inspection performed by the Project Acceptance Board after project completion and after correction of deficiencies identified during Interim Inspection
Fit-up for initial occupancy	The preparation of accommodation for initial occupancy, in accordance with the federal Fit-up Standards. This fit-up may include alternations to the base building and its building systems.
Fit-up of existing space for reuse, Refit	Work required to alter space previously occupied by one organization to meet the requirements of a different organization.
Fit-Up Cost Limits	The funding limits for the fit-up of office accommodation. The limits are based on the average cost per useable square meter, for fit-up elements in specific urban centres across Canada, and are updated from time to time. The limits do not include soft costs or items funded by clients or under base building costs.
Fit-Up Items	Components that are installed removed or relocated to prepare the space for occupancy. They include partition walls, doors, frames, hardware, counters and cabinetry, modifications to base building systems, etc. as detailed in the Fit-up standards. Some base building components are included in consultant scope of work, such as the flooring and the ceiling finishes or telecommunications spaces and related environmental controls.
Focus Group	Group sessions held to establish qualitative requirements. They are most effective at the strategic planning level. They are used primarily to translate the Client Department's mission statement into organizational requirements and to assess planning alternatives
Full-time equivalent.	It measures of labour utilization in the federal government which approximates the actual number of persons "employed" by the government for carrying out the unit of work
Functional space equation	Identifies space requirements (in usable m^2) by group along with summary of the total space required for all groups.
Gross Space	The total floor space
High risk	A project (or element of a project) may be assessed as high risk if one or more hazards exist in a significant way and, unless mitigated, would result in probable failure to achieve project objectives
Impact	The result of the occurrence of an event on the project either positive or negative (i.e. a schedule delay as a result of late delivery of a piece of equipment may have a high negative impact on a project; increased access to a construction site due to early departure of occupants in an office space may have positive

	impact on a project). The Impact of individual Risk Events can be qualified as low, medium, high or quantified in terms of time, cost (immediate cost or in-service cost (O&M)) or performance.
Interim Certificate of Completion	The certificates issued by Project manager following the Interim Inspection. Interim payment to the Contractor by PWGSC is based on the interim certificates. This payment takes place of a regular progress claim.
Interim Inspection	The inspection performed by the Project Acceptance Board after substantial completion of the project. A list of deficiencies is prepared, and subject to the Contractor's agreement to correct these, the Project Manager accepts the work and prepares the interim certificates
LEED®	Leadership in Energy & Environmental Design; an environmental rating system
Low risk	A project (or element of a project) should be assessed as low risk if hazards do not exist or have been reduced to the point where routine project management control should be capable of preventing any negative effect on the attainment of project objectives
Medium risk	A project (or element of a project) may be assessed as medium risk if some hazards exist but have been mitigated to the point that allocated resources and focused risk management planning should prevent significant negative effect on the attainment of project objectives
National Project Management System	The system used by PWGSC for management of its projects. It replaces the earlier Project Delivery System (PDS).
PI Forms	Product Information forms; used in commissioning documentation
Probability	The likelihood that an event will occur (i.e. Low, Medium, High)
Project Acceptance Board	A team assembled by the Project Manager to perform interim and final inspections of the Client Department's improvements.
PV Forms	Performance Verification forms; used in commissioning documentation
Record drawings	Drawings used to record field deviations, dimensional data, and changes or deviations from the 'Construction Document-Issued for Construction'. They indicate the work as 'actually' installed. They are also called as-builts
Rentable Space	Usable space plus space occupied by columns, convectors, elevator lobbies and washrooms. It also includes some common base building areas such as telephone and janitorial closets.
Request for Proposal	The document used for requesting consultant services. It includes the Terms of Reference as well as other contracting documents

Risk management	The art and science of identifying, analysing, and responding to risk factors throughout the life of a project and in the best interests of its objectives
Risk Event	A discrete occurrence that may affect the project for better or worse (i.e. late delivery of a piece of equipment is a "risk event" that may cause a schedule delay)
Scheduler	Refers to the Time Scheduler; also referred to as Time Specialist
Space Equation	A spreadsheet that reflects the Client's organizational structure, functional requirements, and proposed planning alternatives. It is used to determine the total usable area required to accommodate the following: Open and enclosed workstations/worksettings; Support space; Special purpose space circulation factor; Building loss factor; Total population; and Total space required; and Summary by group
Space Optimization	Maximizing the utilization of space.
Special Purpose Spaces	Non-standard spaces required to accommodate activities that are essential to departmental programs. This space is often not suitable for conversion to office accommodation because of its special requirements. Examples include: laboratories, health units or clinics, meeting or training complexes which serve outside groups, processing space, departmental libraries, gymnasiums, warehouses, file or storage areas not allowed by the PWGSC Fit-Up Standards, trade shops, mailrooms, computer training rooms, cash offices and similar spaces requiring special service and security features and hearing rooms.
Support Space	Space for typical office support functions not included in workstation or circulation space but necessary for office operation. The Fit-Up Standards identify specific sizes and ratios for kitchenette / recycling centre / lunchroom / resource areas, shared equipment spaces, meeting rooms, quiet / touch down rooms, printer stations, reception / mail drop / waiting / display areas and coat / storage closets. Limited allowances for "Other" support spaces including non-dedicated workstations, storage rooms, LAN rooms, breakout rooms, interview rooms, training rooms, reading rooms etc. are also identified in the Fit-Up Standards.
Terms of Reference	A document prepared by PWGSC when requesting Consultant services, which forms part of the RFP and is also included in the Consultant Agreement with PWGSC.
Universal Footprint	One standard module which can be multiplied to accommodate

	all office functions including workstations, support space and special purpose space
Usable space, "Walk-on" Space	The space, in M^2, that is actually usable by the occupant. Measurement calculations do not include columns and convectors, building service areas and accessory areas.
Worksettings	Common work areas that support both collaboration and privacy. They include: teaming areas, non-dedicated workstations, privacy nooks, resource areas and multipurpose areas.
Workstations	An enclosed or open area dedicated for the use of individual employees.

F.2 ACRONYMS

ACRONYM	DESCRIPTION
A&E	Architecture & Engineering
AHJ	Authorities Having Jurisdiction
AMP	Asset Management Report
ASAE	American Society of Agricultural Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASPE	American Society of Plumbing Engineers
BCC	Building components and connectivity
BCR	Building Condition Report
BMM	Building Maintenance Manual
CAD	Computer aided drawing
CCDC	Canadian Construction Document Committee
CBIP	Commercial building incentive program
COE	PWGSC Centre of Expertise
EMCS	Energy Monitoring & Control System
EPA	Effective Project Approval
FHBRO	Federal Heritage Building Restoration Office
FOBS	Federal Office Building Standards (PWGSC)
FTE	Full-time equivalent
HCP	Heritage Conservation Program
HRSDC	Human Resources and Skills Development Canada
IT/MM	Information Technology/Multi-media
MMS	Maintenance management system
NBC	National Building Code
NCA	National Capital Area;
NCR	National Capital Region;
NFBC	National Farm Building Code
NGMA	National Greenhouse Manufacturers' Association
NMS	The National Master Specification used by PWGSC

NPMS	National Project Management System
OAA	Ontario Association of Architects
O&M	Operation and Maintenance
P&S	General Procedures and Standards
PA	Project administration
PI	Product Information
PD	Project Description
PM	Project Manager
PV	Performance verification
PWGSC	Public Works and Government Services Canada
RAIC	Royal Architectural Institute of Canada
RAS	Requirements and Standards
RS	Required Services
RSR	Resident site services
RPCD	Real Property Contracting Directorate
TOR	Terms of Reference

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Canada

Respect ◆ Integrity ◆ Excellence ◆ Leadership

Serving GOVERNMENT, Serving CANADIANS.

Architectural & Engineering Services

TERMS OF REFERENCE

NRCan GSCC Mechanical, Electrical and Laboratory Renovations

For:

Natural Resources Canada (NRCan)

Geological Survey of Canada - Calgary Building (GSCC)

Calgary, Alberta

July 20, 2015

www.pwgsc-tpsgc.gc.ca

Table of Contents:

1 PROJECT DESCRIPTION

1.1 GENERAL

1.1.1 PURPOSE OF TERMS OF REFERENCE (TOR)

.1 Public Works & Government Services Canada (PWGSC) requires the services of an architectural firm, acting as prime consultant with a multi-disciplinary team of sub-consultants for the provision of service required for this project.

1.1.2 THE PWGSC GENERAL PROCEDURES AND STANDARDS DOCUMENT (GP&S)

.1 The TOR describes project-specific requirements, services and deliverables while the GP&S document outlines minimum standards and procedures common to all projects.

.2 The TOR document must be used in conjunction with the GP&S, as the two documents are complementary.

.3 In the case of a conflict between the two documents, the requirements of the TOR override the GP&S Document.

1.1.3 PROJECT INFORMATION

.1 National Resources Canada (NRCan) requires mechanical and electrical system upgrades and laboratory renovations consolidating existing laboratory operations into the West Wing of the Geological Survey of Canada Building and other modernizations.

Project Information	
Project Title:	NRCan Geological Survey of Canada – Calgary Building Mechanical, Electrical and Laboratory Renovations
Project Address:	Geological Survey of Canada – Calgary 3303 – 33 Street NW Calgary, Alberta
PWGSC Project Number:	R.076774.001
PWGSC Departmental Representative:	To be announced
Project Management Support Services:	To be announced

1.2 BACKGROUND INFORMATION

1.2.1 USER DEPARTMENT NEED

.1 There have been various upgrades to the building and its' mechanical and electrical systems over the 48 year life of the building. However, due to the age of the building and previous project deferrals there is a need to upgrade and update various building systems and components. The purpose of this program is to advance the upgrade of the building systems and components that have been identified as priorities.

1.2.2 USER DEPARTMENT

.1 The User Department referred to throughout the TOR is Natural Resources Canada (NRCan).

.2 Natural Resources Canada (NRCan) seeks to enhance the responsible development and use of Canada's natural resources and the competitiveness of Canada's natural resources products.

1.2.3 EXISTING CONDITIONS

.1 The Geological Services Canada – Calgary (GSCC) building includes three building additions. The building includes the original main building, 2 – laboratory wings (East and West) and a warehouse/storage wing.

.2 The original main building at the Geological Survey of Canada – Calgary was constructed in 1967 and is a 2-storey concrete framed structure, with basement and penthouse, clad primarily with precast concrete panels, double-glazed aluminum framed windows.

.3 Laboratory use in the Laboratory wings (constructed in 1972) has decreased over time. Consolidating laboratories with continuous (i.e. 24/7) fresh air requirements into the West Wing will improve energy efficiency and optimize space utilization. Refer to Appendix B for a HVAC and Space Optimization Study prepared by PWGSC in 2013.

.1 Laboratories are also in need of modernization.

.4 The total building floor area, including the warehouse/storage wing is approximately 16,790 m^2. The current project mechanical and electrical work is focused on the main building and Laboratory wings which comprise approximately 9,570 m^2 of floor area. The areas of architectural scope are described in Appendix A.

.5 The existing Electrical System Distribution has passed the life expectancy and most of the components (i.e. switchgear, transformers, distribution panels) are obsolete.

.6 HVAC air handling units, pumps and control system are nearing the end of their service life and require upgrading/replacement.

.7 Significant upgrades on the base building were completed in 2011.

1.2.4 STRATEGY

.1 This TOR is comprised of separate mechanical and electrical maintenance program work items and consolidation of laboratories requiring continuous fresh air supply into one wing of the building.

.2 The Consultant will be required to begin design on the work items immediately in order that procurement and construction may start on the packages as soon as possible.

.3 A Construction Manager will be selected to manage the tendering and construction of each of the work items.

1.2.5 CONSTRAINTS AND CHALLENGES

.1 The Consultant will be required to become familiar with the project site and obtain local information as required.

.2 All site visits must be arranged through the Departmental Representative.

.3 The construction on the project site will be performed during the full operation of the facilities.

.4 The Consultant will be required to observe NRCan security procedures at the site.

.1 Access to the building interior will be controlled.

.5 Environmental conditions must be kept under control during all phases of the work.

.6 The project scope must be tailored to meet the User Department's budget. Diligent cost estimating and cost control is required.

.7 Scope of work may require prioritization of work items (refer to Appendix A) in the Pre-Design phase to fit within the maximum construction budget.

.8 Consultant’s key personnel must be available to respond to emergencies within 1 day.

.9 The Consultant team and the Construction Manager (CM) are tasked to accelerate the implementation of the program to the fullest extent possible and if possible exceed the indicated schedules.

1.2.6 HAZARDOUS MATERIALS

.1 The following hazardous materials have been identified at this site through various audits of this building:
  .1 Asbestos

.2 The PWGSC Asbestos Containing Building Materials Survey, June 2013, developed by Tetra Tech will be available to the Consultant at the beginning of the Pre-Design phase.

.3 The CM is responsible for providing all Hazardous Abatement Professional consulting and carrying out remedial work results associated with abatement work.

.4 The Consultant is responsible for identifying the area(s) of design that may require abatement.

1.2.7 PROJECT DELIVERY APPROACH

.1 This project will use a construction management approach.

.2 There are 13 work items that will be delivered using multiple tender packages. These work items will be grouped into tender packages as determined by the Departmental Representative, Construction Manager and Consultant. It is anticipated that up to 8 separate tender packages will be required for this project.
  .1 Each package will use a design-bid-build approach;
  .2 Refer to Appendix A for details;
  .3 The Consultant, in consultation with the Construction Manager, Departmental Representative and User Department representative will develop a strategy to find opportunities to combine work items into single tenders.

.3 The Consultant shall prepare each tender package and ensure full co-ordination of the work of all disciplines.

.4 The Construction Manager will manage the tendering and construction of the packages.

.5 The Consultant shall incorporate the Construction Manger's tendering requirements and QA review comments into the various packages.

1.3 SUMMARY OF SERVICES

1.3.1 GENERAL

.1 The services of an architect, acting in the capacity of Prime Consultant, together with a multi-disciplinary team of sub-consultants, are required to undertake the design and provide the contract administration services necessary for this project.

.2 As Prime Consultant the selected architectural firm will provide a full consulting team including the required expertise in structural, mechanical and electrical engineering.

1.3.2 COST ESTIMATING

.1 Provide class D estimates based on the work items in Appendix A at the completion of the Pre-Design phase.

.2 Provide class C estimates for all options explored at the completion of the Schematic Design Phase.

.3 Provide class B estimates for all work items at the completion of the Design Development Phase and updates for the 50% Construction Documents.

1.3.3 PROJECT SCHEDULING

.1 Prepare a Project Planning and Control Schedule, in accordance with the milestone list.

1.3.4 COMMISSIONING

.1 Provide a Commissioning Plan following the CSA Z320-11 guidelines.

.2 Prepare Component Verification and System & Integrated System Testing Forms for this project.

1.4 SUMMARY OF DESIGN WORK

1.4.1 SCOPE SPECIFIC REQUIREMENTS

.1 Refer to the “Work Item” table in Appendix A for the anticipated specific design work requirements.

1.5 OBJECTIVES

1.5.1 GENERAL GOALS

.1 Ensure the design is efficient and cost effective considering both initial cost and operation & maintenance costs over the respective life cycle of equipment/building material.

1.5.2 DESIGN PERFORMANCE

.1 Deliver the project within the timeframe identified. The work items (design and construction) must be completed by March 31, 2017.

.2 Provide improved systems that meet the operational and functional needs of NRCan with improved sustainability provisions (reduced resource use and green house gas emissions).

.3 Provide an integrated design of systems and facilities that:

- .1 Optimizes performance of components and systems.
- .2 Are designed for ease of maintenance.
- .3 Meets or exceeds the requirements of the National Building Code.
- .4 Will endure and remain serviceable for its unique purpose by:
  - .1 Incorporating suitable high quality materials into the design that are of a quality, durable and are constructed with the best workmanship possible;
  - .2 Employing advanced systems and technologies to support contemporary operating requirements with capacity for growth and change;
  - .3 Fully integrating all components and systems, including architectural, structural, mechanical, electrical, IT, and security design; and
  - .4 Welcomes access by visitors while respecting security requirements.

.4 The building must:

- .1 Provide a healthy and safe working environment that meets or exceeds all codes for fire, health, and life safety, including the Canada Labour Code, that fully supports optimum work productivity;
- .2 Provide efficient and productive accommodations with planning configurations and workspaces that are flexible, functional, responsive and efficient in keeping with current PWGSC, Treasury Board, Health Canada and User Department Standards;
- .3 Fully integrate and optimize the performance of components and systems;
- .4 Embody contemporary sustainable design and application principles and is implemented in an environmentally responsible manner;

.5 Be designed for ease of maintenance, with systems that can be accessed and easily repaired and / or replaced during the building's life cycle;
.6 Provide physical security for occupants;
.7 Allow capacity for growth and change;
.8 Provide integration with User systems for security and information IT services.
.9 Ensure the new systems provided are compatible with existing systems in building.

1.5.3 FUNCTIONAL REQUIREMENTS

.1 On the basis of the information contained in the Appendices in this TOR the Consultant will meet with the User Department to confirm functional requirements.

1.5.4 HERITAGE

.1 Although the Geological Survey of Canada building is not designated by the Federal Heritage Building Review Office (FHBRO), solutions should be implemented using a minimum intervention approach causing the least harm to the heritage character of the original main building.

1.5.5 ENVIRONMENTAL/SUSTAINABLE DEVELOPMENT

.1 Consider, as part of "green construction" building materials, methods and practices, the following:
  .1 Low toxicity including low VOC materials;
  .2 Low embodied energy materials;
  .3 Durable materials capable of being reused to the greatest extent possible;
  .4 Incorporating structure as a finished material where practical, such as, storage areas.
.2 Design to reduce greenhouse gases (GHG) to the least extent possible.
  .1 Consultant to demonstrate how GHG are reduced in the design.

1.5.6 PROJECT DELIVERY

.1 Deliver the project within the construction budget established during preliminary project approval.
.2 Deliver the project within the key milestones and according to the project schedule.
.3 Ensure that each Consultant team member understands the project requirements, for seamless delivery of the required services.
.4 Ensure co-ordination of services with other consultants hired by PWGSC.
  .1 Installation of a new roof over various parts of the building will be underway.
.5 Provide a quality management plan that includes rigorous quality reviews.
.6 Provide a continuous risk management program; address the risks associated specifically with this project including scheduling and presence of hazardous materials.

1.6 SUMMARY OF SERVICES AND QUALIFICATIONS

1.6.1 GENERAL SERVICES

.1 The prime consultant will provide a full consulting team including the following consultant services and specialties:
  .1 Professional Architectural Services;
    .1 Prime Consultant,
    .2 Project management of the consultant team,

.2 Professional Engineering Services;
  .1 Structural Engineering,
  .2 Mechanical Engineering,
    .1 HVAC specialist,
    .2 HVAC Control specialist.
  .3 Electrical Engineering,
    .1 Licensed Electrician,
    .2 Security System specialist.
.3 Laboratory Design specialist;
.4 Commissioning specialist;
  .1 Independent from the mechanical and electrical engineers above to conduct the work as described in this TOR.
.5 Cost Estimating specialist;
  .1 Independent cost estimator certified by the Canadian Institute of Quantity Surveyors.

1.7 SCHEDULE

1.7.1 GENERAL

.1 Deliver the project to be ready for occupancy in accordance with the project milestone listing identified below.
.2 Completion dates shown are relative to an assumed start date in October, 2015.
.3 Prepare a Project Schedule in accordance with the milestone list.

1.7.2 ANTICIPATED MILESTONE DATES

Project Phase	Milestone Completion Date	Number of Weeks
Consultant Contract Award	October, 2015	
Pre-Design	November, 2015	4 weeks
PWGSC Quality Assurance Review		2 weeks
Schematic Design	On-going as required.	
PWGSC Quality Assurance Review		2 weeks
Design Development	On-going as required.	
PWGSC Quality Assurance Review		2 weeks
Construction Documents	On-going as required.	
PWGSC Quality Assurance Review (for each tender package submission)		2 weeks
Final Construction Documents	On-going as required.	
Construction Start	On-going as required.	
Substantial Completion of Construction	February 28, 2017	
Final Completion (Commissioning, Final Inspection and Acceptance)	March 31, 2017	
Post Construction Deliverables	April 30, 2017	
Post Construction Warranty Evaluation	January 31, 2018	

1.8 COST

1.8.1 CONSTRUCTION BUDGET

.1 The construction estimate does not include project management fees, administration costs, consultant fees, risk allowance, escalation or GST and is in 'Budget-Year (Current)' dollars.

.2 The maximum construction budget (excluding GST) is six million one hundred sixty thousand dollars ($6,160,000).

1.9 EXISTING DOCUMENTATION

1.9.1 AVAILABLE FOR THE CONSULTANT

.1 Copies of all pertinent documentation will be made available to the Consultant.

.2 Limited as-built drawings and Operation & Maintenance Manuals will be available on the project site at the start of the Pre-Design phase. The Consultant will be responsible for verifying the accuracy of the information incorporated into the design.

.3 Building record drawings in AutoCAD (dwg) format.

.1 The drawings will require modifications by the Consultant.

.2 The Consultant may need to develop as found drawings as required.

.4 Hazardous Materials Report.

1.9.2 DISCLAIMER

.1 Reference information will be available in the language in which it is written.

.2 The documentation may be unreliable and is offered, "as is" for the information of the Consultant.

1.10 CODES, ACTS, STANDARDS, REGULATIONS

1.10.1 GENERAL

.1 A listing of Codes, Acts, Standards and Guidelines potentially applicable to this project are contained in the GP&S Document. In addition the following standards also apply to this project:

.1 Commissioning (Cx) to comply with CAN/CSA Standards Z320-11.

.2 Accessible Design for the Built Environment – CSA B651-12;

.3 NRCAN Environmental System SOP's;

.1 Hazardous Waste Handling and Disposal,

.2 Wastewater Quality Management.

.2 The Authorities Having Jurisdiction (AHJ) on this project are:

.1 The local AHJs;

.2 Treasury Board of Canada.

.3 The Consultant must identify, analyse and design the project in accordance with the requirements of all AHJs and all applicable Codes, Acts, Standards and Guidelines and Legislation:

.1 The applicability of various Codes, Acts, Standards and Guidelines listed in the GP&S document arise out of direct and indirect references in documents which apply to Federal buildings, such as the Canada Labour Code;

.2 The consultant team must be fully versed with the legislation and requirements that are unique to Federal Government buildings in Canada;

.3 The consultant team must be fully versed with the legislation and requirements that are unique to Federal Government projects tendered through Public Works & Government Services Canada.

.4 The Consultant team must fully incorporate the Commissioning Processes and Procedures using the acceptable standard but not limited to CSA Z320-11 and ASHRAE Guideline 0-2005.

2 REQUIRED SERVICES

2.1 CONSTRUCTION MANAGER INTERFACE

2.1.1 COORDINATION WITH THE CONSTRUCTION MANAGER (CM)

.1 The Consultant will work closely with the CM to develop the design and ensure that all information is made available to the CM. The CM shall provide advice on the following CM activities throughout the design and construction phases:
- .1 Construction costs;
- .2 Material delivery & construction schedules;
- .3 Constructability;
- .4 Suitability and availability of materials and components; and
- .5 Sustainable design, construction, and operation principles and practices.

.2 The Consultant Team shall facilitate Integrated Design Process (IDP) Workshops through the design stage. The Consultant Team and CM's Construction Project Manager (CPM) shall attend 3 IDP workshops for the purpose of receiving advice from the CM's CPM on Constructability of various options that the Consultant is considering including:
- .1 Selection of materials, building systems and equipment;
- .2 Constructability; and
- .3 Coordination between all design disciplines.

.3 The Consultant, in consultation with the CM and Departmental Representative, will help determine the number of tender packages required for the project. This is to enable the Consultant to prepare the tender packages in a timely manner and ensure full co-ordination of the work of all disciplines.

2.2 GENERAL REQUIREMENTS

2.2.1 SERVICES

.1 Commissioning Service.
.2 Pre-Design Service.
.3 Schematic Design Service.
.4 Design Development Service.
.5 Construction Documents Service.
.6 Contract Procurement Service.
.7 Construction Support Service.
.8 Post Construction Service.

2.3 PROJECT REVIEW AND APPROVAL

2.3.1 GENERAL

1. Comply with all applicable laws and regulatory requirements as required by the General Conditions of the Contract.

2.3.2 PWGSC REVIEWS, APPROVALS AND PRESENTATIONS

.1 Project delivery team approval includes both the PWGSC Architectural & Engineering Centre of Expertise (A&ECoE) reviews and User Department approval:
- .1 The purpose of this review is technical quality assurance (including fire protection, health and life safety);
- .2 The purpose of these reviews is to ascertain for PWGSC that the Consultant has reasonably fulfilled the objectives of this project;

.3 Work that does not meet the objectives of the project will be rejected, rejected work will require further design (including re-design), coordination and documentation at the Consultant's expense;
.4 Quality assurance for the project design and documentation remains the responsibility of the Consultant;
.5 Submissions will be reviewed at pre-design, schematic design, design development and pre-tender construction documents phases as required;
.6 Expected turnaround time is 2 weeks;
.7 For each review provide one submission (i.e. electronic copies of documents in pdf format) plus any follow-up submissions.

2.4 COMMISSIONING SERVICE

2.4.1 GENERAL

.1 The purpose of the Commissioning Service is to ensure that a fully functioning project is delivered to the Client.
.2 Commissioning (Cx) is an integral part of the Consultants' required services and therefore, required activities and deliverables are listed within each project phase service.
.3 Provide fully integrated and comprehensive commissioning for the project in accordance with the requirements in CSA Z320-11.
.4 The project will be accepted and the Certificate of Substantial Completion will be issued only after:
  .1 Successful completion of integrated systems tests, life safety support systems tests and after meeting all requirements of the authority having jurisdiction.
  .2 All test certificates, commissioning reports and commissioning documentation have been approved by the Departmental Representative.
.5 Commissioning deliverables at various project phases are:
  .1 During the Schematic and Design Development Phases, develop/ update:
    .1 Commissioning Plan.
  .2 During the Construction Document Phase, develop:
    .1 Commissioning specifications,
    .2 Component, system and integrated system test verification sheets
  .3 During the Construction Phase:
    .1 Monitor and report on contract commissioning activities,
    .2 Review and certify verification sheets as they are completed by the contractor, and
    .3 Review commissioning schedule.
  .4 During the Commissioning Phase:
    .1 Witness all component, system and integrated systems tests,
    .2 Review and certify commissioning test results,
    .3 Track and compile all commissioning documentation submitted by the contractor and confirm that all commissioning tasks are completed,
    .4 Incorporate all commissioning documentation into a preliminary commissioning report and recommend interim acceptance.
    .5 Identify "deferred" commissioning tests due to seasonal constraints, etc.
  .5 During the Operating Phase:
    .1 Provide advice and recommendations for fine tuning, if required,

.2 Witness “deferred” commissioning tests,
.3 Review and certify “deferred” systems test results,
.4 Incorporate deferred system test results and all other commissioning documentation into a final commissioning report with an executive summary recommending final acceptance.

.6 During the Evaluation Phase:
.1 Provide advice and recommendations during the final evaluation phase,
.2 Provide debriefing report on Commissioning outlining the process, major activities, and lessons learned from this project,
.3 Finalize the Design Intent Report and Client / Users O&M Manual to reflect as-commissioned operation and maintenance of each system,
.4 Provide Training summary and participate in training sessions,
.5 Provide List of Spare Parts,
.6 Provide Certified and dated PV results.

2.5 PRE-DESIGN SERVICE

2.5.1 GENERAL

.1 The Consultant Team will:
.1 Review and analyse all available project information, consult with the Departmental Representative and deliver a comprehensive Pre-Design Report;
.2 Confirm the scope of work defined in the Work Item Table included in Appendix A of this TOR.

.2 The Pre-Design Report will consolidate the Scope of the design and will be utilized as the benchmark project control document to monitor progress of the project.

2.5.2 SCOPE AND ACTIVITIES

.1 The Consultant shall:
.1 Conduct an Analysis of existing conditions and previous studies.
.1 Analyse scope, budget, schedule and risk and identify any conflicts;
.2 Analyse project requirements and identify any additional work, indicating the impact on project scope, schedule and costs;
.1 Review and confirm functional requirements with the User Department based upon the reports in the Appendices of this TOR.
.3 Identify options, associated costs paybacks where applicable.
.4 Visit the project site, analyze site conditions, document any conditions that will impact project delivery and design, and report the results to the Departmental Representative;
.5 Visit the site and determine the detailed as-built information as required in order to complete the design;
.6 Review and acknowledge all existing reports and documents relating to this project and compare with actual site conditions;
.7 Analyse existing condition of all systems (architectural, mechanical, electrical) including each component.
.8 Confirm availability of all necessary pre-design information;
.1 Verify that all information is correct and notify Departmental Representative about any missing information.
.9 Establish the preliminary sustainability targets for the water and energy use, waste reduction etc.;

.10 Identify Authority Having Jurisdiction and the applicable codes, regulations and standards;

.11 Develop a preliminary Building Code Analysis based on the applicable codes, regulations and standards;

.1 Applicable Codes, Standards and Regulations,

.2 Compliance and non-compliance concerns,

.3 Strategy for dealing with non-compliant aspects of the work.

.12 Identify all additional information that will be required to deliver the project;

.2 Prepare a preliminary strategy that addresses the project objectives and resolves the issues outlined in the scope of work.

.3 Initiate the Commissioning process;

.1 Define the Commissioning Team (including roles and responsibilities) for all project phases,

.2 Review project objectives and functional requirements to outline a preliminary commissioning scope,

.3 Develop a draft Commissioning (Cx) Plan as per CSA Z320-11 to incorporate who, what, when, where and how and the Owner Project Requirement based upon the Functional Programming document and/or Owner requirements.

.4 Establish and develop a draft commissioning cost estimate for all component(s), system(s) and integrated system(s) within the context of each discipline.

2.5.3 DELIVERABLES

.1 The Consultant shall prepare and submit a Pre-Design Report encompassing the project scope, all related investigations and analyses, along with the specific deliverables noted below, for review and acceptance by the Departmental Representative:

.1 Refer to the GP&S Document for report content;

.2 Include necessary sections to document and present the items listed in the “Scope and Activities” section above;

.3 Preliminary commissioning approach or outline;

.4 A summary of key Owner Project Requirements (OPR), in priority sequence, for evaluation of the project success;

.5 A Basis of Design (BOD) report component which directly responds to the OPR, which records any and all assumptions being used to inform the design and which will form the basis on which to commission the building;

.6 Class D estimate;

.7 Include an updated milestone project schedule.

2.6 SCHEMATIC DESIGN SERVICE

2.6.1 GENERAL

.1 The Consultant Team will review and analyse all available project information, consult with the Departmental Representative and deliver a comprehensive Schematic Design Report.

2.6.2 SCOPE & ACTIVITIES

.1 For work items identified in Appendix A the Consultant shall:

.1 Prepare a minimum of three (3) viable options for each discipline to meet the functional and technical requirements for the project;

.1 Analyse and develop each option with regard to the project goals including cost and schedule for each design option,
.2 Develop each Design Option in sufficient detail to clearly indicate all key elements in the design.
.3 Assess each design option against project specific Objectives and Goals documented in the Pre-Design report.

.2 Review, validate and update the details of the Functional Program requirements, including space data sheets;
.3 Update the sustainable design strategy;
.4 Update the budget, schedule and risk analysis and identify any conflicts that will need to be addressed with respect to scope, quality, schedule, cost;
.1 Prepare a Class 'C' Cost Estimate for each option,
.2 Confirm that the work item remains within budget and on schedule and make any adjustments needed to stay within the construction budget and on schedule.

.2 Out of this process one option will be selected as the basis to proceed to Design Development:
.1 The Departmental Representative, in concert with others, shall select the preferred option to be further developed;
.2 Although the Consultant is required to identify a preferred option, the Departmental Representative reserves the right to select another option.

.3 Develop a draft Basis of Design document to describe the selected option as per CSA Z320-11including and are not limited to:
.1 Illustrate the general form, scale, and relationship of the major project component(s), system(s) type of construction proposed and the building systems and equipment impacted and/or recommended in support of the design options;
.2 Illustrate a general description of the work indicating the major systems and/or material choices for the design options;
.3 Demonstration that design options satisfy the OPR.

.4 Update all Cx documents.

2.6.3 DELIVERABLES

.1 The Consultant shall prepare and submit the Schematic Design Report for review and acceptance by the Departmental Representative and include:
.1 Report content as per the GP&S document;
.2 Necessary information to document and present the items listed in the "Scope and Activities" section above;
.3 Class C estimates;
.4 Recommendations for 'best' option complete with the related Basis of Design and any assumptions contained therein;
.5 Updated Owner Project Requirements (OPR), goals and objectives including updated preliminary Cx Plan and Cx Cost Estimate.

2.7 DESIGN DEVELOPMENT SERVICE

2.7.1 GENERAL

.1 For the work items identified in Appendix A requiring a schematic design submission, further develop the option selected for refinement at the completion of Schematic Design.
.1 For all other work items, proceed directly to Design Development.

.2 Prepare the Design Development documents, which consist of drawings and other documents to describe the scope, quality and cost of the project in sufficient detail to facilitate design approval, confirm code compliance and obtain authorization to prepare the construction documents.

2.7.2 SCOPE AND ACTIVITIES

.1 For the work items identified in Appendix A requiring the development of Schematic Design options the Consultant shall:

.1 Coordinate the work of various disciplines, including scope changes required to remain within budget;

.2 Further develop the selected schematic design option and expand the intent for each design discipline to complete the Design for this project;

.3 Finalize the selected design option in an integrated manner to ensure that all major components have been considered in a collaborative environment and that the design continues to support the project specific Objectives and Goals documented in the approved Pre-Design report;

.4 Present / submit the design for review and approval to review groups and authorities having jurisdiction as required;

.5 Update the schedule, the risk analysis and identify any conflicts that will need to be addressed with respect to scope, quality, schedule and cost;

.1 Prepare a class B cost estimate,

.2 Confirm that the work item remains within budget and on schedule and make any adjustments needed to stay within the budget and on schedule.

.6 Continue to review all applicable statutes, regulations and by-laws in relation to the design of the project and conduct a detailed code analysis to demonstrate compliance;

.1 If there are non-compliance issues, develop alternative solutions to support the design and submit for approval to the local AHJ.

.7 Analyse the constructability of the project and advise on the construction phasing process and duration;

.8 Develop outline specifications for all systems, principle components and equipment, including manufacturers literature;

.9 Provide a written response to the PWGSC Schematic Design Quality Assurance (QA) review;

.10 Provide a waste diversion assessment of the waste materials from the project site in a spreadsheet format;

.1 This shall be incorporated into the Construction/Demolition Waste Management and Disposal NMS specifications.

.11 Update Basis of Design (BOD) document and Owner Project Requirements (OPR);

.12 Coordinate a multi-disciplinary approach to sustainability, building design and commissioning;

.13 Commissioning;

.1 Identify and provide a system components list to be commissioned,

.2 Commissioning issues logs and tracking logs specific to the project,

.3 Develop pre-functional and functional verification and test forms specific to each component(s), system(s) and integrated system(s) as per CSA Z320-11,

.4 Develop draft Commissioning project Risks and Cost Estimate,

.5 Prepare outline draft Commissioning construction documents.

2.7.3 DELIVERABLES

.1 The Consultant shall prepare and submit the Design Development Report for review and acceptance by the Departmental Representative and include:
- .1 Report content as per the GP&S document;
- .2 Information necessary to document and present the items listed in the “Scope and Activities” section above;
- .3 Building Code Analysis Report and Alternative Solutions Report (if relevant);
- .4 Include a more detailed and updated Basis of Design, with an analysis that confirms the adequacy of the developed design solution for each key project requirement, goal and objective;
- .5 An updated milestone project schedule including allowances for reviews and approvals for each stage of the project life cycle;
- .6 An updated risk analysis including deviations that may affect cost or schedule;
  - .1 Recommend corrective measures.
- .7 An updated project log tracking approved major decisions;
- .8 Preliminary estimated distribution loads, preliminary electrical systems layouts, preliminary panel locations, and a preliminary single line diagram;
- .9 Class B estimate;
- .10 Commissioning;
  - .1 Approved Owner Project Requirements (OPR) and Basis of Design documentation,
  - .2 Commissioning Plan,
  - .3 Updated Cx issues log and tracking log for each discipline,
  - .4 Include a Cx cost breakout for each discipline in the cost estimate,
  - .5 Include commissioning specifications in the outline specifications,
  - .6 Include Cx schedule in the milestone project schedule.

2.8 CONSTRUCTION DOCUMENTS SERVICE

2.8.1 GENERAL

.1 The objective of this stage is to translate the Design Development phase into construction drawings and specifications for the purpose of tendering.

.2 The Consultant must obtain written authorization from the Departmental Representative before proceeding with Construction Documents.

.3 Prepare tender packages co-ordinated with all disciplines.

2.8.2 SCOPE AND ACTIVITIES

.1 Create construction documents in accordance with the GP&S document.

.2 Update the cost estimates:
- .1 Provide a cost breakdown by unit rate and/or trade for review of bids and comparison with the successful Contractor's cost breakdown;
- .2 Provide a Commissioning cost estimate breakdown by discipline;
- .3 Provide cost breakdown to correspond to work items identified in Appendix A.

.3 Update the project schedule.

.4 Establish a quality control process for the construction and contract administration stage.

.5 The Consultant shall:

.1 Design according to the budget and schedule;
  .1 Confirm that work items remain within budget and on schedule and make any adjustments needed to stay within the budget and on schedule.
.2 Coordinate the work of various disciplines including scope changes required to remain within budget;
.3 In consultation with the Departmental Representative approve construction materials, processes and specifications considering sustainability and commissioning;
.4 Apply a process of continuing cost control with increasing level of detail during production of contract/construction documents;
  .1 At each review prepare an up-to-date estimate demonstrating compliance with the Construction Cost Plan,
.5 Continue to review all applicable statutes, codes, regulations and by-laws in relation to the design of the project and revise the building code analysis accordingly;
.6 Advise the Departmental Representative and resolve issues other governmental authority officials raise, and adjust Construction Documents as required;
.7 Provide written responses to PWGSC comments at 50% and 99% completion review stages prior to the next submission and integrate comments into final construction documents;
.8 Participate in the risk management process;
.9 Update project log tracking approved major decisions;
.10 Provide commissioning forms and check lists specific to each component(s), system(s) and integrated system(s) including and are not limited to;
  .1 Cx Issues Log, Cx sequence of event, Cx tracking log, Cx system components check list, Cx meeting minutes and Cx verification event matrix and responses,
  .2 Installation verification, pre functional and functional performance verification and test,
  .3 Name plate data,
  .4 First test or retest following correction of an issue,
  .5 Identification of the component(s), system(s) and integrated system(s) under test including location and construction document designation,
  .6 Expected design performance parameters and responses,
  .7 Observed performance including indication of whether or not this performance is acceptable and/or deviation from design set point and qualify,
  .8 Design Engineer of Record date and signatures along with those performing and witnessing the test,
.11 Update and incorporate Cx Plan, Cx forms and training requirements into Cx construction document within the context of Division 01.

2.8.3 DELIVERABLES

.1 Include items listed in the “Scope and Activities” section above the PWGSC GP&S document and items listed below.
.2 Updated report at each submission noting any deviations from earlier Basis of Design submissions and, as necessary, reconfirming key Owner Project Requirements, goals and objectives, along with:
  .1 An updated estimate demonstrating compliance with the Construction Cost Plan;

.2 An updated project log, tracking approved major decisions;

.3 50% complete Construction Documents:

.1 Updated class “B” estimate;

.2 Updated OPR and BOD documents;

.3 Updated project schedule;

.4 Construction Drawings;

.1 Drawings should reflect 50% completeness with all planned and required drawings / sheets shown.

.5 Specifications;

.1 Index to specifications (identifying all sections to be used for the project),

.2 Draft Division 01 including draft commissioning sections,

.3 Draft mechanical and electrical specification sections,

.4 Updated Commissioning document,

.1 Cx Building Envelope,

.2 Cx cost estimate,

.3 Cx risk and complexity assessment,

.4 Draft Cx Construction Document specification Division 01.

.4 99% complete Construction Documents (fully coordinated as if ready for tender):

.1 This submission incorporates all revisions required by the review of the previous submission and a written response for the PWGSC 50% QA review;

.2 The Consultant shall submit documents to the Departmental Representative, local municipality, or any other Authority having jurisdiction;

.3 An updated project schedule;

.4 Construction Drawings;

.1 Drawings should reflect 99% completeness as a complete design without any incomplete drawings (as if ready for tendering).

.5 Specifications complete with all sections and thoroughly coordinated with the drawings:

.1 Component, System and assembly requirement(s) including;

.1 Close Loop System Verification,

.2 Close Loop Integration System Verification.

.6 Updated Commissioning Plan;

.1 Updated Cx issues and resolution log.

.5 Final (100%) Construction Documents ready for tendering:

.1 This submission incorporates all revisions required by the review of the previous submission an a written response for the PWGSC 99% QA review;

.2 Advise the Departmental Representative of all issues raised by other officials;

.3 The submittal shall include;

.1 Signed and sealed documents:

.1 3 – hard copies;

.2 1 – electronic copy in PDF format.

.2 An updated project schedule,

.3 Construction Drawings & Specifications as per the GP&S document.

.4 An updated Commissioning Plan;

.1 Updated Cx issues and resolution log.

.5 Commissioning;
.1 Updated draft from previous 99% submission to the 100% completion submission.

.4 The Consultant must confirm in writing that;
.1 The documents are ready to be issued for tender,
.2 The checklist in the GP&S Document has been reviewed in concert with the requirements of the Consultant Agreement and
.3 A full review and coordination of the Contract Documents are complete and in accordance with professional standard of care.

2.9 CONTRACT PROCUREMENT SERVICE

2.9.1 GENERAL

.1 The Consultant shall:
.1 For Tender call, Bid Evaluation and Construction Contract award services;
.1 Assist the Construction Manager with the preparation of the General Requirements (Divisions 01) of the specifications,
.2 Provide the Construction Manager with information required by bidders to interpret construction documents,
.3 Prepare explanations, and addenda in response to all questions within two (2) business days during the bidding period and submit to Construction Manager,
.4 If the Construction Manager decides to re-tender the project, or any specific tender package, provide full services to the Departmental Representative,
.5 Submit to the Departmental Representative, one reproducible and one electronic copy of the complete tender documents including addenda for all tender packages,
.1 Indicate “Issued for Construction” on the documents, along with the date.
.2 For Cost services:
.1 During the tender period, report on cost impacts of addenda,
.1 Incorporate the results into the final pre-tender estimate (both elemental and trade versions), prior to receipt of bids.
.2 During Bid Review and Analysis, assist the Departmental Representative, as required, by analyzing and reconciling any differences between pre-tender estimates and submitted bids,
.3 During negotiation, provide cost information as needed for bid negotiation and enter into the negotiations if requested,
.4 Reconcile, if necessary, both the elemental and trade estimates, in detail, with the agreed contract sum,
.1 These estimates will be used by the Construction Team during the construction phase.

2.10 CONSTRUCTION SUPPORT SERVICE

2.10.1 SCOPE AND ACTIVITIES

.1 The Consultant shall:
.1 Authorize special tests, inspections and minor works that do not impact project cost and schedule;
.1 Provide the Departmental Representative with all material specifications, mixes and test results for future maintenance by PWGSC and NRCan.

.2 Review shop drawings and provide electronic copies to the Departmental Representative;

.3 Provide an updated project schedule, based on Contractor's submissions and on-site performance;

.4 For Contract Administration Services;

.1 Provide monthly work progress reports and project cost reports,

.2 Interpret contract documents as required and provide any additional drawings or specifications required to clarify, interpret or supplement Construction Documents,

.3 Furnish supplemental instructions to the Contractor with reasonable promptness or in accordance with a schedule for such instructions agreed to by PWGSC and the Contractor,

.4 Review and comment on various documents such as Contractor's Progress Claims and updated schedules,

.5 Offer timely technical advice time on all disputes and claims between PWGSC and the Contractor,

.6 Determine the amounts owing to the Contractor based on work progress, and certify payments to the Contractor and

.7 Provide Certificate of Substantial Completion.

.5 For Site Services;

.1 Monitor performance of the Contractor and review work at regular intervals to determine conformity with the contract documents and keep Departmental Representative informed of work progress,

.2 Prepare site instructions to be issued by the Departmental Representative,

.3 Conduct site inspections and reject unsatisfactory work,

.1 Provide written reports on all site visits.

.6 For Changes to the work;

.1 Prepare Contemplated Change Notices and Change Orders, to be issued by the Construction Manager.

.7 For Cost Estimating Services;

.1 Evaluate change orders; claims, work completed and cash flow.

.2 After issue of contract provide details for evaluating the project's cost performance.

.8 For Scheduling Services;

.1 Review Construction Manager's Monthly Report and report findings and recommendations to PWGSC for further discussion with the Contractor.

2.11 POST CONSTRUCTION SERVICE

2.11.1 PROJECT CLOSE-OUT SERVICES

.1 Before handing over the project to PWGSC, the Consultant shall:

.1 Revise documentation to reflect all changes, revisions and adjustments after completion of commissioning,

.1 Prepare record drawings and specifications based on Contractor's as-builts.

.2 Prepare and submit deficiency report, coordinate deficiency rectification inspections with Departmental Representative and Construction Manager. Include a minimum of two (2) site visits to confirm completion of deficient items.

.3 Prepare and submit Final Certificate of Completion, Post-occupancy inspection report and final records Project Plan.

2.11.2 PROJECT EVALUATION SERVICES

.1 The Consultant shall:

.1 Participate in Lessons Learned workshops if requested.

.2 Develop an occupant's comments/complaints audit system to track problems that may occur after occupancy.

.3 Prepare and submit an integrated Commissioning, Operation and Evaluation Report to the Departmental Representative.

2.11.3 WARRANTY SERVICES

.1 The Consultant shall:

.1 Monitor and certify rectification of deficiencies before expiry of warranties.

.2 Monitor environmental and life safety system checks to be carried out by Contractor/O&M staff before expiration of warranties.

.3 Participate in warranty inspections with Departmental Representative and Contractor.

.4 Provide warranty deficiency list.

.5 Provide Final Warranty Review report.

3 PROJECT ADMINISTRATION

3.1 GENERAL REQUIREMENTS

3.1.1 PWGSC PROCEDURES AND STANDARDS

.1 The consultant shall comply with the amendments and/or additions in this section in addition to adhering to the requirements contained in the GP&S section 3 (Project Administration).

3.1.2 MEETINGS

.1 Bi-weekly meetings to be conducted at the NRCan Geological Survey of Canada building at 3303 – 33 Street NW, Calgary, Alberta, unless otherwise agreed to by the Departmental Representative.

3.1.3 TECHNICAL AND FUNCTIONAL REVIEWS

.1 The role of the federal HRSDC fire commissioner no longer exists and has been replaced by the Client Department Fire Protection Coordinator where applicable. Fire protection, health and life safety reviews will be undertaken by the PWGSC Fire Protection Coordinator (DFPC) who is now part of the PWGSC Quality Assurance review team.

4 APPENDIX A

4.1 WORK ITEM TABLE

Item	Project Name & Rm No.	High Level Description (Re: Rm Data Sheets)	Current Use	New Use	Major Reno / High Priority	Major Reno / Medium Priority	Minor Reno	Area (m^2)
2.18	**Trace organics - Clean Lab (37)**	Objective: To revamp space to be a Clean Lab space for the inspection of trace Organics. Special Construction: - Room must be in postive pressure - Room must be sealed and clean - Minimize particulate through stainless steel fixturing - HVAC with Heppa Filters - SS fumehood, SS lab benches, and a labware washer.		Trace Organics Lab		X		15
2.19	**Rock Cutting / Crushing Lab (32)**	Objective: To renovate space to include improve the lighting and ventilation. Special Construction: - Improve ventilation. Space is very dust and ventilation needs major upgrades. - Space is very dimly lit and needs to be upgraded - General minor updates to the room (painting and floors) - New lab bench and 1 sink.	Crushing and sawing large sample rocks	Same as Current		X		25.8
2.20	**Trace Metals Lab (34)**	Objective: To revamp space to be a trace metals clean lab for the inspection of metals. Special Construction: - Room must contain as little metal as possible. - Non-metalic fumehood (or coated) - Eye wash station and shower required. - Room needs to be sealed. - Lab benches with epoxy tops (non-metal)		Trace Metals Inspection lab		X		22.1
2.21	**Project Rms (130-131)**	Objective: to renovate space as general plotter / scanning room. Special Construction: - Smart board connectivity - Vinyl tile flooring - Smartboard control from meeting table		Project Rooms		X		45.4
2.22	**IT Lab (264-275) IT Lab**	Objective: To repurpose space to an open office space. Special Construction: - Priority is to update the HVAC zone controls for entire area (Mech Scope). Turn 270 into open workstation area (Arch Scope).		Open Office		X	X	186
2.23	**Project Rms (227 & 228)**	Objective: to renovate space to expand these into one large project room (3 total), repaint, vinyl tile floor, and refit as a modern room (SMART Board connectivity etc). Special Construction: - Smart board connectivity - Vinyl tile flooring - Smartboard control from meeting table				X		67
2.24	**Project Rms (230-232)**	Objective: to renovate space to expand these into one large project room (3 total), repaint, vinyl tile floor, and refit as a modern room (SMART Board connectivity etc). Special Construction: - Smart board connectivity - Vinyl tile flooring - Smartboard control from meeting table				X		45.8

Item	Project Name & Rm No.	High Level Description (Re: Rm Data Sheets)	Current Use	New Use	Major Reno / High Priority	Major Reno / Medium Priority	Minor Reno	Area (m^2)
2.25	**General Workstation Area (234, 235, 236)**	Function (and some equipment) to be relocated to 2226-2229. This space to be re-purposed as open work station area.			X			78.7
2.26	**Relocated Conodont & Foram Lab 2226-2229 (from 234,235,236)**	Objective: To Relocate labs 234-236 to 2226-2229. Complete modernization of lab. Special Construction Notes: - Room needs to run 24/7 under negative pressure with detection capability - Emergency Showers required with floor drain - provisions to install 4 fumehoods and one more for storage of samples - Upgraded lighting required - New lab benchs with sinks required	Conodont Lab Micropalaentology	Large Wet and Dry Lab	X			79
2.27	**Paleo Microscope Lab (2224 - 2225)**	Objective: to modernize and expand space for a larger clean microscope lab. Special Construction: - Room must be as clean as possible and sealed. - Room must be "vibration" free - Workstations need to have have provisions to mitigate vibration. - Storage containers in space.	Computer Lab	Microscope Lab		X		46.2
2.28	**Wet / Dry Labs (2223)**	Objective: to provide a room that needs to be clean, sealed and under positive pressure. No metal is allowed in the room.				X		22.8
2.29	**Lapidary Lab (216, 217, 218)**	Objective: To modernize and expand and combine the lapidary lab into one space into 215-218. Special Construction Notes: - Ventilation required for rock saw cutters - Emergency Showers required with added drains - Upgarded lighting - Provisions for 3 fumehoods - New lab benches with sinks required. - Polished concrete with epoxy	Paleontology Lab/Project Copier/220 lab/224 lab	Large Lapidary Lab	X			75.1
2.30	**Lapidary Microscope Lab (225) Expansion to 224.**	Objective: to modernize and expand space for a larger clean microscope lab. Special Construction: - Room must be as clean as possible and sealed. - Room must be "vibration" free - Workstations need to have have provisions to mitigate vibration. - Storage containers in space.	224-225	Microscope Lab		X		45.7
2.31	**Offices 237,238,240,241,243,244**	Objective: Refresh the room. Clean surfaces. Patch and repair as required.					X	121.3
2.32	**Offices 2218,2219,2220,2221,2222 and 2203,2206**	Objective: Refresh the room. Clean surfaces. Patch and repair as required.					X	140.4
2.33	**Macro Paleo Prep Lab 2212**	Obejective: New fumehood required.						30
2.34	**Paly Lab 2213-2214**	Objective: Provide ventiliation for tabletop fumehood and drains for emergency shower.	Palynology	Same as Current		X		51.1
2.35	**Microwave Room (from 218 to 220)**	Objective: Provide a typical kitchenette area.	Lab 'R. Thorsteinsson'	Microwave Lab		X		37.8

Item	Project Name & Rm No.	High Level Description (Re: Rm Data Sheets)	Current Use	New Use	Major Reno / High Priority	Major Reno / Medium Priority	Minor Reno	Area (m^2)
2.36	**Inorganic Microscope Lab 1115**	Objective: Reduce or eliminate vibration and dust. Provide negative environment.	Microscope Room	Same as Current		X		53.4
2.37	**Enviro Lab 1 (116 - 118)**	Objective: Refresh and repair, as required. New flooring and repair or replace damaged countertops and provide air cooling.	Geochemistry Analysis	Same as Current		X		61.9
2.38	**Enviro Lab 2 (132-134)**	Objective: Refresh and repair, as required. New flooring and repair or replace damaged countertops and provide air cooling.	Geochemistry Analysis	Same as Current		X		100.8
2.39	**Mass Spec Lab (1129 - 1130)**	Objective: To reduce noise emitting from machines and provide temperature control.	Chemical compound analysis.	Same as Current			X	45.6
2.40	**Rock Prep / Grinding Lab (33)**	Objective: Improve wash stations and large benches. Improve noisy environment. Provide appropriate flooring as required.	"Coal Cutting"	Rock prep and grinding		X		23
2.41	**Mass Spec Lab with UPS (1127-1128)**	Objective: To reduce noise emitting from machines. Note: that UPS is housed in this room	Chemical compound analysis.	Same as Current			X	43.4
								1,463

Component Description /Component ID	Excerpts from 2007 Building Condition Report	Work Objectives	Constraints/Coments
HVAC-Central Station AHU TT04-000095 TT04-000097 TT04-000098	The building is served by 7 main indoor central station air handling units. Air handling unit AS-1 serves the administrative area of the original building. This unit was originally a constant volume CB and F built-up unit. The unit was updated in 1985 with a variable speed drive and a replacement cooling coil. AS2 and AS3 are also CB and F built-up units. These units serve the laboratory areas of the original building. These dual duct units were converted to VAV in 1995 as part of an energy efficiency upgrade. Lab pressurization in maintained through air handling unit air volume modulation in conjunction with the fume hood sash controls. The AS3 blower wheel coating is coming off. Remedial repairs are required. AS4 is an Engineered Air packaged unit. This unit serves the original Lab building perimeter induction system. AS5 is also an Engineered Air packaged unit. This unit serves the cafeteria area of the original building. Central station air handling units AS1, AS2 and AS3 were installed as part of the 1967 original building construction and will have had a 45 year service life at the time of replacement. These units have theoretically reached the end of their original anticipated service lives, however are considered to be in fair condition due to the unit upgrading which occurred in 1985. These units will require replacement in 5 years. Anticipated replacement date 2012. The (2) 1972 Recold units serving the main laboratory and library areas are considered to be in fair condition and will require replacement in 2012, following a service life of 40 years. AS4 and AS5 were installed in 1985 and are in good condition. These units will require replacement in 2025, following a service life of 40 years. Central Station AHU Description Continued: The 1972 laboratory/office block is served by (2) built-up Recold units. This dual duct unit provides variable air volume supply. The above units are provided with filtration, a chilled water cooling coil and glycol heating coils. All units operate in conjunction with an associated return fan. The Library wing is served by a Recold built-up air handling unit. This unit operates in conjunction with a Trane DX water cooled condensing unit and a hot water heating coil. This is a curable component of average quality.	Replace 2 Recold units (1972). Replace Central AHU (1967) AS1, AS2, AS3. Air handlers are original and should be replaced or re-built to meet current codes, standards and client functional requirements.	Confirm that Recold units need replacement. AS1, AS2 and AS3 block access to AS4, AS5 for future change. Provide options at Pre-Design including considering adjacent spaces for new AS1, AS2, AS3, adjacent spaces for future AS4, AS5, and other relevant options.
HVAC- Terminal Units TT04-000108 TT04-000109 TT04-000110	Cast iron perimeter hot water radiation is provided throughout the original building. Commercial grade perimeter radiation and cabinet heaters are provided throughout the 1972 portion of the building. Induction units served from AS-4 provide heating and cooling to the perimeter offices of the original building. As part of the 1994 retro-fit, E H Price System 75 VAV boxes were installed to provide modulating air supply to the 1972 portion of the building. These units replaced the original Buensold terminal boxes. Cabinet heaters and force flow units are provided at the building entrances. Hot water unit heaters are provided in service areas and mechanical rooms. The 1985 addition is provided with natural gas fired unit heaters. This is a curable component of average quality. The terminal heating units (Qty 80) and terminal induction units (Qty 140), which are about 40 years old are in fair condition, based upon age. The heating terminal units were not operating at the time of this review. Anticipated replacement of the units in the 1967 building in 2017. Anticipated replacement of the units in the 1972 building in 2022. The natural gas fired unit heaters in the 1985 building (Qty 50) (with a service life of 35 years) are in good condition and will require replacement in 2020. The fume hood controllers and VAV controllers are in good condition. The fume hood controllers are approximately 13 years old, replacement will not be required under the scope of this report.	Replace 1967 heating and induction terminal units to meet codes, standards and client functional requirements.	Make recommendation on 1972 units.
HVAC- Controls, Electrical or Pneumatic TT04-000114 TT04-000115	The original building heating controls were pneumatic. These controls have since been upgraded to Johnson Metasys direct digital control (DDC) while maintaining pneumatic actuation. This is a curable component of average quality. The pneumatic control system (100 pt) (1967) appears to be in fair condition, however, the original pneumatic heating system controls were not active during this review. The pneumatic controls system will require replacement and upgrading on a regular basis. Allow for pneumatic replacement/upgradeof 1/3 of the system in 5 years and the every 10 years following. The Johnson Metasys direct digital control system was installed in 1998 and is in good condition. The DDC system (1998) (300 pt) will require upgrading in 2028. Control panels - Upgrade to automation system	Upgrade to automated building control system.	Includes replacement on remaining components of pneumatic controls sytem.
HVAC- Ventilation Fans TT04-000099 TT04-000100	The building is provided with numerous exhaust and ventilation fans. The 1985 warehouse and catalog centre, as well as the garage boiler room portions of the building are typically served by aluminum type centrifugal exhaust fans (approximately 28). The majority of these fans provide sanitary and general exhaust to the building. The penthouse fan lofts house the individual exhaust fans for the building labs. These fans are primarily of high commercial grade, the majority being Chicago Blower model AB. There are approximately 30 lab exhaust fans. These fans were fitted with variable speed drives as part of a energy efficiency upgrade. This is a curable component of average quality. The general exhaust fans (1988 - Quantity 28 approx.) are in fair to average condition. These fans are approximately 22 years old and will be scheduled for replacement in 2013. The lab exhaust fans (1993 - Quantity 30 approx.) are in average condition, based upon age and service life. Repairs/replacement of motors and bearings is completed on an as required basis. The majority of these fans are approximately 14 years old. Replacement should be scheduled in 2018.	Replace lab hood exhaust fans to meet current codes, standards and client functional requirements.	Take into account relocation of labs, and new fume hoods in design of new exhaust units. Check age of fans. CBR date of 1993 may be based on change to variable speed drive, or may be a typo.

Component Description /Component ID	Excerpts from 2007 Building Condition Report	Work Objectives	Constraints/Coments
HVAC- Ventilation Fans TT04-000099 TT04-000100	The building is provided with numerous exhaust and ventilation fans. The 1985 warehouse and catalog centre, as well as the garage boiler room portions of the building are typically served by aluminum type centrifugal exhaust fans (approximately 28). The majority of these fans provide sanitary and general exhaust to the building. The penthouse fan lofts house the individual exhaust fans for the building labs. These fans are primarily of high commercial grade, the majority being Chicago Blower model AB. There are approximately 30 lab exhaust fans. These fans were fitted with variable speed drives as part of a energy efficiency upgrade. This is a curable component of average quality. The general exhaust fans (1988 - Quantity 28 approx.) are in fair to average condition. These fans are approximately 22 years old and will be scheduled for replacement in 2013. The lab exhaust fans (1993 - Quantity 30 approx.) are in average condition, based upon age and service life. Repairs/replacement of motors and bearings is completed on an as required basis. The majority of these fans are approximately 14 years old. Replacement should be scheduled in 2018.	Replace exhaust and general ventilation fans to suit current space use, and to meet current codes, standards and client functional requirements.	
Plumbing- Water Treatment Systems TT04-000161	New unit has been purchased, however, funds are necessary to remove and dispose of existing system and install new system. Current system is near breakdown.	Install owner supplied water softener system.	Unit purchased approx. 8 years ago. Confirm unit is appropriate for the application and make recommendation.
Electrical - General		1. Examine the existing power capacity, grounding, and condition of each component from the breaker up to the final connection, wiring, conduits, and junction boxes. 2. Identify the Code deficiencies and propose solutions. 3. Investigate the electrical design solutions for systems, controls, and wiring. 4. Provide the appropriate electrical design solutions, controls, and wiring; 5. Provide coordination study including short circuit study and Arc flash study signed and sealed by a professional engineer confirming all components are fully coordinated;	
Electrical- Distribution Panels TT04-000139 TT04-000140	Branch panels are located throughout the building are located in the Labs in the Service corridor at the rear of the Labs on each floor, and the Panels are fed via Transformers supplied from switches connected to the Lo - Impedance plugin busduct. The typical feeder to each panel is 100 amps with the few at 225 Amps to suit the specific load. 1967 Panels (Qty 99) 1972 Panels (Qty 50). This is a curable component of above average quality. The (1967) panels (Qty 99) are well maintained, functioning as designed, and they are in fair condition based upon age. Anticipated replacement in 2017. The (1972) panels (Qty 50) are well maintained, functioning as designed and are in average condition based upon age. Anticipated replacement in 2022.	Replace 1967 distribution panels. Equipment is obsolete. Cannot source replacement parts.	See Work Summary for Electrical - General.
Electrical- Secondary Transformers TT04-000134 TT04-000135	(1967) Original Building Circa 1967 - Secondary Transformers 600 - 120/208V of various sizes and capacities are located throughout the building and supply local panels for various uses from local office power to Specific lab panel power. This is a curable component of above average quality. (1972) Building addition Circa 1972 - Secondary Transformers 600 - 120/208V of various sizes and capacities are located throughout the building and supply local panels for various uses from local office power to Specific lab panel power. This is a curable component of average quality. The 1967 equipment (Qty 30) is well maintained and functioning as designed. The condition of the equipment is fair based on age and revised/extended service life of 45 years. Anticipated replacement in 2012. The 1972 equipment (Qty 25) is well maintained and functioning as designed. The condition of the equipment is fair, based upon a typical service life of 30 years. Anticipated replacement in 2017.	Replace 1967 and 1972 secondary transformers 600 - 120/208V. Equipment is obsolete. Cannot source replacement parts.	See Work Summary for Electrical - General.

Component Description /Component ID	Excerpts from 2007 Building Condition Report	Work Objectives	Constraints/Coments
Electrical- Secondary Switchgear TT04-000128 TT04-000130	(1967) CDP-2 which is the original building distribution switchboard installed in 1967 is rated 1000 amps - 347/600 volt is located in the same room as CDP-2. Loads supplied from CDP-2 are Protected with fixed mounted Moulded Case Circuit breakers loads supplied are as follows : Bus Duct Feeder - 600 amps; West wing MCC - 400 amps; Boiler room MCC Rm 193; Panel D 347/600; Mechanical Room PDC - 225 amp; PUBS Basement - 150 amp; Kitchen - 100 amp; Room 194 PDC - 70 amp; Panel H - 100 amp; Parking Lot lighting - 40 amp; Exhaust Carpenter Shop - 20 amp; Breaker mounted on the side of the Switchboard for Power factor correction Capacitors. (1992) The 1600 Amp 600 / 347 Volt Secondary Switchgear identified as CDP-1 is located in the main Electrical room on the ground floor East side of the building adjacent to the Boiler room. This Switchboard contains a 1600 Amp Fixed mounted moulded case breaker with LSIG trip unit set at 1500 amps. The 1992 equipment is well maintained and functioning as designed. The condition of the equipment is good condition based on age. Anticipated replacement in 2037. The 1967 equipment is in fair condition, based upon age and revised service life. It is well maintained and functioning as designed. Anticipated replacement in 2012. Secondary Switchgear Description Continued: This switchboard was installed in 1992 as part of the Transformer vault replacement, and it feeds the original building Switchboard identified as CDP-2 with a 1200/1000 amp Fixed mounted Moulded case circuit breaker. The only other load supplied from CDP-1 is normal feeder breaker for the Generator manual transfer switch, this Breaker is a 100 amp 3 pole moulded case breaker. This is a curable component of above average quality.	Replace 1967 secondary switchgear. Equipment is obsolete. Cannot source replacement parts.	See Work Summary for Electrical - General.

5 APPENDIX B

5.1 GSCC HVAC AND SPACE OPTIMIZATION STUDY – MAY 2013

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

Canada

Respect ◆ Integrity ◆ Excellence ◆ Leadership

Serving GOVERNMENT, Serving CANADIANS.

HVAC and Space Optimization Study

Geological Survey of Canada - Calgary

For:
Natural Resources Canada
3303 – 33 Street NW
Calgary, Alberta

May 16, 2013 (revised)

www.pwgsc-tpsgc.gc.ca

TABLE OF CONTENTS:

1 INTRODUCTION

1.1 BACKGROUND

1.1.1 NATURAL RESOURCES CANADA (NRCAN)

.1 The facility focus of this study is the Geological Survey of Canada (GSC) Building located at 3303 – 33 Street NW, Calgary, Alberta.

1.2 PROJECT DESCRIPTION

1.2.1 PROJECT REQUIREMENTS

.1 As an outcome of NRCan study entitled "Energy, GHG and Cost Saving Opportunities During Unoccupied Hours, dated April 2012, PWGSC, A&ECoE was commissioned by NRCan to carry out a study to;

.1 Determine the consequences of shutting down AS-2 or AS-3 during after hours under the status quo scenario,

.2 Assess relocation of select laboratories from the East Lab Wing to the West Lab Wing with night shut down as an energy savings strategy, and

.3 Other energy savings strategies for the East and West Wing Labs to be determined as an outcome of this Study.

.4 This report is exclusive of the administration blocks, warehouse area and plant area of the facility.

.2 The HVAC and Space Optimization Study will contain an overall assessment, layout options and project costs with increased energy efficiency through the consolidation of all active laboratory spaces into the West wing as the primary goal.

.3 Provide Class 'D' cost estimates for each option, simple payback calculation and greenhouse gas emission savings calculations.

.4 Determine the architectural, mechanical and electrical feasibility of the proposed renovations and relocation of spaces prior to involvement of outside consultants;

.5 Define the functional program / scope of work for future use in the preparation of terms of reference to engage architectural and engineering consultants for the preparations of technical documents to renovate the East and West wings.

2 EXECUTIVE SUMMARY

.1 The objective of this study was to reduce energy costs by relocating the one remaining laboratory (requiring 24/7 air handling) in the East wing to the West wing thereby allowing the East wing air handling units to be shut down after regular working hours, and consider other energy efficiency options. The study revealed that the facility is doing well in terms of energy efficiency when the age of the facility is taken into consideration. However, the study revealed a number of operational issues that should be considered as part of a laboratory modernization initiative. Although a laboratory modernization would offer some energy improvements, the modernization cannot be justified by energy savings alone. Each option proposes increasing levels of potential energy savings as well as improvements to the laboratory and office working environments. A Class 'D' estimate is also provided for each option.

.2 Summary of the options investigated are as follows;

Energy Conservation Measure Options	Electric Energy Savings (MWhr)	Natural Gas Savings (GJ)	Annual Cost Savings ($)	Capital Costs ($)	Simple Payback (years)	Greenhouse Gas Reduction (tonnes CO_2)	Priority
1 – Shut Down Air System AS-3	2.3	866	$5,121	$12,000	2.3	45.05	High
2 – Relocate Lab and Shut Down AS-2 and AS-3	4.7	1804	$10,668	$222,700	20.9	93.85	Low
3 – Convert East Wing 2nd Floor to non-Lab	26.6	2868	$18,735	$3,211,000	171	165.83	Low
4 – Relocate all Lab Functions to West Wing	41.5	3954	$27,483	$9,086,000	330	232.84	Med
5 – Option 4 plus Heat Reclaim	6260	37,041	$43,929	$9,176,000	208	377.10	Med
6 – Reduce Lighting Levels in East & West Wings	50.8	-171.5	$5,406	$1,390,000	257	35.67	Low

.3 Options 4 and 5 are rated as Medium priorities since they cannot be justified by energy savings (i.e. simple payback), but they do offer the best laboratory modernization options. These options may be considered for future renewal of the building.

.4 Option 6 also cannot be justified through energy savings (i.e. simple payback) and may be considered instead for future renewal of the building.

.5 As a result of the investigation, there are a number of other system related issues that were discovered and should be corrected and are listed below. Refer to Parts 3.3 and 3.4 of this report for more detailed information. No energy or payback calculation was performed for these items as the energy impact would either be minimal or negative;

.1 Obsolescence of mechanical systems,

.1 Terminal boxes are of an old technology and the inner workings are suspect,

.2 Various piping systems are nearing end of life,

.3 Air handlers are original and should be replaced or re-built.

.2 HVAC systems should be re-balanced and re-commissioned,

.3 The existing discharge plumes from the fume hood exhausts are inadequate,

.4 Various fume hoods and canopies should be updated to current Standards,

.5 Obsolescence of electrical systems,

.1 Air circuit breakers are not reliable.

.2 Most of circuit breakers are obsolete.

.3 Original equipment is beyond or near their normal life expectancy.

.4 There is no emergency power for building.

.5 Sustainability was not fully addressed.

.6 Developments in LED lighting technology should be monitored. This technology will provide the next best opportunity for energy pay-back once the technology is proven.

3 DISCUSSION

3.1 ENERGY BILLING REVIEW

3.1.1 TABULATIONS

.1 Refer to summary of energy billings shown in table format in Appendix 'A'.

.2 Energy bill data is from May 2010 to end of calendar year 2012.

.3 Summary of average years shown are for latest year and not normalized for an average year.

.4 The blended rates include for delivery charges, riders and ratchets and are expressed in dollars per unit of consumption for purposes of simplification.

.5 The above assumption should give a reasonably accurate result since demand and delivery charges and riders will correlate some degree to consumption. Ratchet clauses will eventually be negated by time.

3.1.2 ELECTRICAL

.1 Based on the energy bill tabulations, electrical energy is estimated as;

.1 $0.125 $/kWh for peak hours 8 am to 9 pm.

.2 $0.0928 $/kWh for off peak hours

.2 Latest one year of consumption is 1307532 kWh at a cost of $166,206.

3.1.3 NATURAL GAS

.1 Based on the energy bill tabulations, natural gas energy is estimated as;

.1 5.67 $/GJ.

.2 Latest one year of consumption is 21,981 GJ at a cost of $90,177.

3.1.4 CARBON FOOTPRINT AND ENERGY CALCULATIONS

.1 Greenhouse gas emissions calculations in this report are based on the values contained in the "Federal Greenhouse Gas Tracking Protocol", version 3.1 dated November 2010 as published by PW&GSC. The document references the following values in the Appendices;

.1 1.903 kg CO2 eq/m3 for natural gas consumed at federal facilities in Canada.

.2 0.870 kg CO2 eq/kWh for electricity consumed at federal facilities in Alberta.

.3 1 m3 natural gas = .03826 GJ

.2 Energy savings calculations are based on the costs for energy consumption, demand and distribution costs blended into a single consumption rate, and averaged over the billing periods as shown in the summary table in Appendix A. Values used are as follows;

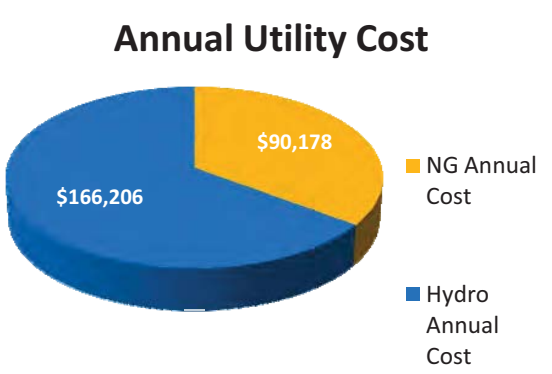
.1 $5.67/GJ for natural gas.

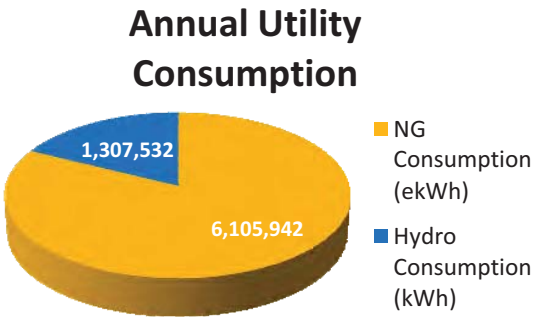
.2 $0.12554/kWh for electricity - on peak.

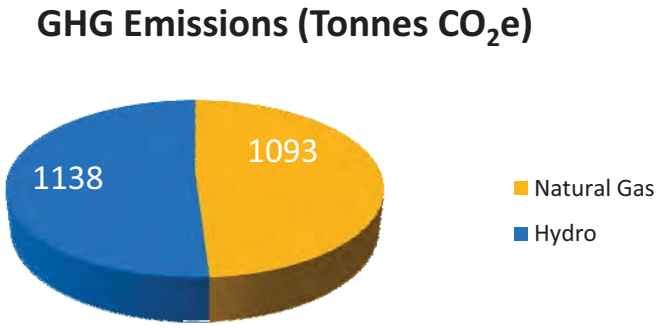
.3 $0.09284/kWh for electricity - off peak.

.3 Energy calculations in this report were prepared using RetScreen.

.4 Pie Chart depiction of the one year summaries are as follows;







3.1.5 BASELINE ENERGY

.1 National averages for energy intensity were obtained from the 2008 Commercial and Institutional Consumption of Energy Survey as published by NRCan. http://oee.nrcan.gc.ca/publications/statistics/cices08/factsheet/summary.cfm?attr=0

.2 The calculated floor area of the entire building excluding basement area is 13,980 m². Though it is not clearly stated in the NRCan Survey, basements have not been included in this report since basements seldom include the same occupancy as upper floors. This is done in order to not understate the energy intensity factor for this building.

.3 The calculated energy intensity for the whole building is 1.91 GJ/ m².

.4 Laboratory accounts for 4610 m².

.5 Core Storage area accounts for 5143 m².

.6 The remaining area is mostly office area and is 4227 m².

.7 Following table summarizes the calculation for average energy intensity accounting for building types;

Area Type	Survey Energy Intensity	Survey Building Type	Proportion of Building	Contribution
Core Storage	0.80 GJ/m²	Warehouse	37%	.296
Laboratory	2.68 GJ/m²	Hospital	33%	.884
Office	1.85 GJ/m²	Public Admin	30%	.555
			TOTAL	**1.735 GJ/m²**

.8 Though the calculated national average is 10% below the consumption intensity for the building, we need to consider that the NRCan publication had no data for laboratories. Hospital data was used as being most applicable, though we would expect a laboratory to consume more energy than a hospital. It therefore appears that the building as a whole consumes approximately the same amount of energy as a typical building of similar type would in Canada.

.9 The above base line comparison does not consider basement areas in the GSC facility. Therefore the result is somewhat conservative.

.10 Therefore considering the facility is more than 40 years old; the facility is doing remarkably well in terms of energy efficiency.

3.2 ARCHITECTURAL

3.2.1 GENERAL

.1 The architectural portion of this study (including the Class 'D' estimate) is included in energy efficiency Option 2 discussed later in this report (Section 4).

3.2.2 EXISTING

.1 Drawings are located in Appendix C.

.2 Both floors (and part of the basement level) of the Geological Survey building contain a mixture of laboratory and office space. The original design intent was to have offices located along the exterior wall with laboratories contained in the interior core of the building. Over time wet laboratory requirements have been reduced with the space being reused for offices, project / computer rooms, storage and laboratories not requiring direct / constant ventilation.

.3 Greater energy efficiency may be obtained by consolidating the "wet" laboratories (i.e. requiring constant and direct ventilation operating 24 hours per day, 7 days per week) into one Wing. With the exception of the Conodont Laboratory on level 2 in the East Wing, all wet laboratories are currently located on both levels in the West Wing.

.4 Conodont Laboratory (36 m2):

- .1 Laboratory size is small with minimum width work area in front of fume hoods and counters;
- .2 Equipment:
  - .1 3 - fume hoods (2 – 750mm x 1800mm and 1 – 900mm x 1500mm);
  - .2 1 -canopy hood (900mm x 6000mm x 2200mm high) with curtain closure. The current set-up is suitable (i.e. convenient and safe) for its' intended use.
- .3 Millwork:
  - .1 3 - Counters with base cabinets – approx. 12 linear metres - (2 counters have stainless steel tops);
  - .2 Double sink.
- .4 Furniture:
  - .1 2 – 600mm x 900mm rack storage units;
  - .2 3 – 600mm x 650mm steel storage cabinets;
  - .3 1 – 600mm x 900mm portable steel storage base cabinet.

.5 Conodont Laboratory Office (39 m2):

.1 Office is oversized as it currently serves one person who operates the Conodont Laboratory;

.2 Desks:

.1 2 – 2200mm x 2200mm work stations;

.2 1 – 1200mm wide desk;

.3 Millwork:

.1 2 – counters with double sinks and base cabinets (stainless steel top);

.2 1 – 1500mm x 3000mm work counter with base cabinets;

.3 1 – small counter with base cabinets and shelving above work and counter areas.

.4 Equipment:

.1 1- fume hood (does not meet current standards and its' function will not be required with future office relocation).

.6 A few small laboratories using fume hoods - but not requiring constant ventilation – are also located in the East Wing. A proposal to relocate these laboratories is discussed in energy efficiency Option 5 in section 4 of this report.

3.2.3 ARCHITECTURAL OPTION A

.1 Drawings are located in Appendix C.

.2 Relocate the Conodont Laboratory (Rooms 235 and 234) and Conodont Laboratory Office (Room 236) to level 2 of the West Wing (Rooms 2223, 2224 and 2225).

.1 Relocated Conodont Laboratory (45 m2):

.1 This space is larger in area (i.e. width). This allows a layout similar to the existing laboratory but with more circulation space within the laboratory and work space in front of fume hoods and counters;

.2 Relocated Conodont Laboratory Office (22 m2):

.1 Adjacent to the relocated Conodont Laboratory;

.2 Although this space is about half the area (and width) of the existing office it easily accommodates a workstation for one person, counter space and a large work counter (1200mm x 1800mm) with base cabinets.

3.2.4 ARCHITECTURAL OPTION B

.1 Drawings are located in Appendix C.

.2 Relocate the Conodont Laboratory (Rooms 235 and 234) to level 2 of the West Wing (Rooms 2209 and 2210). Leave Conodont Laboratory Office in existing location.

.1 Relocated Conodont Laboratory (41 m2):

.1 This space is larger in area (i.e. width). This allows a layout similar to the existing laboratory but with more circulation space within the laboratory and work space in front of fume hoods and counters;

.2 Conodont Laboratory Office remains in current location (on the same level) in the adjacent East Wing. The spaces adjacent to the relocated Conodont Laboratory are currently unavailable for re-use.

3.3 MECHANICAL

3.3.1 GENERAL

.1 The east wing HVAC systems were designed in 1965 and installed some short time after that. The east wing laboratory wing was constructed at the same time as the administration block, power plant and core storage warehouse.

.2 The west wing HVAC systems were designed in 1972 and installed some short time after that.

.3 The air handling systems for the laboratory wings are original though a number of upgrades have occurred over the years which include the following:

.1 AS-2 was converted from a re-circulating air system to a 100% outdoor air system;

.2 Installation of variable speed drives on fume hood exhaust fans;

.3 Volume controls have been integrated to control exhaust volumes based on the fume hood sash positions;

.4 Dual duct terminal boxes associated with AS-2 and AS-3 have been programmed to set-back to 50% air volume during night time operations.

.4 Additionally, as part of the recent AIP program, the following upgrades were made to the mechanical base building systems:

.1 Replacement of the original boilers with three Buderus SB735 condensing boilers;

.2 Original west wing ductwork was replaced with new ductwork;

.3 Original chiller and cooling tower were replaced with new units.

3.3.2 EAST LAB WING

.1 Air systems for the east wing lab consist of the following:

.1 AS-2; Interior dual duct constant air volume system with 100% outdoor air;

.1 The unit is rated at 12,720 cfm (6057 l/s) cold deck and 6180 cfm (2943 l/s) on the hot deck

.2 AS-3; Interior dual duct constant air volume system with 100% outdoor air;

.3 AS-4; Perimeter Induction system with 100% outdoor air;

.4 EF-2 is the general exhaust fan associated with these three air systems

.1 Latest air balance information indicates a capacity of 8,341 cfm (3971 l/s).

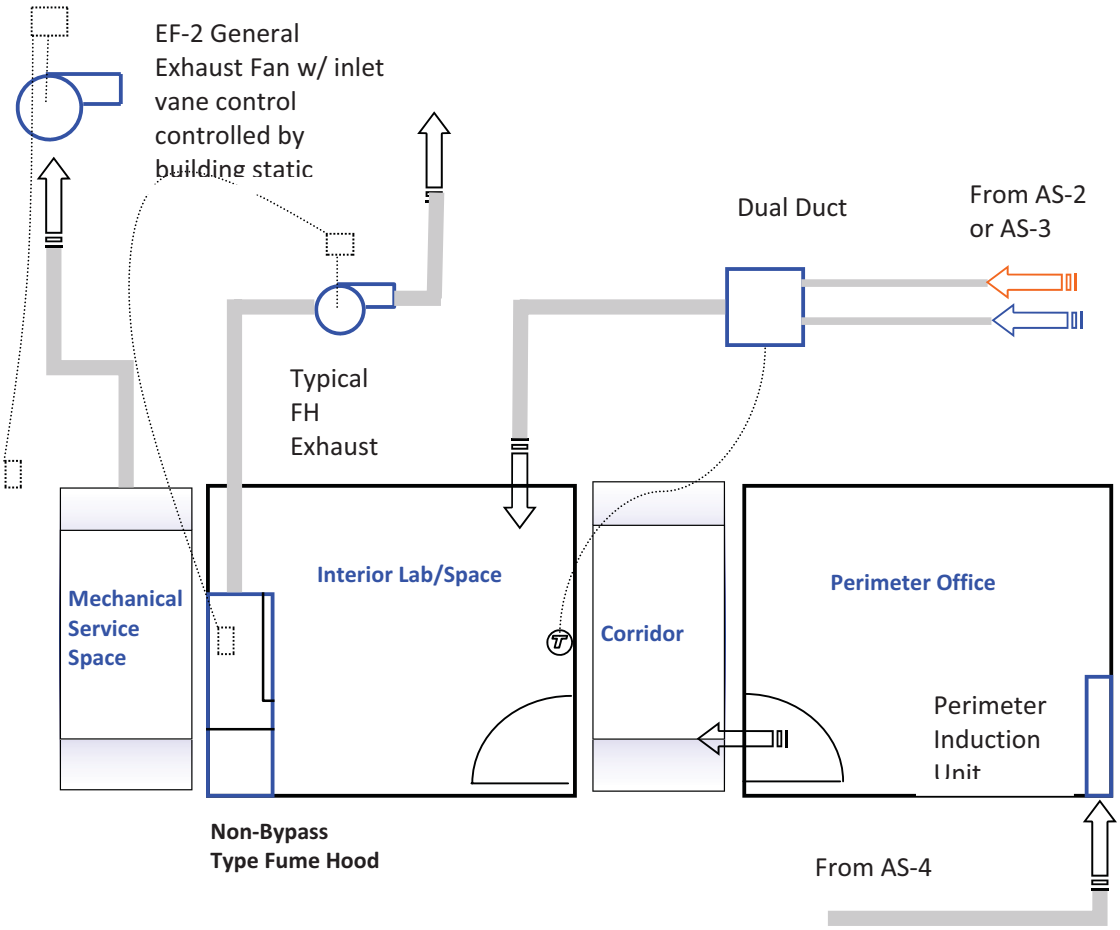
.2 Capacity is regulated by variable inlet vanes.

.2 An inventory of the exhaust systems in the east wing as well was compiled. Data was compiled with information available on site including available air balance information. It is noted that some information is missing. Numbers in blue on the following tables are calculated values as the air balance information was either not available or equipment descriptions in the reports did not match the size condition. Noted that all air balance information requires verification. Tabulated as;

East Wing Exhaust Summary

Room/Area	Equip	Description	Exhaust Air (cfm)	Exhaust Air (l/s)
117	N3	CANOPY	634	302
119	S9	CANOPY	0	
120	S5	FUME HOOD	0	
120	S6	FUME HOOD	0	
123	S1	CANOPY	0	
132	S4	FUME HOOD	680	324
132	S7	FUME HOOD	586	279
Subtotal			1901	905
216	S8	CANOPY	0	
219	E25	ROOM EXH	0	
220	E20	FUME HOOD	743	354
220	E21	CANOPY	743	354
224	N2	CANOPY	1273	606
227	N1	CANOPY	1896	903
228	E12	ROOM EXH	477	227
232	N4	CANOPY	1430	681
234	E26	FUME HOOD	672	320
234	N5	FUME HOOD	788	375
235	N10	DUST EXH	0	
235	N11	DRYING HOOD	349	166
236	E27	FUME HOOD	628	299
Subtotal			8999	4285
EAST WING	S3	WASH ROOM	0	
			10899	**5190**

.3 The following is a schematic of the east wing HVAC system:



East Wing Air System Schematic

3.3.3 WEST LAB WING

.1 West wing has one dual duct, constant volume 100% outdoor air system.

.2 Latest air balance information indicates a capacity of 29,400 cfm (14,000 l/s).

.3 EF-1 is the general exhaust fan associated with this air system.

.1 Latest air balance information indicates this fan is rated at 2,360 cfm (1124 l/s)

.2 Capacity is regulated by variable inlet vanes.

.4 Total airflow rate for a laboratory is dictated by on of the following:

.1 Total amount of exhaust from containment and exhaust devices;

.2 Cooling required to offset internal heat gains;

.3 Minimum ventilation rate requirements.

.5 Terms of Reference for this Study included for a load calculation to be performed for the West Wing. Purpose of the load calculation was to verify that the additional hoods and

canopies to be relocated from the East Wing into the West Wing would not overtax the mechanical systems.

.6 The load calculation was completed using ASHRAE Radiant Time Series (RTS) cooling load calculation method. The RTS method is a simplified approach but uses current techniques. The approach yields somewhat conservative results. But, note that no safety factors have been applied in any of the calculations. The detail load calculation results are provided in Appendix B. Summary table is provided as follows:

	Area	Cooling	Block Clg Load	Intensity	Tot Htg	Intensity
West Wing Labs	ft^2	cfm	tons	cfm/ft^2	btuh	btuh/ft^2
2nd Flr Offices	3456.0	2403.0	7.4	0.7	278942.7	80.7
2nd Flr Perim Corr	282.0	286.6	0.8	1.0	14590.0	51.7
2nd Flr Labs	3384.0	1470.3	16.9	0.4	1126003.0	332.7
Main Flr Offices	3456.0	2169.6	5.7	0.6	362490.7	104.9
Main Flr Perim Corr	282.0	417.5	1.4	1.5	10422.7	37.0
Main Flr Labs	5372.9	3893.3	23.2	0.7	1016400.0	189.2
Bsment Flr Offices	3456.0	1603.9	4.3	0.5	259459.2	75.1
Bsment Flr Corr	282.0	748.5	2.0	2.7	10422.7	37.0
Bsment Flr Labs	1325.0	2013.3	18.1	1.5	1016400.0	767.1
Total WW	21295.9	**15006.0**	**79.9**		**4095131.0**	

.7 The result shows a requirement for 15,000 cfm (7142 l/s) air supply to meet cooling load requirements, where the actual capacity of the unit is about 30,000 cfm (14,285 l/s). This is based on a generous 2 w/ft^2 for equipment loads and 3 w/ft^2 lighting loads. We feel this is generous since during the walk about there was generally minimal equipment on the lab benches. The result shows that the cooling load is not the dominant factor for the West Wing. Dominant factor is the exhaust air requirement for the West Wing.

.8 An inventory of the exhaust systems in the west wing was compiled. Information was compiled with information available on site including available air balance information. Some information is missing, but the data shows that the exhaust load of 19,568 cfm (9300 l/s) is well below the 30,000 cfm (14,285) make-up air capacity of the unit. Tabulated as:

West Wing Exhaust Summary			
Room/Area	Description	Exhaust Air Volume	Exhaust Air Volume
		(cfm)	(l/s)
1124	FUME HOOD		
1125	FUME HOOD	911	434
1109	FUME HOOD	454	216
1129	FUME HOOD	1829	871
2211	FUME HOOD	743	354
34	FUME HOOD	609	290
31	FUME HOOD	916	436
2214	FUME HOOD	437	208
2214	FUME HOOD	672	320
2214	FUME HOOD	670	319
1110	ROOM EXHAUST		
37	FUME HOOD	739	352
1112	CANOPY	2514	1197
1111	FUME HOOD	588	280
33	COAL EXH		
33	COAL EXH		
32	DUST EXH		
1110	FUME HOOD	899	428
1124	CANOPY	2478	1180
2223	CANOPY	1982	944
	WASHROOM	2675	1274
1125	CANOPY	452	215
		19568	**9318**

3.3.4 SUMMARY OF ISSUES

.1 Following issues were evident as a result of the walk about;

.1 All air systems serving the East Lab Wing and the West Lab Wing are 100% outdoor air systems with no provision for heat reclaim. Due to the configuration, the existing system could not be economically refitted for heat reclaim.

.2 Systems are more than 40 years old and generally have reached the end of their life expectancy. Parts are increasingly difficult to obtain. Controllability of components such as the dual duct terminal boxes is poor.

.3 There is no current air balance for the complete facility.

.4 The existing systems controls strategy does not utilize direct measurement of ventilation air volumes and exhausts in order to control directional air flows through the building. The layout of the systems does not lend themselves to such a strategy.

.5 Many fume hoods are old and some wood hoods are still in use. It is questionable that the hoods meet current Standards for fume hoods such as ASHRAE 110.

.6 Fume hood exhaust fans are installed in the penthouses located above the second floor. Shaft seals as well as duct accessories located on the positive pressure side of the exhaust fans probably leak into the penthouses. There is no industry Standard for the ventilation of enclosed spaces containing fume hood fans.

.7 There are no cones on the outlet of the fume hood exhaust fans. Also, being installed indoors, there is no way to duct by-pass air into the fans. Therefore, it is highly

suspected that the exit velocity is too low and an effective exhaust plume cannot be achieved with the existing configuration.

.8 The controls strategy of the existing non-bypass hoods would lower the fume hood air volume to below the threshold specified in NFPA 45 when the sashes are lower than about 200 mm.

3.4 ELECTRICAL

3.4.1 GENERAL

.1 The Electrical systems have been well maintained over the years, however, some parts of the electrical systems that are original are now either beyond or near their normal life expectancy. The purpose of this electrical systems study is to analyze the areas where energy savings are possible and provide proposed recommendations and planning to improve the safety, efficiency and the reliability of the electric systems.

.2 Records of previous electrical systems studies were not made available which would include confirmation of short circuit analysis, power flow analysis, harmonic analysis, reliability analysis, dynamic and transient analysis, motor starting/acceleration studies, protective device coordination, arc flash studies and labelling protocol.

.3 The site visit for purpose of reviewing the electrical systems was conducted on February 25th, 2013.

3.4.2 EXISTING ELECTRICAL SYSTEMS

.1 Electrical Services

.1 The Electrical Service Entrance consists of the Electrical Room complete with Switchgear Power distribution.

.2 The distribution is a mixture of original and rebuilt panels and breakers.

.3 The existing Fire Alarm System is a zoned single stage system. Verification and testing have been done on a regular bases and it is in excellent condition.

.4 Telecommunication wiring is Cat3.

.2 Motor Control Center

.1 The Building has a Motor Control Center (MCC) that was recently completely rebuilt as part of Economic Action Plan in 2009.

.3 Secondary Transformers

.1 The Step down Secondary Transformers utilized to convert 600/347V to 208/120V, are of the dry type and of various sizes.

.2 Most of the transformers are original. However, some new ones have been installed as part of

various upgrades over the years.
Transformers are not overloaded and do not show any noticeable overheating or unusual noise.

.4 Materials and Equipment
- .1 Equipment and components have been operating for decades. However due to over painting and corrosion it is difficult to confirm nameplate data for CSA certification or manufacture to proper Standards.
- .2 The majority of wiring is original. Wiring condition and wiring insulation cannot be properly assessed. However, it has reached the end of its life expectancy based on age.

.5 Lighting
- .1 Typically linear fluorescent light fixtures are utilized in labs, offices, corridors, service rooms and mechanical equipment rooms.
- .2 Original design utilized T12, 40W lamps with acrylic diffusers. As a result of a retrofit project, the majority of lighting fixtures lamps and ballasts were replaced with T8 32W lamps and electronic ballasts.
- .3 Lighting in Labs consists of (305 x1220) mm, two lamp light fixtures. Most of the areas in the labs are too bright.
- .4 Performance of light fixtures has diminished dramatically as a result of age, poor reflectors and quality of lenses.
- .5 Based on a typical lab of 5.6m x 6.1m equalling 34 m^2 and utilizing 10 lighting fixtures with 2x32W lamps, the calculated power density is 19W/ m^2.
- .6 Emergency lighting is original.

3.4.3 SUMMARY OF ISSUES

.1 Electrical Distribution
- .1 Branch circuit breakers in some panels are original. Operational capabilities diminish with age and spare parts are more difficult to obtain. The aging components of the distribution present a risk. Future system renovations without proper study can result in the loss of a modern, code compliant and logical electrical distribution system.
- .2 There is no emergency power system.
- .3 Over the years the transformer's copper insulation diminishes dramatically, causing short circuits, fire and life safety hazards. Performing any maintenance on them is dangerous for maintenance personnel.
- .4 No arc flash study or labelling has been done.
- .5 The original transformers have exceeded their life expectancy.
- .6 Transformer failures incur high direct costs, disrupt utility operations and increase the risk of major power system outages.
- .7 Insulation failure has been shown to be the most common cause of failure in most of the power transformers which exceeded their life expectancy.
- .8 The lack of identification and labelling make it impossible to identify what part of the building each transformer feeds.

.2 Load Balance:
  .1 It is important for an electrical system that all the phases in a three phase power system have approximately the same loads so that current in the neutral conductor will be as close to zero as possible.
  .2 No load, coordination or rating studies have been done over the years.
.3 The existing transformers do not have the capability of mitigating the harmonics. In addition to filtering out unwanted noise, harmonic mitigating transformers reduce the effects of harmonic currents.
.4 Lighting
  .1 Lighting is one of electrical systems that building users are generally more cognizant of since it has a direct effect on their use of space. Effective lighting should enhance an environment and be supportive of the activities, provide safety and comfort to the building occupants, yet also be energy efficient and environmentally friendly.
  .2 It is important that the selection of luminaries be examined carefully for the following:
    .1 Ability to function with natural light;
    .2 Required level of illumination;
    .3 Color temperature compatibility with the functional requirements;
    .4 Control of glare and shadowing;
    .5 Efficiency; and
    .6 Readily maintainable components.
  .3 It is very challenging to meet all Code requirements and at the same time provide good quality lighting. New design must be done in accordance with the NBC, Canadian Labour Code and IESNA recommendations. The Canadian Energy Code for Building provides guidance on energy efficiency requirements. The electrical design should consider all the options possible to meet all off the above Codes.
  .4 Even though the lighting retrofit done some years ago has considerably diminished the energy consumption, there is still some potential for savings.
  .5 Sustainable lighting should be designed to satisfy:
    .1 Human needs by using design techniques to support health, well being, visibility and productivity;
    .2 Economics by managing initial equipment costs with specifications that reduce operations costs;
    .3 Environment by reducing carbon emissions, hazardous waste and controlling light pollution;
    .4 Aesthetics by providing light that improves interior and exterior design aesthetics;
    .5 Light reflection;
    .6 Wall, ceiling and floor reflectance as per IESNA recommendation.
    .7 Unfortunately all of the above criteria are a concern.
  .6 The existing lighting control in Labs and offices has limited options for energy savings.
.5 Emergency Lighting
  .1 Emergency lighting is an original battery pack system that does not appear to be in good condition. This is a life and safety concern.
.6 Telecommunication systems
  .1 Telecommunication rooms and wiring do not meet the current telecommunication Codes such as TIA/EIA 568, 569, 606, and 607.

.2 The proposed structured communication wiring system must comply with Treasury Boards Information Technology Standard for wiring as described in the TBITS 6.9document. (TBITS 6.9 - Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings - Technical Specifications) shall be as per Information and Technology Standards: http://www.tbs-sct.gc.ca/it-ti/itp-pti/its-nit-eng.asp

3.4.4 SUMMARY OF RECOMMENDATIONS

.1 Main Electrical Distribution

.1 Coordination Study including Short circuit, Load and Arc Flash Study & labelling should be done as soon as possible.

.2 Emergency Power for the building should be provided for reliable and continuous operation.

.2 Lighting

.1 As lighting here represents one of the single largest energy loads in the building, there is an opportunity not only to reduce operating costs but also to make significant improvements in their commercial energy consumption and performance.

.2 A new lighting design should be provided for labs and offices. Options to be considered:

.1 Lighting Design utilizing (610 X1220)mm lighting fixtures, 2XT5, 28W lamps and task lighting;

.2 Lighting Design utilizing (610 X1220) mm lighting fixtures, 2XT8, 25W lamps and task lighting.

.3 LED lighting technology utilizing Canadian power standards is not sufficiently developed at this time. However, LED is the future of the lighting and its development should be monitored closely as its technology progresses. Performance data proven through independent laboratories testing and provided by manufacturers look incredible, though its application is in experimental phases and its reliability and performance has to be proven in market.

.1 Here are pros and contras of utilising LED lighting:

.1 LED lighting is crispier and more natural than fluorescent,

.2 Energy savings go up to 45%,

.3 Life expectancy seems to be double than fluorescent (however there is no proof that this is accurate).

.4 Costs for a LED lamp are about 12 times higher than for a florescent lamp.

.5 No data is available on how dimming and switching ON/OFF effects LED.

.2 More time is required for LED lighting to prove reliability and performance. At this point of time I can recommend comfortably using LED indoor lighting only in experimental bases (for example in one of the labs).

.4 Lighting Levels should not be compromised for the sake of energy savings. Task lighting in some areas of the lab should be part of design to ensure lighting levels in accordance with IESNA recommendation. To ensure more savings task lighting should be controlled automatically- utilising proximity switches.

.5 Utilizing energy efficient light fixtures and lamps lowers the power density considerably. Lighting power intensity can be reduced to the range of 16.5W/m^2 to 14.7W/m^2, making lighting energy savings from 10% to 20% possible.

.6 Utilizing LED light fixtures and lamps lowers the power density to 8 W/m², making lighting energy savings up to 45%.

.3 Lighting Control:

.1 Lighting control design is one of the most essential parts of energy savings for lighting.

.2 Lighting should be controlled automatically, utilizing sustainable smart technology.

.3 Among the options to be considered are:

.1 Intelligent addressable lighting controls system utilizing motion sensors and two stage photo sensors compatible with building energy system;

.2 Wireless lighting controls system, contingent that the technology used ensures the required reliability;

.3 Dimming combined with motion sensors and dual stage photo sensor switches providing reliability and enhanced energy savings.

.4 The table below illustrates how new design using energy management strategy can be applied to the building to maximize the energy savings.

						
	Task Tuning	Individual Control	Occupancy Control	Smart Time Scheduling	Daylight Harvesting	Load Shedding
Lab/ Office (No Window)	●	●	●			●
Lab/ Office (Window)	●	●	●		●	●
Open Office (Cubicles)	●	●	●	●	●	●
Hallways/Lobbies	●			●		●
Washrooms			●			●
Meeting Rooms	●	●	●	●	●	●
Storage			●	●		●

.5 Up to an additional 20% savings are possible by utilizing the following techniques in the design:

.1 **Task tuning** - Each task has different lighting requirements. Task tuning in labs and offices offers the option of setting default maximum light levels for each task in order to minimize over lighting.

.2 **Individual Control –** Each person has different lighting levels preferences. The individual control makes it possible to dim the light levels in the workspace to suit personal preferences from their PC.

.3 **Occupancy Control-** In the course of the use of occupancy sensors, lights are automatically turned on or off or dimmed based on occupancy detection. The time delay of turning off has to be studied for each application.

.4 **Smart Time Scheduling –** In some areas the occupancy sensor is not an appropriate method of lighting control. Where occupancy sensors do not work the switching or dimming of lights can be done by time scheduling.

.5 **Daylight Harvesting –** Utilize the ambient natural sunlight entering the building as much as possible. Utilize two stage lighting and dimming depending on the intensity

of the natural light entering through the windows, while maintaining the lighting levels set for that area.

.6 **Variable Load Shedding –** Identifying the peak load demand for a building and applying the automatic reduction of electrical demand in a building by shedding lighting loads selectively based on the area priorities is an important energy management strategy.

.4 Emergency Lighting

.1 Emergency power should be provided. Even though the power interruptions for this building do not occur often, it can happen for a number of internal or external reasons. In the instances that power cannot be restored quickly any work in the building would not be possible.

.2 Due to its' age battery pack emergency lighting should be replaced.

.5 Exit Lights

.1 The green "running man" image and directional arrows in place of the traditional red EXIT or SORTIE signs should be provided as per National Building Code.

.2 Photo luminescent Exit Signs are a highly sustainable product and should be considered for both safety and energy conservation reasons. Photo luminescent signs absorb and store light at levels as low as 5 Lux and once charged can provide illumination for several hours in the absence of light. They can function in combination with conventional or emergency lighting without having to be wired into a power system, and they require negligible maintenance.

.6 Telecommunication Systems

.1 A new telecommunication design should be provided to include:

.1 A Telecommunication Equipment Room;

.2 A Telecommunication Room on each floor;

.3 Wiring to CAT 6a; and

.4 Consideration of a Wireless Telecommunication System.

4 ENERGY EFFICIENCY OPTIONS DISCUSSION

4.1 OPTION 1 – SHUT DOWN AS-3 DURING OFF HOURS

4.1.1 DESCRIPTION

.1 This is the lowest cost option and is described in the NRCan report of April 2012. The strategy involves de-energizing AS-3 fans during off hours of evenings and weekends.

.2 No room relocations are required.

4.1.2 DISCUSSION

.1 Based on the air balance information provided, AS-4 delivers 1509 cfm (719 l/s) of primary air to the second floor.

.2 With the fume hood sashes at normal operating height of 450mm, the total exhaust volume of the four hoods is 3300 cfm (1571 l/s).

.3 At the NFPA 45 minimum air volume for fume hoods, the exhaust requirement from the fume hoods alone is 1100 cfm (523 l/s).

.4 There is a large 3' x 12' canopy hood. Information from the site indicates that the canopy hood draws 1430 cfm (681 l/s). Note that this equates to a 40 fpm capture velocity not considering the drapes, which seems reasonable.

.5 AS-2 serves the room and can provide the required volume of make-up air directly through the room diffusers and/or through the existing transfer air grilles on its own. Therefore AS-3 could be shut down during off hours.

.6 For purpose of properly controlling the building exhaust with make-up air, the exhaust fans EF-1 and EF-2 need to be retrofit with variable speed drives.

4.1.3 BASIS OF ENERGY SAVINGS CALCULATION

.1 Provides fan energy savings 12 hours per day plus full weekends (off hours).

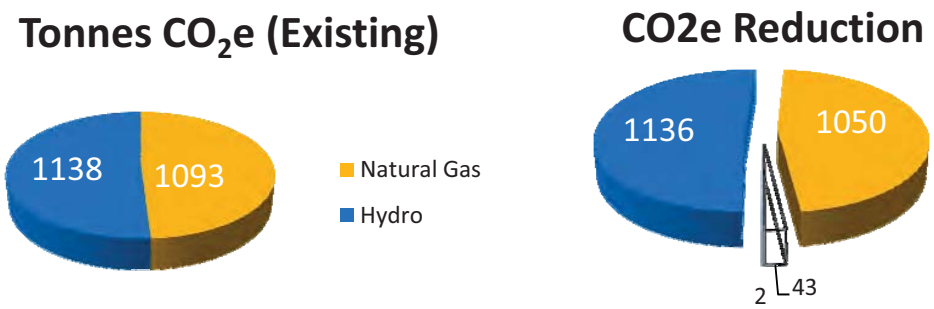
.2 AS-3 is currently at 50% setback during off hours.

.3 Provides natural gas savings by avoidance of heating outdoor air 12 hours per day plus full weekends. Basis of calculation is the volume of the hot deck of AS-3 which is 5420 cfm (2580 l/s). From 50% to 0% this equate to 2710 cfm (1290 l/s).

.4 The energy savings do not consider any savings by conversion of the exhaust fans from variable inlet vane control to variable speed drive since it is not know if the existing condition is to under supply or over supply. We assume net zero considering fan energy savings.

4.1.4 ENERGY AND GHG REDUCTION

Fuel type	Fuel consumption - unit	Fuel rate	Fuel saved	Fuel cost savings	Fuel consumption - unit		CO2e Savings Tonnes	% GHG Savings
Electricity	MWh	$ 92.840	2.3	$ 209	kWh	2251.41	1.96	0.17%
Natural gas	GJ	$ 5.670	866.3	$ 4,912	m^3	22641.58	43.09	3.94%
Total				$ 5,121			45.05	**2.02%**



4.1.5 CLASS 'D' ESTIMATE AND SIMPLE PAYBACK

.1 The estimate is inclusive of;
  .1 New variable speed drive for EF-1 and EF-2
  .2 Re-programming of AS-3 and verification of controls
.2 The estimate assumes that the work will be negotiated with the current BMS maintenance contractor and there are no associated engineering fees.
.3 The estimated cost is $12,000. (Refer also to Appendix 'D' for detailed cost breakdown).
.4 Simple payback equals 2.3 years.

4.2 OPTION 2 – RELOCATE ROOMS AND SHUT DOWN AS-2 AND AS-3

4.2.1 DESCRIPTION

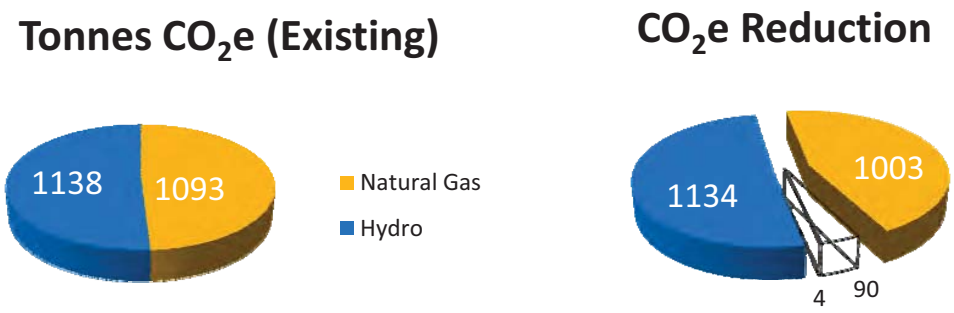
.1 Relocate Room 234, 235 and 236 from the East Wing Laboratory into the West Wing Laboratory
.2 AS-2 and AS-3 can be shut down during off hours.
.3 Other fume hoods and exhausts are manually shut down after hours and are not required for 24/7 operation.
.4 AS-4 serves perimeter induction and cannot be shut down in winter.
.5 Requires scheduling changes in the Building Management System as well as some minor space configurations.

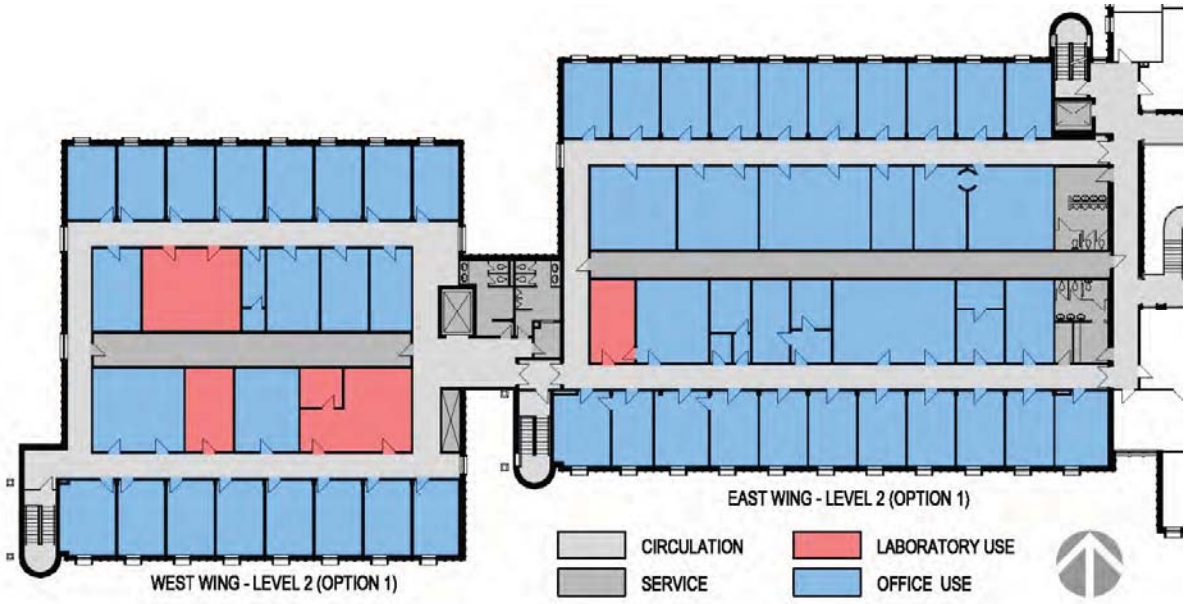
4.2.2 BASIS OF ENERGY SAVINGS CALCULATION

.1 Provides fan energy savings 12 hours per day plus full weekends (off hours).
.2 Fans are currently at 50% setback, therefore the fan energy savings of the 25 Hp + 20 HP motor are in comparison of 50% air volume to 0% volume which equates to 5.6 HP savings.
.3 Provides natural gas savings by avoidance of heating outdoor air 12 hours per day plus full weekends. Basis of calculation is the volume of the combined hot decks for AS-2 and AS-3 which is 11,600 cfm (5523 l/s). From 50% to 0% this equate to 5600 cfm (2667 l/s).

4.2.3 ENERGY AND GHG REDUCTION

Fuel type	Fuel consumption - unit	Fuel rate	Fuel saved	Fuel cost savings	Fuel consumption - unit		CO2e Savings Tonnes	% GHG Savings
Electricity	MWh	$ 92.840	4.7	$ 435	kWh	4690.44	4.08	0.36%
Natural gas	GJ	$ 5.670	1,804.7	$ 10,233	m^3	47169.96	89.76	8.21%
Total				$ 10,668			93.85	**4.21%**





4.2.4 Class 'D' Estimate and Simple Payback

.1 The estimate is inclusive of:
  .1 Relocate Rooms 234, 235 (both rooms make up one lab) and 236 (office) to East Wing Laboratory;
    .1 New counters and sinks with base cabinets;
    .2 Re-painting;
    .3 New flooring (i.e. VCT and carpet tile).
  .2 Three new fume hoods;
  .3 New canopy hood (approx 4.5 metres in length);
  .4 New roof-mounted fume hood exhaust fan;
  .5 BMS programming and new graphics.
.2 The Preliminary Construction Cost Estimate class "D" provides Hard and Soft Costs as defined, and includes the following:
  .1 Project related FEE including disbursements.
  .2 Constant Dollars amount.

.3 Current Dollars or Budgetary value of the project by clearly defining the:

.1 Contingency allowance, Escalation, risk etc.

.3 The budgetary value for Option 2 is approximately $222,700. (Refer also to Appendix 'D' for detailed cost breakdown).

.4 Simple payback equals 20.9 years.

4.3 OPTION 3 – CONVERT EAST WING 2ND FLOOR TO NON-LAB SPACE

4.3.1 DESCRIPTION

.1 Relocate all Fume Hoods and Exhausts into either the main floor of the East Wing or to the West Wing Laboratory.

.2 AS-2 and AS-3 would be reconfigured to serve basement and main floor only. The preliminary indications of this study indicate the both units would be required for the make-up air volume requirements of the east wing.

.3 A new VAV system is installed on the roof to serve the second floor of the East Wing only.

.4 AS-4 serves perimeter induction and cannot be shut down in winter.

.5 New rooftop VAV unit serving 2nd floor of the East Wing.

.6 Some additional space programming and reconfiguration required.

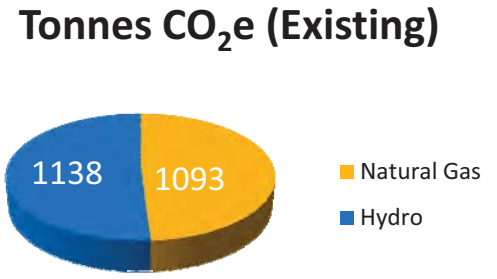
4.3.2 BASIS OF ENERGY SAVINGS CALCULATION

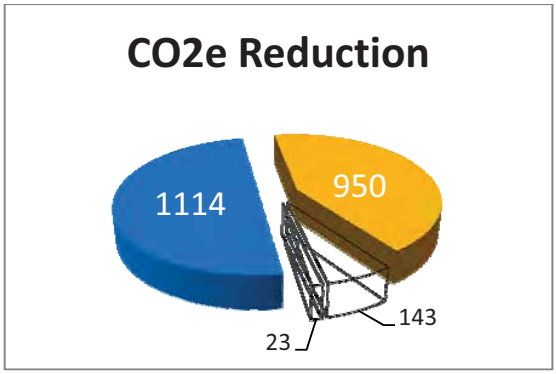
.1 In addition to the saving of Option 1; Energy savings by avoiding supply of 100% outdoor air to the second floor. Calculation assumes a supply air volume of 5000 cfm (2380 l/s) with a minimum outdoor air requirement of 10%. Calculation considers avoidance of associated heating and cooling energy year round. Calculation also considers fan energy savings for a VAV system.

.2 Calculation considers the savings for shut down of the unit during after hours and weekends.

4.3.3 ENERGY AND GHG REDUCTION

Fuel type	Fuel consumption - unit	Fuel rate	Fuel saved	Fuel cost savings	Fuel consumption - unit		CO2e Savings Tonnes	% GHG Savings
Electricity	MWh	$ 125.540	26.6	$ 2,474	kWh	26644.59	23.18	2.04%
Natural gas	GJ	$ 5.670	2,868.0	$ 16,262	m^3	74961.30	142.65	13.05%
Total				$ 18,735			165.83	**7.43%**





4.3.4 CLASS 'D' ESTIMATE AND SIMPLE PAYBACK

.1 The estimate is inclusive of;
  .1 Relocation of all fume hoods and canopy exhaust from the East Wing Laboratory 2nd Floor to other areas of the East Wing
    .1 Allowance for 8 new fume hoods
    .2 Allowance for 10 other hoods
  .2 New roof mount exhaust system to serve the exhausts
  .3 Installation of a new rooftop air handling unit to serve the second floor of the East Wing only.
    .1 New terminal units, ductwork, controls, fire suppression and plumbing suitable for office application for the second floor.
  .4 Reconfiguration AS-2 and AS-3 to provide air delivery to the basement and main floor laboratory areas.
    .1 New terminal units, ductwork, controls for the basement and main floor areas.
.2 The Preliminary Construction Cost Estimate class "D" provides Hard and Soft Costs as defined, and includes the following:
  .1 Project related FEE including disbursements.
  .2 Constant Dollars Amount.
  .3 Current Dollars or Budgetary value of the project by clearly defining the:
    .1 Contingency allowance, Escalation, risk etc.
.3 The budgetary value for Option 3 is approximately $3,211,000 (Refer also to Appendix 'D' for detailed cost breakdown).
.4 Simple Payback equals 171 years.

4.4 OPTION 4 – RELOCATE ALL LAB FUNCTION TO WEST WING

4.4.1 DESCRIPTION

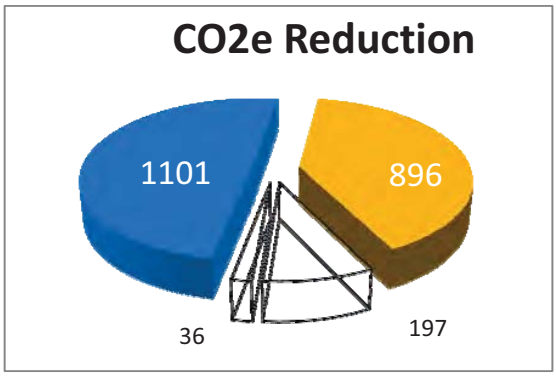
.1 Relocate all Fume Hoods and Exhausts into the West Wing Laboratory.
.2 AS-2 and AS-3 are replaced with a new roof located VAV unit.
.3 AS-4 could also be replaced with a recirculating VAV system
.4 Reconfiguration of West Wing Laboratory is required.
.5 Refurbish/replace West Wing AH system would be required due to the increased make-up air volume.

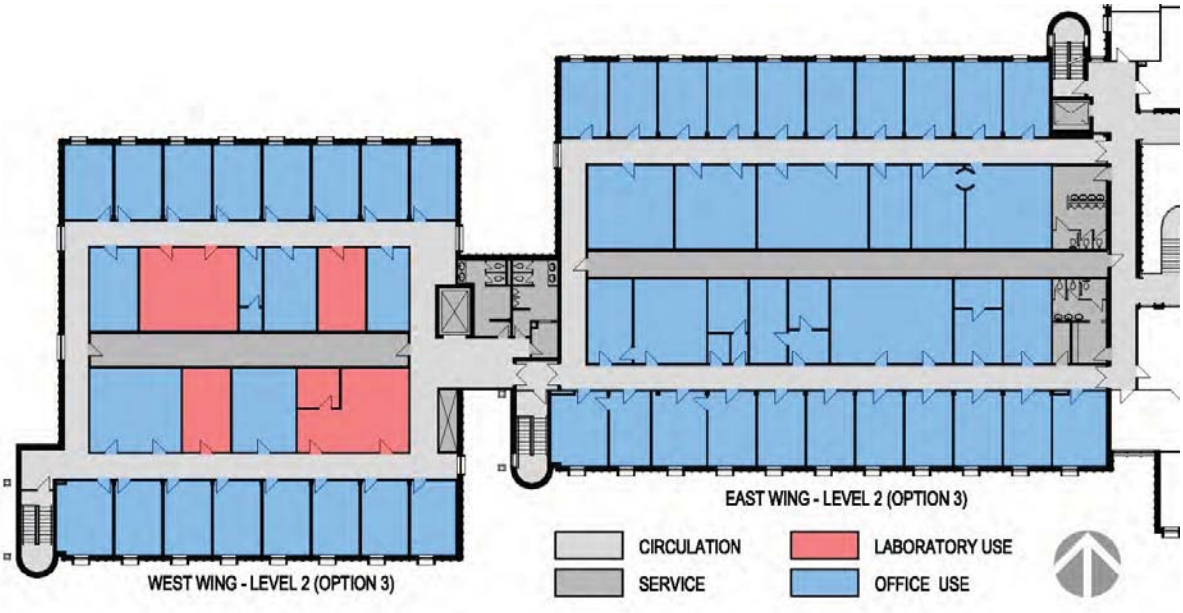
4.4.2 BASIS OF ENERGY SAVINGS CALCULATION

.1 Energy savings by avoiding supply of 100% outdoor air to the entire East Wing. Calculation assumes a supply air volume of 5000 cfm (2380 l/s) per floor with a minimum outdoor air requirement of 10%. Calculation considers avoidance of associated heating and cooling energy year round. Calculation also considers fan energy savings for a VAV system.
.2 Calculation considers the savings for shut down of the East Wing unit during after hours and weekends.

4.4.3 ENERGY AND GHG REDUCTION ANALYSIS

Fuel type	Fuel consumption - unit	Fuel rate	Fuel saved	Fuel cost savings	Fuel consumption - unit		CO2e Savings Tonnes	% GHG Savings
Electricity	MWh	$ 125.540	41.5	$ 5,061	kWh	41544.78	36.14	3.18%
Natural gas	GJ	$ 5.670	3,954.6	$ 22,422	m^3	103360.41	196.69	18.00%
Total				$ 27,483			232.84	**10.44%**





4.4.4 CLASS 'D' ESTIMATE AND SIMPLE PAYBACK

.1 The estimate is inclusive of;
  .1 Complete lab refit of the West Wing Laboratory
    .1 New roof mounted lab exhaust system, new make-up air system, new terminal units, ductwork, controls, fire suppression and plumbing for West Wing.
  .2 Complete refit of the East Wing to office space
    .1 New air handling system, terminal units, ductwork, controls, fire suppression and plumbing suitable for office application
.2 The Preliminary Construction Cost Estimate class "D" provides Hard and Soft Costs as defined, and includes the following:
  .1 Project related FEE including disbursements.
  .2 Constant Dollars Amount.
  .3 Current Dollars or Budgetary value of the project by clearly defining the:
    .1 Contingency allowance, Escalation, risk etc.
.3 The budgetary value for Option 3 is approximately $9,086,000. (Refer also to Appendix 'D' for detailed cost breakdown).
.4 Simple Payback equals 330 years.

4.5 OPTION 5 – OPTION 4 PLUS MANIFOLDED EXHAUST AND HEAT RECLAIM

4.5.1 DESCRIPTION

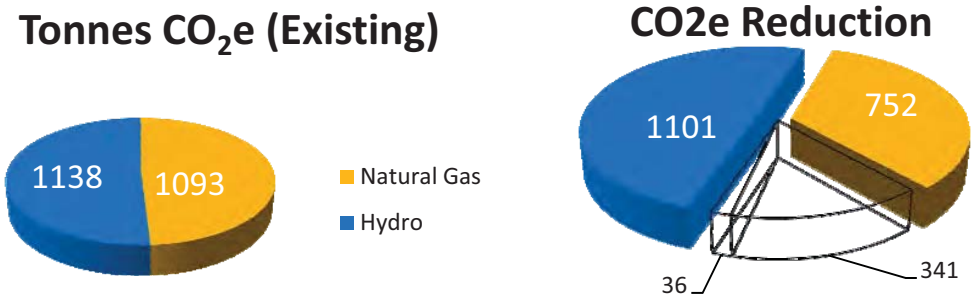
.1 Relocate all Fume Hoods and Exhausts into the West Wing Laboratory
.2 De couple the room conditioning system from the make up air system.
.3 AS-2 and AS-3 are replaced with a re-circulating VAV system.
.4 AS-4 could also be replaced with a re-circulating VAV system
.5 The individual fume hood and canopy hood exhaust fans are replaced with a new room mounted fume hood exhaust fan.
.6 The associated manifolding of the fume hood exhausts provides opportunity to install a heat reclaim unit for additional energy savings.
.7 Venturi air valves are installed on the ventilation supply to each room as well as on the exhaust from each room.
.8 Space conditioning is provided by new fan coils or chilled beams or other terminal device. This also provides flexibility for future when re-programming is required.
.9 Precisely controls make up air to each space of the building.

4.5.2 BASIS OF ENERGY SAVINGS CALCULATION

.1 Energy savings by avoiding supply of 100% outdoor air to the entire East Wing. Calculation assumes a supply air volume of 5000 cfm (2380 l/s) per floor with a minimum outdoor air requirement of 10%. Calculation considers avoidance of associated heating and cooling energy year round. Calculation also considers fan energy savings for a VAV system.
.2 Calculation considers the savings for shut down of the East Wing unit during after hours and weekends.
.3 Calculation considers the energy savings for heat reclaim of the exhaust air of the West Wing by run around loop at 30% effectiveness. Calculation assumes that heat can be reclaimed from the entire West Wing's rated air volume of 30,000 cfm (14285 l/s) for 12 hours per day, Monday through Friday.

4.5.3 ENERGY AND GHG REDUCTION

Fuel type	Fuel consumption - unit	Fuel rate	Fuel cost	Fuel saved	Fuel consumption - unit		CO2e Savings Tonnes	% GHG Savings
Electricity	MWh	$ 125.540	6,260.2	$ 5,061	kWh	0.00	36.14	3.18%
Natural gas	GJ	$ 5.670	37,041.8	$ 38,868	m^3	102453.45	340.96	31.19%
Total				$ 43,929			377.10	**16.90%**



4.5.4 CLASS 'D' ESTIMATE AND SIMPLE PAYBACK

.1 The estimate is inclusive of
  .1 Option 4 costs plus;
    .1 New run around heat reclaim loop with pumps, coils, controls, etc.

.2 The Preliminary Construction Cost Estimate class "D" provides Hard and Soft Costs as defined, and includes the following:
  .1 Project related FEE including disbursements.
  .2 Constant Dollars Amount.
  .3 Current Dollars or Budgetary value of the project by clearly defining the:
    .1 Contingency allowance, Escalation, risk etc.

.3 The budgetary value for Option 5 is approximately $2,091,003.00. (Refer also to Appendix 'D' for detailed cost breakdown).

.4 Simple Payback equals 208 years.

4.6 OPTION 6 - LIGHTING

4.6.1 DESCRIPTION

.1 Reduce lighting levels in offices and laboratories.

4.6.2 BASIS OF ENERGY SAVINGS CALCULATION

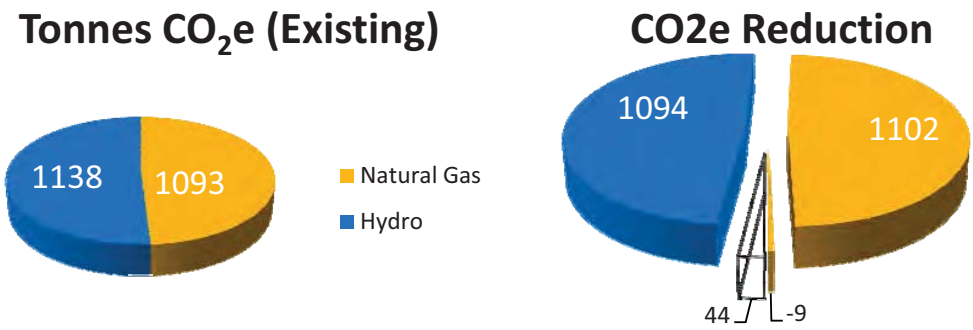
.1 Calculation considers the reduction of lighting power density in the offices and laboratories throughout the east and west wing labs from19 w/m2 to 14.7 w/m2.

.2 Calculation considers 2700 m² of office and lab area.

.3 Savings calculations are stand-alone and are not inclusive of any other energy saving scenarios.

4.6.3 ENERGY AND GHG REDUCTION

Fuel type	Fuel consumption - unit	Fuel rate	Fuel saved	Fuel cost savings	Fuel consumption - unit			
Electricity	MWh	$ 125.540	50.8	$ 6,378	kWh	50808.00	44.20	3.88%
Natural gas	GJ	$ 5.670	-171.5	$ (972)	m^3	-4481.89	-8.53	-0.78%
Total				$ 5,406			35.67	**1.60%**



4.6.4 CLASS 'D' ESTIMATE AND SIMPLE PAYBACK

.1 The estimate is;
  .1 A Break-out price for new lighting and ceiling systems throughout East and West Wing
  .2 Estimate is separate from options 1 – 5 (i.e. any option may add this option if desired).
.2 The Preliminary Construction Cost Estimate class "D" provides Hard and Soft Costs as defined, and includes the following:
  .1 Project related FEE including disbursements.
  .2 Constant Dollars Amount.
  .3 Current Dollars or Budgetary value of the project by clearly defining the:
    .1 Contingency allowance, Escalation, risk etc.
.3 The budgetary value for Option 6 is approximately $1,390,000 (Refer also to Appendix 'D' for detailed cost breakdown).
.4 Simple Payback equals 257 years.

5 PROJECT TEAM

5.1 KEY TEAM MEMBERS

5.1.1 SENIOR ARCHITECT & TEAM MANAGER

.1 David Patsula, Architect AAA
Area Design Manager, Architecture & Engineering Centre of Expertise (A&ECoE)

5.1.2 SENIOR MECHANICAL ENGINEER

.1 Brad Trott, P. Eng.
Regional Mechanical Engineering Discipline Manager, Architecture & Engineering Centre of Expertise (A&ECoE)

5.1.3 SENIOR ELECTRICAL ENGINEER

.1 Andy Dedinca, P. Eng.
Regional Electrical Engineering Discipline Manager, Architecture & Engineering Centre of Expertise (A&ECoE)

5.1.4 SENIOR COST ESTIMATOR

.1 Sukhvinder Singh Virdi, P.Eng.
Cost Estimator & Commissioning Specialist, Architecture & Engineering Centre of Expertise (A&ECoE)

6 APPENDIX A – ENERGY BILLING TABLES

Bill Date	Meter Reading Date	Peak to Peak Alloc	Rate	On Peak Usage Site Alloca	Rate	Off Peak Site Alloc	Rate	Excess Usage	Rate	Total Usage	Calc Energy Charge	Other Energy Charges	Total Energy Charges (exl GST)	Total Delivery Charges	Other Charges and Adjusts	Total Bill (excl GST)	Effective On Peak Rate	Effective Off Peak Rate
		(kWh)	($/kWh)	(kWh)	($/kWh)	(kWh)	($/kWh)	(kWh)	($/kWh)	(kWh)	($)	($)	($)	($)	($)	($)	($/kWh)	($/kWh)
Peak is 8am to 9pm					One year average of Effective on Peak Rate					0.125542 $/kWhh				One Year Consumption		1307532 kWh		
					One year average of Effective off Peak Rate					0.092835 $/kWhh				Hydro One Year Cost		$166,206		
28-Dec-12	30-Nov-12	16077	0.0806	37164	0.0737	65977	0.04735	4397	0.1045	107538	$7,618.29	$227.52	$7,845.81	$4,253.89	-$37.40	$12,062.30	$0.10	$0.09
30-Nov-12	31-Oct-12	16665	0.0806	40099	0.0737	65571	0.04735	3897	0.1563	109567	$8,012.46	$205.41	$8,217.87	$4,683.55	$25.12	$12,926.54	$0.12	$0.09
29-Oct-12	28-Sep-12	14150	0.0806	35809	0.0737	65946	0.04735	788	0.2470	102543	$7,096.80	-$547.78	$6,549.02	$6,005.45	$5.61	$12,560.08	$0.12	$0.09
29-Sep-12	31-Aug-12	17850	0.0806	46564	0.0737	60146	0.04735	1506	0.0879	108216	$7,850.77	-$438.23	$7,412.54	$6,464.64	$51.39	$13,928.57	$0.13	$0.09
27-Aug-12	31-Jul-12	16598	0.0806	45310	0.0737	63346	0.04735	706	0.2015	109362	$7,818.85	-$760.27	$7,058.58	$6,311.87	$22.29	$13,392.74	$0.12	$0.09
26-Jul-12	29-Jun-12	16282	0.0806	43347	0.0737	59164	0.04735	830	0.0136	103341	$7,319.73	-$982.10	$6,337.63	$5,958.79	$0.00	$12,296.42	$0.12	$0.08
27-Jun-12	31-May-12	16561	0.0806	43260	0.0737	63348	0.04735	2491	0.0346	109099	$7,608.72	$32.03	$7,640.75	$6,197.83	$0.00	$13,838.58	$0.13	$0.09
28-May-12	30-Apr-12	14772	0.0806	35851	0.0737	67623	0.04735	4203	0.0459	107677	$7,227.62	$221.49	$7,449.11	$6,202.86	$0.00	$13,651.97	$0.13	$0.10
27-Apr-12	30-Mar-12	17965	0.0806	41748	0.0737	65702	0.04735	6761	0.0424	114211	$7,922.33	$397.17	$8,319.50	$6,770.45	$14.62	$15,104.57	$0.13	$0.10
28-Mar-12	29-Feb-12	17204	0.0806	40914	0.0737	62796	0.04735	1601	0.0480	105311	$7,452.16	$173.14	$7,625.30	$6,890.75	$0.00	$14,516.05	$0.14	$0.10
29-Feb-12	31-Jan-12	17453	0.0806	40448	0.0737	70956	0.04735	4576	0.1301	115980	$8,342.97	$266.57	$8,609.54	$7,755.10	$15.65	$16,380.29	$0.14	$0.10
27-Jan-12	30-Dec-11	15626	0.0806	34144	0.0737	74232	0.04735	6311	0.0535	114687	$7,628.20	$265.32	$7,893.52	$7,617.75	$36.90	$15,548.17	$0.14	$0.11
28-Dec-11	30-Nov-11	16109	0.0806	37380	0.0737	65955	0.04735	6807	0.1341	110142	$8,088.88	$277.23	$8,366.11	$6,797.01	$12.30	$15,175.42	$0.14	$0.10
28-Nov-11	31-Oct-11	15086	0.0806	36307	0.0737	68771	0.04735	6852	0.0855	111930	$7,734.18	$182.90	$7,917.08	$7,356.28	$0.00	$15,273.36	$0.14	$0.11
28-Oct-11	30-Sep-11	15640	0.0806	39577	0.0737	62962	0.04735	1484	0.2524	104023	$7,533.19	-$629.76	$6,903.43	$4,936.54	$4.84	$11,844.81	$0.11	$0.08
28-Sep-11	31-Aug-11	17569	0.0806	46264	0.0737	59986	0.04735	1981	0.1302	108231	$7,923.98	-$2,527.58	$5,396.40	$5,547.86	$26.61	$10,970.87	$0.10	$0.07
26-Aug-11	29-Jul-11	15829	0.0806	43256	0.0737	64271	0.04735	1698	0.1436	109225	$7,750.88	-$1,158.23	$6,592.65	$5,405.24	$17.83	$12,015.72	$0.11	$0.08
28-Jul-11	30-Jun-11	17076	0.0806	45487	0.0737	57910	0.04735	2832	0.0216	106229	$7,531.81	-$1,344.90	$6,186.91	$3,830.64	$0.00	$10,017.55	$0.09	$0.07
27-Jun-11	31-May-11	15719	0.0806	40885	0.0737	64697	0.04735	6370	0.0266	111952	$7,512.96	$447.39	$7,960.35	$3,971.01	$25.76	$11,957.12	$0.11	$0.08
30-May-11	29-Apr-11	14772	0.0806	35840	0.0737	67681	0.04735	6414	0.0569	109935	$7,401.68	$611.52	$8,013.20	$4,621.49	$21.13	$12,655.82	$0.12	$0.09
28-Apr-11	31-Mar-11	18824	0.0806	43721	0.0737	64133	0.04735	6905	0.0490	114759	$8,114.36	$553.76	$8,668.12	$4,427.28	$42.43	$13,137.83	$0.11	$0.09
25-Mar-11	28-Feb-11	16396	0.0806	38943	0.0737	61080	0.04735	7336	0.1219	107359	$7,977.65	$130.35	$8,108.00	$3,844.42	$8.41	$11,960.83	$0.11	$0.09
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28-Jan-11	31-Dec-10	16418	0.0806	35915	0.0737	72461	0.04735	9031	0.0682	117407	$8,017.35	$169.48	$8,186.83	$4,048.66	$33.45	$12,268.94	$0.10	$0.09
29-Dec-10	30-Nov-10	16091	0.0806	37459	0.0737	65869	0.04735	16422	0.0561	119750	$8,098.33	$394.55	$8,492.88	$3,888.55	$11.56	$12,392.99	$0.10	$0.09
26-Nov-10	29-Oct-10	15125	0.0806	36455	0.0737	68764	0.04735	9401	0.0317	114620	$7,459.33	$267.38	$7,726.71	$3,751.07	$17.02	$11,494.80	$0.10	$0.08
28-Oct-10	30-Sep-10	15648	0.0806	39682	0.0737	63003	0.04735	8143	0.0278	110828	$7,395.44	$284.77	$7,680.21	$4,335.35	$17.41	$12,032.97	$0.11	$0.08
28-Sep-10	31-Aug-10	16749	0.0806	44121	0.0737	61223	0.04735	8248	0.0317	113592	$7,761.81	-$39.00	$7,722.81	$4,620.18	$15.29	$12,358.28	$0.11	$0.08
27-Aug-10	30-Jul-10	16575	0.0806	45358	0.0737	62931	0.04735	7461	0.0338	115750	$7,910.50	$27.40	$7,937.90	$4,714.82	$2.45	$12,655.17	$0.11	$0.08
29-Jul-10	30-Jun-10	17073	0.0806	45457	0.0737	57892	0.04735	10003	0.0487	113352	$7,954.30	$205.35	$8,159.65	$4,479.85	$0.00	$12,639.50	$0.11	$0.08
25-Jun-10	31-May-10	14956	0.0806	38878	0.0737	66092	0.04735	15909	0.0994	120879	$8,781.89	$368.52	$9,150.41	$4,430.53	$13.90	$13,594.84	$0.11	$0.09

Bill Date	From	To	Consumption	Rate		From	To	Consumption	Rate	Total Usage	Calc Energy Charge	Other Charges	Energy Charges (excl GST)	Riders plus Fixed Deliv Charges	Demand Charges	Total Deliver Charges	TOTAL less GST	Effective Rate less GST & Fees
			GJ	($/GJ)				GJ	($/GJ)	GJ	($)	($)	($)	($)	($)	($)	($)	($)
Average Effectiver Rate incl Fees			$5.67	$/GJ														
NG Latest Year Consumption:			21,981.39	GJ														
NG Latest Year Cost:			$90,177.89															
5-Dec-12	29-Oct	31-Oct	174.93	2.5830		31-Oct	28-Nov	2,241.20	3.6730	2,416.13	$8,683.77	-$185.69	$8,498.08	$2,017.39	$671.22	$2,688.61	$11,186.69	$4.63
5-Nov-12	26-Sep	30-Sep	57.93	1.7010		30-Sep	29-Oct	1,692.42	2.5830	1,750.35	$4,470.06	$42.27	$4,512.33	$1,535.95	$884.30	$2,420.25	$6,932.58	$3.96
3-Oct-12	29-Aug	31-Aug	38.76	2.1860		31-Aug	26-Sep	582.95	1.7010	621.71	$1,076.33	$35.87	$1,112.20	$1,001.42	$750.31	$1,751.73	$2,863.93	$4.61
6-Sep-12	27-Jul	31-Jul	30.28	2.2100		31-Jul	29-Aug	358.05	2.1860	388.33	$849.62	$42.27	$891.89	$1,134.61	$884.30	$2,018.91	$2,910.80	$7.50
3-Aug-12	27-Jun	30-Jun	29.95	2.7480		30-Jun	27-Jul	286.55	2.2100	316.50	$715.58	$38.43	$754.01	$1,024.32	$803.91	$1,828.23	$2,582.24	$8.16
5-Jul-12	29-May	31-May	65.05	1.3310		31-May	27-Jun	544.34	2.7480	609.39	$1,582.43	$37.15	$1,619.58	$1,089.15	$777.11	$1,866.26	$3,485.84	$5.72
5-Jun-12	26-Apr	30-Apr	204.29	1.7000		30-Apr	29-May	1,065.98	1.3310	1,270.27	$1,766.11	$42.27	$1,808.38	$1,234.93	$884.30	$2,119.23	$3,927.61	$3.09
3-May-12	28-Mar	31-Mar	168.39	2.0990		31-Mar	26-Apr	1,476.80	1.7000	1,645.19	$2,864.01	$37.15	$2,901.16	$1,227.18	$777.11	$2,004.29	$4,905.45	$2.98
4-Apr-12	27-Feb	29 feb	200.34	2.0640		29 feb	28-Mar	2,098.77	2.0990	2,299.11	$4,818.82	$38.43	$4,857.25	$1,475.69	$803.90	$2,279.59	$7,136.84	$3.10
5-Mar-12	27-Jan	31-Jan	239.86	2.9570		31-Jan	27-Feb	2,418.47	2.0640	2,658.33	$5,700.99	$39.71	$5,740.70	$1,726.83	$830.71	$2,557.54	$8,298.24	$3.12
3-Feb-12	28-Nov	30-Nov	155.49	3.3110		30-Nov	28-Dec	2,353.88	3.3620									
3 Feb cont'd	28-Dec	31-Dec	224.77	3.3620		31-Dec	27-Jan	2,762.57	2.9570	5,496.71	$17,353.17	$93.86	$17,447.03	$5,032.82	$1,399.62	$6,432.44	$23,879.47	$4.34
5-Jan-12	28-Nov	30-Nov	155.49	3.3110		30-Nov	28-Dec	2,353.88	3.3620	2,509.37	$8,428.57	$53.88	$8,482.45	$2,990.04	$595.71	$3,585.75	$12,068.20	$4.81
5-Dec-11	27-Oct	31-Oct	205.63	3.6700		31-Oct	28-Nov	2,297.97	3.3110	2,503.60	$8,363.24	$57.47	$8,420.71	$3,226.94	$697.89	$3,924.83	$12,345.54	$4.93
3-Nov-11	28-Sep	30-Sep	43.9	3.3230		30-Sep	27-Oct	1,407.36	3.6700	1,451.26	$5,310.89	$52.09	$5,362.98	$2,087.56	$907.53	$2,995.09	$8,358.07	$5.76
5-Oct-11	29-Aug	31-Aug	88.53	3.8960		31-Aug	28-Sep	592.76	3.3230	681.29	$2,314.65	$53.88	$2,368.53	$1,548.48	$938.82	$2,487.30	$4,855.83	$7.13
6-Sep-11	27-Jul	31-Jul	42.16	4.0840		31-Jul	29-Aug	470.09	3.8960	512.25	$2,003.65	$59.27	$2,062.92	$1,568.51	$1,032.71	$2,601.22	$4,664.14	$9.11
4-Aug-11	28-Jun	30-Jun	23.98	3.8960		30-Jun	27-Jul	350.27	4.0840	374.25	$1,523.93	$52.09	$1,576.02	$1,328.18	$907.53	$2,235.71	$3,811.73	$10.18
6-Jul-11	27-May	31-May	168.85	3.6450		31-May	28-Jun	710.85	3.8960	879.70	$3,384.93	$54.39	$3,439.32	$1,801.02	$1,001.41	$2,802.43	$6,241.75	$7.10
3-Jun-11	27-Apr	30-Apr	207.51	3.8500		30-Apr	27-May	988.81	3.6450	1,196.32	$4,403.13	$53.88	$4,457.01	$1,933.67	$938.82	$2,872.49	$7,329.50	$6.13
5-Apr-11	24-Feb	28-Feb	389.65	4.2110		28-Feb	29-Mar	2,253.15	3.0710	2,642.80	$8,560.24	$42.27	$8,602.51	$2,870.09	$1,032.71	$3,902.80	$12,505.31	$4.73
3-Mar-11	27-Jan	31-Jan	363.14	2.8810		31-Jan	24-Feb	1,650.32	4.2110	2,013.46	$7,995.70	$35.87	$8,031.57	$2,454.30	$876.24	$3,330.54	$11,362.11	$5.64
3-Feb-11	29-Dec	31-Dec	242.4	3.9000		31-Dec	27-Jan	2,412.20	2.8810	2,654.60	$7,894.91	$37.07	$7,931.98	$2,713.36	$977.94	$3,691.30	$11,623.28	$4.38
6-Jan-11	31-Oct	30-Nov	2926.69	3.2120		30-Nov	29-Dec	2,585.24	3.9000	5,511.93	$19,482.96	$73.29	$19,556.25	$5,258.06	$3,923.50	$9,181.56	$28,737.81	$5.21
3-Dec-10	27-Oct	31-Oct	258.29	3.3260						258.29	$859.07	$4.97	$864.04	$260.56	$266.00	$526.56	$1,390.60	$5.38
3-Nov-10	28-Sep	30-Sep	56.03	3.7300		30-Sep	27-Oct	1,019.89	3.3260	1,075.92	$3,601.15	$36.00	$3,637.15	$1,354.95	$1,467.07	$2,822.02	$6,459.17	$6.00
5-Oct-10	27-Aug	31-Aug	131.72	2.3460		31-Aug	28-Sep	965.76	3.7300	1,097.48	$3,911.30	$39.75	$3,951.05	$1,276.53	$1,430.05	$2,706.58	$6,657.63	$6.07
3-Sep-10	28-Jul	31-Jul	21.99	4.2210		31-Jul	27-Aug	375.33	2.3460	397.32	$973.34	$36.28	$1,009.62	$691.81	$1,340.67	$2,032.48	$3,042.10	$7.66
5-Aug-10	25-Jun	30-Jun	48.16	4.1080		30-Jun	28-Jul	488.30	4.2210	536.46	$2,258.96	$30.28	$2,289.24	$653.17	$1,474.74	$2,127.91	$4,417.15	$8.23
6-Jul-10	27-May	31-May	305.62	3.0620		31-May	25-Jun	640.93	4.1080	946.55	$3,568.75	$26.62	$3,595.37	$884.04	$1,295.99	$2,180.03	$5,775.40	$6.10
3-Jun-10	28-Apr	30-Apr	127.61	3.3770		30-Apr	27-May	1,126.81	3.0620	1,254.42	$3,881.23	$26.63	$3,907.86	$969.62	$1,295.98	$2,265.60	$6,173.46	$4.92
5-May-10	29-Mar	30-Mar	105.36	5.1800		31-Mar	28-Apr	1,296.93	3.3700	1,402.29	$4,916.42	$36.61	$4,953.03	$772.40	$1,348.60	$2,121.00	$7,074.03	$5.04

7 APPENDIX B – WEST WING LOAD CALCULATION

RTS COOLING LOAD CALCULATIONS					MASTER INPUT DATA			February 15, 2013	
ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		Page:	1
IDENTIFICATION:		Design Firm:	Public Works & Gov't Services Canada						
		Project Engineer:	Brad Trott P.Eng						
		Project Name:	Geological Survey Building						
		Project Location:	Calgary, Alberta						
		Project Number:							
SITE:	CAN - AB - CALGARY INT'L A - 0.4%				DESIGN CONDITIONS:				
					Inside Design Conditions:			Supply Air Temp:	
Latitude:	51.11	Month:	DB, F	MWB, F	Cooling:			Cooling:	
Longitude:	-114.02	1	53.7	40.8	DB, F	74		DB, F	49.6
Elevation	3556	2	59.2	42.3	RH	50%			
		3	62.4	44.5	Heating:			Heating:	
		4	72.5	51.0	DB, F	72		DB, F	100
Htg 99.6%	-20.4	5	81.3	56.8					
		6	82.9	58.7					
TZ +/- UTC:	-7	7	87.9	62.2		INTERNAL LOADS:			
Time Zone:	Mountain	8	88.0	60.9	Default:	People:	Default:	Lighting:	Equip.:
Std Merid:	-105	9	83.2	57.4	Sf/person:	200	Watts/sf:	3	2
		10	73.9	53.1	Btuh/person:				
Solar:		11	59.4	44.3	Sensible:	250			
Gnd Reflec	20%	12	53.9	39.2	Latent:	200			
RADIANT TIME SERIES SELECTION:					Convective %:		Convective %:		
	MW no Carpet 50% glass					40%		52%	70%
					Radiant %:	60%	Radiant %:	48%	30%
	RTS Type:	11				Usage		Usage	Usage
RTS Data:	Hour	Non-Solar	Solar		Hour	Profile		Profile	Profile
	1	33%	29%		1	0%		0%	0%
	2	16%	15%		2	0%		0%	0%
	3	10%	10%		3	0%		0%	0%
	4	7%	7%		4	0%		0%	0%
	5	5%	6%		5	0%		0%	0%
	6	4%	5%		6	0%		0%	0%
	7	3%	4%		7	100%		100%	100%
	8	3%	3%		8	100%		100%	100%
	9	2%	3%		9	100%		100%	100%
	10	2%	3%		10	100%		100%	100%
	11	2%	2%		11	100%		100%	100%
	12	2%	2%		12	100%		100%	100%
	13	1%	2%		13	100%		100%	100%
	14	1%	2%		14	100%		100%	100%
	15	1%	1%		15	100%		100%	100%
	16	1%	1%		16	100%		100%	100%
	17	1%	1%		17	100%		100%	100%
	18	1%	1%		18	100%		100%	100%
	19	1%	1%		19	0%		0%	0%
	20	1%	1%		20	0%		0%	0%
	21	1%	1%		21	0%		0%	0%
	22	1%	0%		22	0%		0%	0%
	23	1%	0%		23	0%		0%	0%
	24	0%	0%		24	0%		0%	0%

RTS COOLING LOAD DEMONSTRATION								February 15, 2013
MASTER INPUT DATA								Page: 2
IDENTIFICATION:	Geological Survey Building							
	Calgary, Alberta							
EXTERIOR EXPOSURES:						Plan Rotation:	0	degrees
		Nominal	North	South	East	West	Roof	
		Azimuth:	-180	0	-90	90	0	
		Actual:	-180	0	-90	90	0	
		Tilt:	90	90	90	90	0	
WALL DATA:	TYPE 1 WALL			TYPE 2 WALL			ROOF DATA:	
Descrip.	Brick pilasters			Spandrel panels		Descrip:	Metal deck	
Input Actual "U" :	0.08			0.08		Input Actual "U" :	0.07	
Absorbtance:	0.45			0.9		Absorbtance:	0.45	
h(outside):	3			3		h(outside):	3	
Emittance:	1			1		Emittance:	1	
delta R:	0			0		delta R:	20	
Convective %:	54%			54%		Convective %:	40%	
Radiant %:	46%			46%		Radiant %:	60%	
	4" LW Concrete. R-10 Bd, 4" LW Conc			Spandrel Glass, R-10 Bd, Gyp Bd			Memb, R-10 Bd, Mtl Dk	
Similar CTS ID:	Wall # 29			Wall # 1		Similar CTS ID:	Roof # 9	
	4" LW Concrete. R-10 Board Insulation, 4" LW Concrete			Spandrel Glass, R-10 Insulation Board, Gyp Board			Membrane, Sheathing, R-10 Insulation Board, Metal Deck	
Hour						Hour		
1	1%			18%		1		18%
2	1%			58%		2		61%
3	3%			20%		3		18%
4	6%			4%		4		3%
5	8%			0%		5		0%
6	9%			0%		6		0%
7	9%			0%		7		0%
8	9%			0%		8		0%
9	8%			0%		9		0%
10	7%			0%		10		0%
11	7%			0%		11		0%
12	6%			0%		12		0%
13	5%			0%		13		0%
14	4%			0%		14		0%
15	4%			0%		15		0%
16	3%			0%		16		0%
17	2%			0%		17		0%
18	2%			0%		18		0%
19	1%			0%		19		0%
20	1%			0%		20		0%
21	1%			0%		21		0%
22	1%			0%		22		0%
23	1%			0%		23		0%
24	1%			0%		24		0%

RTS COOLING LOAD DEMONSTRATION								February 15, 2013
MASTER INPUT DATA								Page: 3
IDENTIFICATION:	Geological Survey Building							
	Calgary, Alberta							
	WINDOW TYPE 1				WINDOW TYPE 2			
Window.Width:	3.70	ft		Window.Width:	6.25	ft		
Window Height:	5.00	ft		Window Height:	6.40	ft		
Description:	Dbl glazed, low-E, bronze			Description:	Dbl glz, low-E, brnz 10' ohng			
Window Area:	18.50	sf		Window Area:	40.00	sf		
Overall U-value:	0.56			Overall U-value:	0.56			
Dbl Glz Uncoat, 1/4 in, CLR CLR, SHGC(0)= 0.7				Dbl Glz Uncoat, 1/4 in, BRZ CLR, SHGC(0)= 0.49				
	17				19			
SHGC(0):	70%			SHGC(0):	49%			
SHGC(40):	67%			SHGC(40):	46%			
SHGC(50):	64%			SHGC(50):	44%			
SHGC(60):	58%			SHGC(60):	39%			
SHGC(70):	45%			SHGC(70):	31%			
SHGC(80):	23%			SHGC(80):	17%			
SHGC(90):	0%			SHGC(90):	0%			
SHGC(Hemis):	60%			SHGC(Hemis):	41%			
IAC(0):	0.74			IAC(0):	0.74			
IAC(60):	0.65			IAC(60):	0.65			
IAC(diff):	0.79			IAC(diff):	0.79			
Unshaded % C:	0%			Unshaded % C:	0%			
Unshaded % R:	100%			Unshaded % R:	100%			
Shaded % C:	54%			Shaded % C:	54%			
Shaded % R:	46%			Shaded % R:	46%			
	Overhang:				Overhang:			
Overhang Depth:	0	ft		Overhang Depth:	10	ft		
Overhang Above wind:	0	ft		Overhang Above wind:	0	ft		
	Vertical Projection:				Vertical Projection:			
Depth:	0	ft		Depth:	0	ft		
Distance from Wind:	0	ft		Distance from Wind:	0	ft		

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		NW	Second Floor Offices					
	Length:	192	feet				Infiltration cfm	
	Width:	18	feet	Area	3456	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	51840	cubic feet	0	41
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:		250	11059.2	1215		RH	50%
	Default:	17	Latent:	10368	6912	Heating:	DB, F	72
	Use:	17	200	11059	1215	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West		CAN - AB - CALGARY INT'L A - 0.4%	
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:	17280	17280	270	270	Brick pilasters		
	Type 2 Wall Area, sf:	0	0	0	0	Spandrel panels		
	No. Type 1 Windows:	8	8	0	0	Dbl glazed, low-E, bronze		
	No. Type 2 Windows:	0	0	0	0	Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	30%	= Roof % to RA		26%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	17	234	3,970		3,400	
			watts:	Btuh/room sf				
		Lighting:	11,059	7.6	26,433			
	Lightiing % to RA:		26%	2.7		9,287		
		Equipment:	1,215	1.2	4,006			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
	Roof % to RA:		30%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	17280	0.3	5,906			127,734
		South	17280	1.0	17,853			127,734
		East	270	1.2	325			1,996
		West	270	0.6	171			1,996
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	148	17.3	2,560			7,658
70%	SHGF(0)	South	148	22.1	3,274			7,658
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	41	101.6				4,167
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	64,498	9,287	3,400	278,943
				COOLING CFM =	2,403		HEATING CFM =	9,057
				CFM/SF =	0.7			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			77,185		ROOM HTG:	278,943
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	4.36915797	HP to S. Air:	11,124		TOT HEATING,btuh=	278,943
		PUMP HEAT:	0	HP to CHW:	-		Heating btuh/sf =	80.7
					=====	tons	sf/ton	
				TOTAL BLOCK COOLING LOAD, btuh -	88,309	7.4	470	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		SEO	Second Floor Perimeter Corridor					
	Length:	94	feet				Infiltration cfm	
	Width:	3	feet	Area	282	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	4230	cubic feet	0	41
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	0	250	902.4	1215		RH	50%
	Default:	1	Latent:	846	564	Heating:	DB, F	72
	Use:	1	200	902	1215	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:			705	705	Brick pilasters		
	Type 2 Wall Area, sf:	0	0	0	0	Spandrel panels		
	No. Type 1 Windows:				0	Dbl glazed, low-E, bronze		
	No. Type 2 Windows:	0	0	0	0	Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	30%	= Roof % to RA		26%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	1	234	234		200	
			watts:	Btuh/room sf				
		Lighting:	902	7.6	2,157			
	Lightiing % to RA:		26%	2.7		758		
		Equipment:	1,215	14.2	4,006			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07 U factor		-	0.0	-			-
	Roof % to RA:		30%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	705	1.2	849			5,211
		West	705	0.6	446			5,211
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
	Cooling, Sensible:		0	0.0	-			
	Cooling, Latent:		0	0.0			-	
		Heating:	41	101.6				4,167
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	7,692	758	200	14,590
				COOLING CFM =	287	HEATING CFM =		474
				CFM/SF =	1.0			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			8,650		ROOM HTG:	14,590
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	0.52108139	HP to S. Air:	1,327	TOT HEATING,btuh=		14,590
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		51.7
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			9,977	0.8	339	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						**rev 2009.05.25**		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		**NEPC**	**Second Floor Labs**					
	Length:	**72**	feet				Infiltration cfm	
	Width:	**47**	feet	Area	3384	sq. feet	Cooling:	Heating:
	Ceiling Height:	**15**	feet	Volume	50760	cubic feet	**0**	**863**
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:		250	**8460**	**1**		RH	50%
	Default:	17	Latent:	10152	6768	Heating:	DB, F	72
	Use:	17	200	8460	1	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:					Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:					Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	**3384**	**0%**	= Roof % to RA		**0%**	= Lights % to RA	
ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	15	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	17	228	3,868		3,400	
			watts:	Btuh/room sf				
		Lighting:	8,460	7.9	26,772			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	1	0.0	3			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	3,384	2.6	8,822			21,888
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
	Cooling, Sensible:		0	0.0	-			
	Cooling, Latent:		0	0.0			-	
		Heating:	863	101.6				87,715
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	**39,464**	**-**	**3,400**	**109,603**
				COOLING CFM =	**1,470**	**HEATING CFM =**		**3,559**
				CFM/SF =	**0.4**			
BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			42,864		ROOM HTG:	109,603
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	152,900		OA Heating:	1,016,400
Month:	7	OA cfm =	**10000**	OA Latent:	-			=====
Hour:	15	FAN HEAT:	**2.67333945**	HP to S. Air:	6,807	**TOT HEATING,btuh=**		**1,126,003**
		PUMP HEAT:	**0**	HP to CHW:	-	**Heating btuh/sf =**		**332.7**
					=====	**tons**	**sf/ton**	
				TOTAL BLOCK COOLING LOAD, btuh -	**202,570**	**16.9**	**200**	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		NEPC	Main Floor Offices					
	Length:	192	feet				Infiltration cfm	
	Width:	18	feet	Area	3456	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	51840	cubic feet	0	863
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	1	250	8640	1		RH	50%
	Default:	17	Latent:	10368	6912	Heating:	DB, F	72
	Use:	1	200	8640	1	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West		CAN - AB - CALGARY INT'L A - 0.4%	
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:	17280	17280	270	270	Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:	8	8	0	0	Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	1	234	234		200	
			watts:	Btuh/room sf				
		Lighting:	8,640	8.1	27,907			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	1	0.0	3			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
		Roof % to RA:	0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	17280	0.3	5,906			127,734
		South	17280	1.0	17,853			127,734
		East	270	1.2	325			1,996
		West	270	0.6	171			1,996
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	148	17.3	2,560			7,658
70%	SHGF(0)	South	148	22.1	3,274			7,658
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	863	101.6				87,715
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	58,232	-	200	362,491
				COOLING CFM =	2,170	HEATING CFM =		11,769
				CFM/SF =	0.6			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			58,432		ROOM HTG:	362,491
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	3.94471343	HP to S. Air:	10,044	TOT HEATING,btuh=		362,491
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		104.9
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			68,475	5.7	606	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		AHU-2	Main Floor Perimeter Corridor					
	Length:	94	feet				Infiltration cfm	
	Width:	3	feet	Area	282	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	4230	cubic feet	0	0
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	20	250	902.4	705		RH	50%
	Default:	1	Latent:	846	564	Heating:	DB, F	72
	Use:	20	200	902	705	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:			705	705	Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:					Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	20	234	4,670		4,000	
			watts:	Btuh/room sf				
		Lighting:	902	10.3	2,915			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	705	8.2	2,325			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	705	1.2	849			5,211
		West	705	0.6	446			5,211
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	0	0.0				-
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	11,205	-	4,000	10,423
				COOLING CFM =	417	HEATING CFM =		338
				CFM/SF =	1.5			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			15,205		ROOM HTG:	10,423
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	0.76	HP to S. Air:	1,933	TOT HEATING,btuh=		10,423
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		37.0
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			17,137	1.4	197	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		AHU-2	Main Floor Lab					
	Length:	73.3	feet				Infiltration cfm	
	Width:	73.3	feet	Area	5373	sq. feet	Cooling:	Heating:
	Ceiling Height:	12	feet	Volume	64475	cubic feet	0	0
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	20	250	17193.248	13432.225		RH	50%
	Default:	27	Latent:	16119	10746	Heating:	DB, F	72
	Use:	20	200	17193	13432	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:					Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:					Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	1	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	20	234	4,670		4,000	
			watts:	Btuh/room sf				
		Lighting:	17,193	10.3	55,533			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	13,432	8.2	44,292			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	0	0.0				-
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	104,496	-	4,000	-
				COOLING CFM =	3,893	HEATING CFM =		-
				CFM/SF =	0.7			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			106,700		ROOM HTG:	-
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	154,000		OA Heating:	1,016,400
Month:	8	OA cfm =	10000	OA Latent:	-			=====
Hour:	15	FAN HEAT:	7.08	HP to S. Air:	18,023	TOT HEATING,btuh=		1,016,400
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		189.2
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			278,723	23.2	231	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		IAS	Basement Floor Offices					
	Length:	192	feet				Infiltration cfm	
	Width:	18	feet	Area	3456	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	51840	cubic feet	0	0
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	5	250	4436	1000		RH	50%
	Default:	17	Latent:	10368	6912	Heating:	DB, F	72
	Use:	5	200	4436	1000	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:	17280	17280	270	270	Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:	0	0	0	0	Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	5	234	1,168		1,000	
			watts:	Btuh/room sf				
		Lighting:	4,436	4.1	14,328			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	1,000	1.0	3,297			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	17280	0.3	5,906			127,734
		South	17280	1.0	17,853			127,734
		East	270	1.2	325			1,996
		West	270	0.6	171			1,996
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	0	0.0				-
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	43,048	-	1,000	259,459
				COOLING CFM =	1,604	HEATING CFM =		8,424
				CFM/SF =	0.5			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			44,048		ROOM HTG:	259,459
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	2.91611725	HP to S. Air:	7,425	TOT HEATING,btuh=		259,459
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		75.1
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			51,472	4.3	806	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		IAS	Basement Floor Corridor					
	Length:	94	feet				Infiltration cfm	
	Width:	3	feet	Area	282	sq. feet	Cooling:	Heating:
	Ceiling Height:	15	feet	Volume	4230	cubic feet	0	0
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	5	250	4436	1000		RH	50%
	Default:	1	Latent:	846	564	Heating:	DB, F	72
	Use:	5	200	4436	1000	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:			705	705	Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:					Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	7	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	5	234	1,168		1,000	
			watts:	Btuh/room sf				
		Lighting:	4,436	50.8	14,328			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	1,000	11.7	3,297			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07	U factor	-	0.0	-			-
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	705	1.2	849			5,211
		West	705	0.6	446			5,211
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
		Cooling, Sensible:	0	0.0	-			
		Cooling, Latent:	0	0.0			-	
		Heating:	0	0.0				-
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	20,088	-	1,000	10,423
				COOLING CFM =	748	HEATING CFM =		338
				CFM/SF =	2.7			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			21,088		ROOM HTG:	10,423
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	-		OA Heating:	-
Month:	7	OA cfm =	0	OA Latent:	-			=====
Hour:	18	FAN HEAT:	1.36082035	HP to S. Air:	3,465	TOT HEATING,btuh=		10,423
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		37.0
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			24,553	2.0	138	

ASHRAE RTS COOLING LOAD CALCULATION METHOD						rev 2009.05.25		15-Feb-13
	Public Works & Gov't Services Canada							Brad Trott P.Eng
0	Geological Survey Building							Calgary, Alberta
ROOM NO./NAME:		IAS	Basement Floor Labs					
	Length:	36.4	feet				Infiltration cfm	
	Width:	36.4	feet	Area	1325	sq. feet	Cooling:	Heating:
	Ceiling Height:	12	feet	Volume	15900	cubic feet	0	0
INTERNAL LOADS:			Btuh/person:	Lighting,	Equipment,	Inside Design Conditions:		
		# People:	Sensible:	watts:	watts:	Cooling:	DB, F	74
	Over-ride Room Input:	7	250	14195.2	1987.44		RH	50%
	Default:	7	Latent:	3975	2650	Heating:	DB, F	72
	Use:	7	200	14195	1987	Outside Cooling Weather:		
EXPOSURES:		North	South	East	West	CAN - AB - CALGARY INT'L A - 0.4%		
	Nominal Azimuth:	-180	0	-90	90	Heating 99.6%, F:		-20.4
	Actual Azimuth:	-180	0	-90	90	Supply	Cooling, F	49.6
	Tilt:	90	90	90	90	Air:	Heating, F	100
	Type 1 Wall Area, sf:					Brick pilasters		
	Type 2 Wall Area, sf:					Spandrel panels		
	No. Type 1 Windows:					Dbl glazed, low-E, bronze		
	No. Type 2 Windows:					Dbl glz, low-E, brnz 10' ohng		
	Roof Area, sf:	0	0%	= Roof % to RA		0%	= Lights % to RA	

ROOM LOADS:		Peak Rm.Sens. Occurs:			Room	Ret. Air	Room	Room
		Month:	1	Per Unit	Sensible	Sensible	Latent	Sensible
		Hour:	18	Cooling	Cooling:	Cooling:	Cooling	Heating:
INTERNAL LOADS:			No. People:	Btuh/pers	Btuh	Btuh	Btuh	Btuh
		People:	7	234	1,635		1,400	
			watts:	Btuh/room sf				
		Lighting:	14,195	34.6	45,850			
	Lightiing % to RA:		0%	0.0		-		
		Equipment:	1,987	4.9	6,554			
ENVELOPE LOADS:								
			Roof Area,sf	Btuh/roof sf				
ROOF:	0.07 U factor		-	0.0	-			-
	Roof % to RA:		0%			-		
WALLS:			Wall Area,sf	Btuh/wall sf				
	Wall Type 1:	Brick pilasters						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
	Wall Type 2	Spandrel panels						
0.08	U factor	North	0	0.0	-			-
		South	0	0.0	-			-
		East	0	0.0	-			-
		West	0	0.0	-			-
WINDOWS:			Window Area,sf:	Btuh/win sf				
	Window Type 1:	Dbl glazed, low-E, bronze						
18.5	sf/window	North	0	0.0	-			-
70%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
	Window Type 2:	Dbl glz, low-E, brnz 10' ohng						
40	sf/window	North	0	0.0	-			-
49%	SHGF(0)	South	0	0.0	-			-
0.56	U factor	East	0	0.0	-			-
74%	IAC	West	0	0.0	-			-
INFILTRATION LOADS:			cfm	Btuh/cfm				
	Cooling, Sensible:		0	0.0	-			
	Cooling, Latent:		0	0.0			-	
	Heating:		0	0.0				-
					=====	=====	=====	=====
				ROOM LOAD TOTALS =	54,038	-	1,400	-
				COOLING CFM =	2,013	HEATING CFM =		-
				CFM/SF =	1.5			

BLOCK LOADS:		TOTAL ROOM SENS+RA+LATENT =			54,385		ROOM HTG:	-
Peak Block Load Occurs:		OUTSIDE AIR:		OA Sensible:	154,000		OA Heating:	1,016,400
Month:	8	OA cfm =	10000	OA Latent:	-			=====
Hour:	15	FAN HEAT:	3.66060415	HP to S. Air:	9,320	TOT HEATING,btuh=		1,016,400
		PUMP HEAT:	0	HP to CHW:	-	Heating btuh/sf =		767.1
					=====	tons	sf/ton	
		TOTAL BLOCK COOLING LOAD, btuh -			217,705	18.1	73	

ASHRAE RTS COOLING LOAD CALCULATION METHOD **rev 2009.05.25** 15-Feb-13

Public Works & Gov't Services Canada — Brad Trott P.Eng

0 Geological Survey Building — Calgary, Alberta

SUMMARY SHEET

West Wing Labs	Area ft^2	Cooling cfm	Block Clg Load tons	Intensity cfm/ft^2	Tot Htg btuh	Intensity btuh/ft^2
2nd Flr Offices	3456.0	2403.0	7.4	0.7	278942.7	80.7
2nd Flr Perim Corr	282.0	286.6	0.8	1.0	14590.0	51.7
2nd Flr Labs	3384.0	1470.3	16.9	0.4	1126003.0	332.7
Main Flr Offices	3456.0	2169.6	5.7	0.6	362490.7	104.9
Main Flr Perim Corr	282.0	417.5	1.4	1.5	10422.7	37.0
Main Flr Labs	5372.9	3893.3	23.2	0.7	1016400.0	189.2
Bsment Flr Offices	3456.0	1603.9	4.3	0.5	259459.2	75.1
Bsment Flr Corr	282.0	748.5	2.0	2.7	10422.7	37.0
Bsment Flr Labs	1325.0	2013.3	18.1	1.5	1016400.0	767.1
Total WW	21295.9	**15006.0**	**79.9**		**4095131.0**	

8 APPENDIX C – ARCHITECTURAL DRAWINGS

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES / SERVICES IMMOBILIERS
Western Region / Région de l'ouest

LEGEND:

- CIRCULATION SPACE
- SERVICE SPACE
- OFFICE SPACE
- LABORATORY SPACE
- OFFICE SPACE (TO BE RELOCATED)
- LABORATORY SPACE (TO BE RELOCATED)

DO NOT SCALE DRAWINGS

Client/client	Project title/Titre du projet	Drawing title/Titre du dessin	Approved by/Approuvé par	PWGSC Project Manager/Administrateur de Projets TPSGC	Project No./No. du projet
NATURAL RESOURCES CANADA	GEOLOGICAL SURVEY OF CANADA 3303 - 33 STREET NW, CALGARY, ALBERTA HVAC AND SPACE OPTIMIZATION PHASE 1	FLOOR PLAN (1:250) LEVEL 2 - EXISTING	Designed by/Concept par	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'ingénierie, TPSGC	R.061749.001
			Drawn by/Dessiné par	Date/Date 2013-03-04	Sheet/Feuille 01 OF 03 / Revision/ Revision

A0 – PWGSC – ANSI B–L2 – 11X17

Level 2 - Arch Existing

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES / SERVICES IMMOBILIERS
Western Region / Région de l'ouest

LEGEND:

- CIRCULATION SPACE
- SERVICE SPACE
- OFFICE SPACE
- LABORATORY SPACE
- OFFICE SPACE (RELOCATED)
- LABORATORY SPACE (RELOCATED)

DO NOT SCALE DRAWINGS

Client/client NATURAL RESOURCES CANADA	Project title/Titre du projet GEOLOGICAL SURVEY OF CANADA 3303 - 33 STREET NW, CALGARY, ALBERTA HVAC AND SPACE OPTIMIZATION PHASE 1	Drawing title/Titre du dessin FLOOR PLAN (1:250) LEVEL 2 - OPTION A	Approved by/Approuvé par	PWGSC Project Manager/Administrateur de Projets TPSGC	Project No./No. du projet R.061749.001	
			Designed by/Concept par	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'ingénierie, TPSGC	Sheet/Feuille 02 OF 03	Revision/ Revision
			Drawn by/Dessiné par	Date/Date 2013-03-04		

A0 – PWGSC – ANSI B–L2 – 11X17

Level 2 - Arch Option A

Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES / SERVICES IMMOBILIERS
Western Region / Région de l'ouest

DO NOT SCALE DRAWINGS

Client/client	Project title/Titre du projet	Drawing title/Titre du dessin	Approved by/Approuvé par	PWGSC Project Manager/Administrateur de Projets TPSGC	Project No./No. du projet
NATURAL RESOURCES CANADA	GEOLOGICAL SURVEY OF CANADA 3303 - 33 STREET NW, CALGARY, ALBERTA HVAC AND SPACE OPTIMIZATION PHASE 1	FLOOR PLAN (1:250) LEVEL 2 - OPTION B	Designed by/Concept par	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'ingénierie, TPSGC	R.061749.001
			Drawn by/Dessiné par	Date/Date 2013-03-20	Sheet/Feuille 03 OF 03

Revision/Revision

A0 – PWGSC – ANSI B–L2 – 11X17

Level 2 - Arch Option B

9 APPENDIX D – PROJECT COST SUMMARY

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 1) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 86 M²
PWGSC	$1	$0	$1		$0	$1	0.68%	$0	$1	$0 /M²
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building Administration	$1	$0	$1	20%	$0	$1	0%	$0	$1	$0 /M²
Base Building Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Consultants	$0	$0	$0		$0	$0		$0	$0	$0 /M²
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Construction	$11,381	$0	$11,381		$0	$11,381		$569	$11,950	$138 /M²
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$11,381	$0	$11,381	0%	$0	$11,381	5%	$569	$11,950	$138 /M²
Client	$0	$0	$0		$0	$0		$0	$0	$0 /M²
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	$11,382	$0	$11,382		$0	$11,382	5.00%	$569	$11,951	$138 /M²
					PWGSC	$0		$0		
					Consultants	$0		$0		
					Construction	$47		$2		
					PWGSC	$0		$0		Cost/M²
					Escalation	$47	5.00%	$2	$50	$1 /M²
					Budget-Year Dollars (Excluding Risk)	$11,429	5.00%	$571	$12,000	$139 /M²
					PWGSC	$0				
					Consultants	$0				
					Construction	$0				
					PWGSC	$0				Cost/M²
					Risk Allowance	$0	5%	$0	$0	$0 /M²
					Total Cost in Budget-Year Dollars	$11,429	5.00%	$571	$12,000	$139 /M²

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 2) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 86 M²
PWGSC	**$9,120**	**$0**	**$9,120**		**$1,824**	**$10,944**	1.67%	**$182**	**$11,126**	**$129 /M²**
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building Administration	$6,080	$0	$6,080	20%	$1,216	$7,296	0%	$0	$7,296	$84 /M²
Base Building Disbursements	$3,040	$0	$3,040	20%	$608	$3,648	5%	$182	$3,830	$44 /M²
Consultants	**$25,839**	**$0**	**$25,839**		**$5,168**	**$31,007**		**$1,550**	**$32,557**	**$377 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$25,839	$0	$25,839	20%	$5,168	$31,007	5%	$1,550	$32,558	$377 /M²
Construction	**$151,996**	**$0**	**$151,996**		**$0**	**$151,996**		**$7,600**	**$159,596**	**$1,846 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$151,996	$0	$151,996	0%	$0	$151,996	5%	$7,600	$159,596	$1,846 /M²
Client	**$0**	**$0**	**$0**		**$0**	**$0**		**$0**	**$0**	**$0 /M²**
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	**$186,955**	**$0**	**$186,955**		**$6,992**	**$193,947**	4.81%	**$9,333**	**$203,279**	**$2,352** /M²
					PWGSC	$62		$1		
					Consultants	$182		$9		
					Construction	$2,412		$121		
					PWGSC	$0		$0		**Cost/M²**
					Escalation	**$2,655**	4.92%	**$131**	**$2,786**	**$32 /M²**
					Budget-Year Dollars (Excluding Risk)	**$196,602**	4.81%	**$9,463**	**$206,065**	**$2,384** /M²
					PWGSC	$0				
					Consultants	$620				
					Construction	$15,200				
					PWGSC	$0				**Cost/M²**
					Risk Allowance	**$15,820**	**5%**	**$791**	**$16,611**	**$192 /M²**
					Total Cost in Budget-Year Dollars	**$212,422**	4.83%	**$10,254**	**$222,676**	**$2,576** /M²

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 3) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 2,140 M²
PWGSC	**$131,512**	**$0**	**$131,512**		**$26,302**	**$157,815**	1.67%	**$2,630**	**$160,445**	**$75 /M²**
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building Administration	$87,675	$0	$87,675	20%	$17,535	$105,210	0%	$0	$105,210	$49 /M²
Base Building Disbursements	$43,837	$0	$43,837	20%	$8,767	$52,605	5%	$2,630	$55,235	$26 /M²
Consultants	**$372,619**	**$0**	**$372,619**		**$74,524**	**$447,142**		**$22,357**	**$469,499**	**$219 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$372,619	$0	$372,619	20%	$74,524	$447,142	5%	$22,357	$469,499	$219 /M²
Construction	**$2,191,874**	**$0**	**$2,191,874**		**$0**	**$2,191,874**		**$109,594**	**$2,301,468**	**$1,075 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$2,191,874	$0	$2,191,874	0%	$0	$2,191,874	5%	$109,594	$2,301,467	$1,075 /M²
Client	**$0**	**$0**	**$0**		**$0**	**$0**		**$0**	**$0**	**$0 /M²**
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	**$2,696,005**	**$0**	**$2,696,005**		**$100,826**	**$2,796,831**	4.81%	**$134,581**	**$2,931,412**	**$1,370 /M²**
					PWGSC	$890		$15		
					Consultants	$2,617		$131		
					Construction	$34,780		$1,739		
					PWGSC	$0		$0		**Cost/M²**
					Escalation	**$38,287**	4.92%	**$1,885**	**$40,172**	**$19 /M²**
					Budget-Year Dollars (Excluding Risk)	**$2,835,118**	4.81%	**$136,466**	**$2,971,584**	**$1,389 /M²**
					PWGSC	$0				
					Consultants	$8,943				
					Construction	$219,187				
					PWGSC	$0				**Cost/M²**
					Risk Allowance	**$228,130**	**5%**	**$11,407**	**$239,537**	**$112 /M²**
					Total Cost in Budget-Year Dollars	**$3,063,248**	4.83%	**$147,872**	**$3,211,120**	**$1,501 /M²**

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 4) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 2,140 M²
PWGSC	**$372,103**	**$0**	**$372,103**		**$74,421**	**$446,524**	1.67%	**$7,442**	**$453,966**	**$212 /M²**
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building Administration	$248,069	$0	$248,069	20%	$49,614	$297,683	0%	$0	$297,683	$139 /M²
Base Building Disbursements	$124,034	$0	$124,034	20%	$24,807	$148,841	5%	$7,442	$156,283	$73 /M²
Consultants	**$1,054,292**	**$0**	**$1,054,292**		**$210,858**	**$1,265,151**		**$63,258**	**$1,328,409**	**$621 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$1,054,292	$0	$1,054,292	20%	$210,858	$1,265,151	5%	$63,258	$1,328,408	$621 /M²
Construction	**$6,201,720**	**$0**	**$6,201,720**		**$0**	**$6,201,720**		**$310,086**	**$6,511,806**	**$3,043 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$6,201,720	$0	$6,201,720	0%	$0	$6,201,720	5%	$310,086	$6,511,806	$3,043 /M²
Client	**$0**	**$0**	**$0**		**$0**	**$0**		**$0**	**$0**	**$0 /M²**
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	**$7,628,116**	**$0**	**$7,628,116**		**$285,279**	**$7,913,395**	4.81%	**$380,786**	**$8,294,181**	**$3,876** /M²
					PWGSC	$2,517		$42		
					Consultants	$7,406		$370		
					Construction	$98,407		$4,920		
					PWGSC	$0		$0		**Cost/M²**
					Escalation	**$108,330**	4.92%	**$5,333**	**$113,662**	**$53 /M²**
					Budget-Year Dollars (Excluding Risk)	**$8,021,725**	4.81%	**$386,118**	**$8,407,843**	**$3,929** /M²
					PWGSC	$0				
					Consultants	$25,303				
					Construction	$620,172				
					PWGSC	$0				**Cost/M²**
					Risk Allowance	**$645,475**	**5%**	**$32,274**	**$677,749**	**$317 /M²**
					Total Cost in Budget-Year Dollars	**$8,667,200**	4.83%	**$418,392**	**$9,085,592**	**$4,246** /M²

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 5) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 2,140 M²
PWGSC	**$375,962**	**$0**	**$375,962**		**$75,192**	**$451,154**	1.66%	**$7,508**	**$458,663**	**$214 /M²**
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$2,756	$0	$2,756	20%	$551	$3,308	0%	$0	$3,308	$2 /M²
Site Disbursements	$1,103	$0	$1,103	20%	$221	$1,323	5%	$66	$1,389	$1 /M²
Base Building Administration	$248,069	$0	$248,069	20%	$49,614	$297,683	0%	$0	$297,683	$139 /M²
Base Building Disbursements	$124,034	$0	$124,034	20%	$24,807	$148,841	5%	$7,442	$156,283	$73 /M²
Consultants	**$1,060,908**	**$0**	**$1,060,908**		**$212,182**	**$1,273,089**		**$63,654**	**$1,336,743**	**$625 /M²**
Site Development	$6,615	$0	$6,615	20%	$1,323	$7,938	5%	$397	$8,335	$4 /M²
Base Building	$1,054,292	$0	$1,054,292	20%	$210,858	$1,265,151	5%	$63,258	$1,328,408	$621 /M²
Construction	**$6,256,846**	**$0**	**$6,256,846**		**$11,025**	**$6,267,872**		**$313,394**	**$6,581,266**	**$3,075 /M²**
Site Development	$55,126	$0	$55,126	20%	$11,025	$66,152	5%	$3,308	$69,459	$32 /M²
Base Building	$6,201,720	$0	$6,201,720	0%	$0	$6,201,720	5%	$310,086	$6,511,806	$3,043 /M²
Client	**$0**	**$0**	**$0**		**$0**	**$0**		**$0**	**$0**	**$0 /M²**
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	**$7,693,716**	**$0**	**$7,693,716**		**$298,399**	**$7,992,115**	4.81%	**$384,556**	**$8,376,672**	**$3,914** /M²
					PWGSC	$2,529		$42		
					Consultants	$7,419		$371		
					Construction	$99,029		$4,951		
					PWGSC	$0		$0		**Cost/M²**
					Escalation	**$108,978**	4.92%	**$5,365**	**$114,342**	**$53 /M²**
					Budget-Year Dollars (Excluding Risk)	**$8,101,093**	4.81%	**$389,921**	**$8,491,014**	**$3,968** /M²
					PWGSC	$0				
					Consultants	$25,462				
					Construction	$626,787				
					PWGSC	$0				**Cost/M²**
					Risk Allowance	**$652,249**	**5%**	**$32,612**	**$684,861**	**$320 /M²**
					Total Cost in Budget-Year Dollars	**$8,753,342**	4.83%	**$422,534**	**$9,175,876**	**$4,288** /M²

PROJECT COST SUMMARY

Cost Estimate: Indicative — NRCan GSCC HVAC and Space Optimization - Phase 1 (Option 6) — **Date:** 21-Mar-13

Project Number: R.061749.001 — PWGSC — **Building Type:** 2 story Office cum Lab — **Notes:** N/A

SD target: N/A — **Heritage:** Not a Heritage Building — **Site Area:** 1.00 Hectares

Parking: N/A

	Cost Estimate			Contingency		Constant $	GST		Constant $	Cost/M²
	Estimate	Expended	Balance	%		GST Excluded	%		GST Included	GFA 2,140 M²
PWGSC	**$56,948**	**$0**	**$56,948**		**$11,390**	**$68,338**	1.67%	**$1,139**	**$69,477**	**$32 /M²**
Site Acquisition	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Administration	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Site Disbursements	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building Administration	$37,965	$0	$37,965	20%	$7,593	$45,558	0%	$0	$45,558	$21 /M²
Base Building Disbursements	$18,983	$0	$18,983	20%	$3,797	$22,779	5%	$1,139	$23,918	$11 /M²
Consultants	**$161,353**	**$0**	**$161,353**		**$32,271**	**$193,623**		**$9,681**	**$203,304**	**$95 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$161,353	$0	$161,353	20%	$32,271	$193,623	5%	$9,681	$203,304	$95 /M²
Construction	**$949,133**	**$0**	**$949,133**		**$0**	**$949,133**		**$47,457**	**$996,590**	**$466 /M²**
Site Development	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Base Building	$949,133	$0	$949,133	0%	$0	$949,133	5%	$47,457	$996,589	$466 /M²
Client	**$0**	**$0**	**$0**		**$0**	**$0**		**$0**	**$0**	**$0 /M²**
Time Costs	$0	$0	$0	20%	$0	$0	0%	$0	$0	$0 /M²
Special Costs	$0	$0	$0	20%	$0	$0	5%	$0	$0	$0 /M²
Constant Dollars (Excluding Risk)	**$1,167,433**	**$0**	**$1,167,433**		**$43,660**	**$1,211,094**	4.81%	**$58,277**	**$1,269,371**	**$593** /M²
					PWGSC	$385		$6		
					Consultants	$1,133		$57		
					Construction	$15,060		$753		
					PWGSC	$0		$0		**Cost/M²**
					Escalation	**$16,579**	4.92%	**$816**	**$17,395**	**$8 /M²**
					Budget-Year Dollars (Excluding Risk)	**$1,227,673**	4.81%	**$59,093**	**$1,286,766**	**$601** /M²
					PWGSC	$0				
					Consultants	$3,872				
					Construction	$94,913				
					PWGSC	$0				**Cost/M²**
					Risk Allowance	**$98,786**	**5%**	**$4,939**	**$103,725**	**$48 /M²**
					Total Cost in Budget-Year Dollars	**$1,326,459**	4.83%	**$64,032**	**$1,390,491**	**$650** /M²